PARIS

CHALLENGES, OPPORTUNITIES AND NEW PERSPECTIVES IN ENDODONTOLOGY

3-6 SEPTEMBER 2025

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Clinical Posters Award Competition

KU LEUVEN CP 003

GUIDED ENDODONTICS: A PROMISING TREATMENT FOR APICAL PATHOLOGY IN SEVERELY OBLITERATED TEETH

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AIM

This case report describes the use of guided endodontics as a predictable and minimal invasive technique for the endodontic treatment of tooth 41 with a severely calcified root canal and apical pathology.

INTRODUCTION

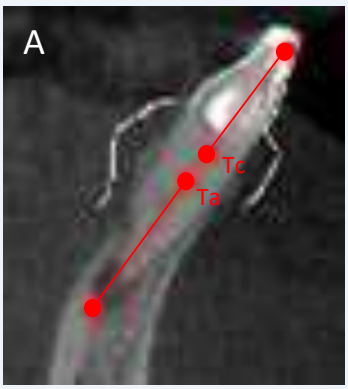
In current practice, endodontic treatment of severely obliterated teeth could be challenging with a high likelihood of procedural errors. Guided endodontics presents an innovative approach enhancing accuracy and reducing the risk of iatrogenic complications.

CASE PRESENTATION

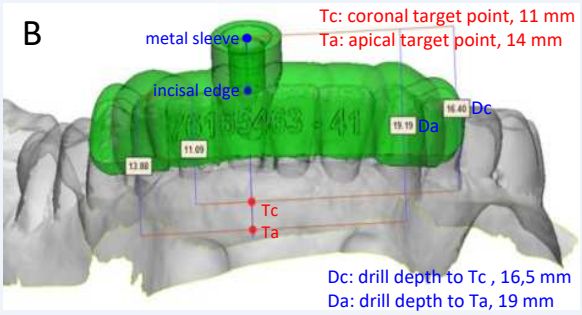
CLINICAL TREATMENT

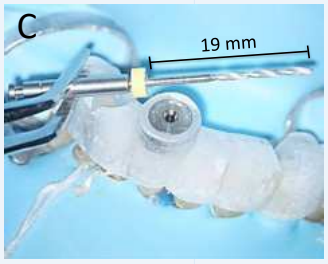
A 66-year-old male patient (ASA score I) presented with a diagnosis of necrotic pulp and asymptomatic chronic apical periodontitis. Due to the severe root canal obliteration on tooth 41, a guided endodontic treatment was indicated.

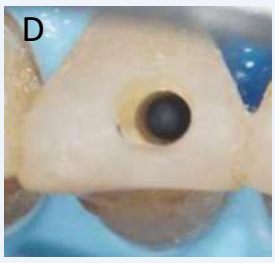
To plan the treatment an intraoral scan and CBCT (A) were acquired. Then, a guide was designed using 3-Matic medical software (Materialize, Leuven, Belgium) based on the planning from the CBCT (B). Two target points (Tc, Ta) were selected on the CBCT to measure from the incisal edge the depth where the canal could be found (A, B). The drill depth was determined from the sleeve (Dc, Da) (B).

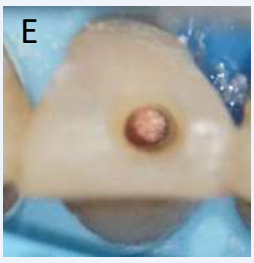


A minimal invasive access was achieved using a 1 mm diameter carbide bur up to Ta (C), followed by canal preparation up to WaveOne Gold Medium (D). Afterwards, the root canal was filled using the warm vertical compaction technique and AH Plus epoxy sealer (E).

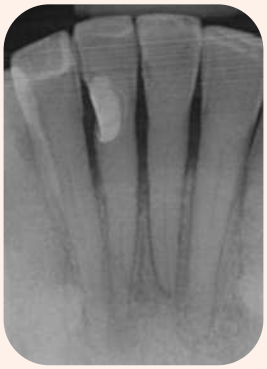






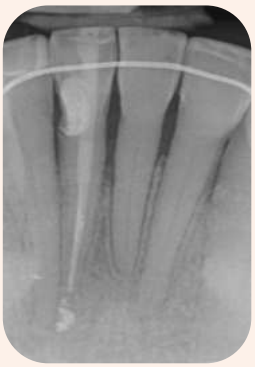


RADIOLOGICAL FOLLOW-UP



PRE-OP

POST-OP



6 MONTHS

1 YEAR

DISCUSSION

Previous literature already established that guided endodontics provides a safe and accurate alternative for free handed access, both ex-vivo and in-vivo, without the need for extensive clinical experience. However, to minimize the risk of iatrogenic damage, this procedure should be carried out with the aid of a dental microscope and a minimum of 1 mm safety margin around the planned trajectory.

CONCLUSION

Guided endodontics presents a clinically viable and effective method to access root canals safely and on a minimally invasive way. This approach is particularly advantageous in teeth with severe pulp canal obliteration, where free handed access may be technically challenging and/or less predictable.

CLINICAL APPROACH OF EXTENSIVE PERIAPICAL LESION: CASE REPORT

CP016

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AIM: To report the management of an extensive periapical lesion treated with root canal therapy and microsurgery, leading to complete paraesthesia resolution and a one-year clinical follow-up.

INTRODUCTION: Microorganisms and their by-products contribute to pulpal and periapical pathology by colonizing root canals and triggering immune responses. Larger lesions suggest compromised host response and for persistent endodontic infections treatment approach may require both non-surgical and surgical.

CASE PRESENTATION: A 38-year-old patient was referred to the FMDUL Endodontics postgraduate clinic for an extensive lesion in the third quadrant with associated paraesthesia. Extraoral examination revealed swelling on the left lower jaw, while intraoral assessment confirmed tenderness in the third quadrant and localized hard tissue enlargement. Diagnostic tests were performed and the pulp and periapical diagnoses of the relevant teeth are shown in Table 1:

Tooth	41	31	32	33	34	35	36
Pulp diagnosis	Necrosis	Necrosis	Normal pulp	Necrosis	PTT	Necrosis	Normal pulp
Periapical diagnosis	AAP	AAP	AAP	SAP	SAP	SAP	NPT

Table.1: Pulp and periapical diagnosis of teeth 36 to 41. PTT – Previously treated tooth, AAP - Asymptomatic apical periodontitis, SAP – Symptomatic apical periodontitis, NPT – Normal periapical tissues

Fig.1: Initial radiographs of teeth 36 to 41

Fig.2: Initial Cone Beam Computer Tomography FOV: 6.01 cm Voxel SIze: 0.15mm

Treatment involved endodontic treatment for teeth 35, 33, 31, 41, retreatment of tooth 34 and subsequent microsurgery and apicectomy on teeth 35–33 due to continuous drainage on tooth 34. All involved teeth were instrumented with the WaveOne Gold System (Dentsply, Ballaigues, Switzerland) and disinfection was done with 5.25% sodium hypochlorite and 10% citric acid, sonically activated with Endoactivator (Dentsply, Switzerland), followed by obturation using the continuous wave technique and AHplus sealer (Dentsplysirona, Switzerland). Intra-coronal sealing was completed with Filtek Supreme XTE Flow (3M, USA). During endodontic treatments marsuapialization with decompression was achieved. Tooth 35 had continuous drainage and prior to microsurgery, the patient was premedicated. Endodontic apical microsurgery involved a papilla base incision, lesion enucleation and granulated tissue removal. Teeth 33–35 underwent retro-preparation and retro-obturation with ProRoot MTA (Dentsply), followed by suturing. The excised lesion was sent for biopsy, and histological analysis confirmed a radicular inflammatory odontogenic cyst. Two weeks postoperatively, sutures were removed, paresthesia was monitored, and patient was prescribed gabapentin 600mg and Neurobion for 12 weeks.

At the one-year follow-up, the patient was asymptomatic with resolved paresthesia, and tooth 32 had normal response to cold test, radiographic examination with CBCT showed significant reduction in the radiolucency.

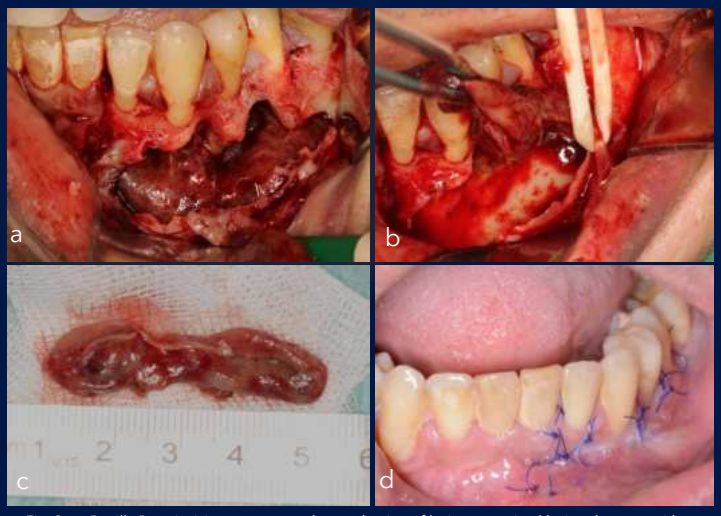

Fig. 3: a. Papilla Base incision, osteotomy, b. enucleation of lesion, c. excised lesion d. suture with 5x0 monofilament

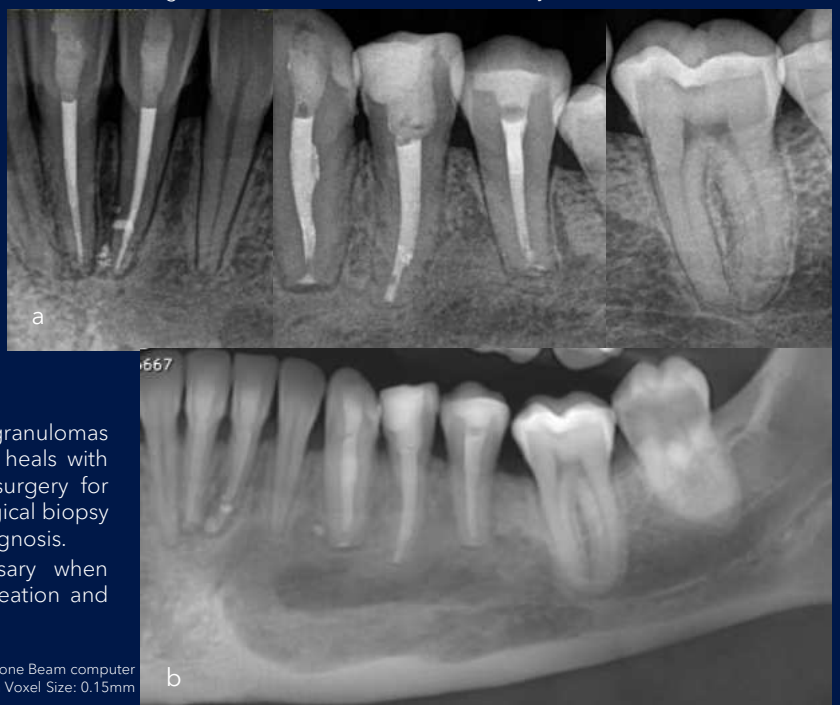

Fig. 4: a. 1 Year follow-up radiographs teeth 36 to 41 b. 1 Year Follow-up Cone Beam computer Tomography FOV: 6.01 cm Voxel Size: 0.15mm

DISCUSSION: Periapical lesions can be classified as dental abscesses, granulomas or radicular cysts. Dental granulomas, the most common and usually heals with endodontic treatment. However, true periapical cysts may require surgery for resolution. Since CBCT and periapical radiography have limitations, surgical biopsy and histopathological analysis remain the gold standard for accurate diagnosis.

CLINICAL RELEVANCE: Endodontic microsurgery may be necessary when conventional treatment is insufficient, ensuring complete lesion enucleation and optimal healing

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Traumatic dental injury: Management of combined avulsion and apical root fracture in a permanent central incisor

CP082

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Aim

To describe the endodontic treatment after dental trauma of the left central incisor (tooth 21) in an 8-year-old patient.

Introduction

The combination of avulsion and root fracture due to traumatic dental injury is rare and the therapy can be challenging. While avulsion is one of the most serious dental injuries, the successful treatment of an apical root fracture is less demanding. The avulsion results in extensive damage of the vascular-nerve bundle and the periodontal ligament. Especially in adolescent patients, this leads to a limited long-time prognosis due to an increased risk of resorptive complications and post-traumatic ankylosis[1]. Moreover, the combination of two injury types on the same tooth can lead to a more unfavorable outcome [1,2].

Case Presentation

• Traumatic Dental Injury

As a result of a collision during a football match, tooth 21 was traumatically injured. The root fractured and the avulsed part of the tooth was attached only to the gingiva (Fig. 1).

• First Aid

After reposition of tooth 21 and wire splinting (Fig. 2), Doxycyclin was prescripted weight-adapted for 7 days.

• Endodontic Treatment

The root canal treatment was initiated 3 days later under local anesthesia using an antibiotic corticosteroid paste as intracanal medication for 2 weeks followed by calcium hydroxide. 4 weeks after trauma, the wire splint was replaced by a titan trauma splint for another 4 weeks. 6 weeks after the trauma, mechanical cleaning and disinfection according to determined length (Fig. 3) were carried out. This was followed by a clinical check-up and renewal of the intracanal medication. 15 months after trauma, the root canal treatment was completed following length control (Fig.4), with normal clinical parameters. The treatment was delayed due to personal reasons of the patient. After extensive sonic activated disinfection with sodium hypochlorite (Fig. 5), a tricalcium silicate cement (Biodentine™, Septodont, France) was applied (Fig. 6, 7) and the cavity was sealed with a composite material (Fig. 8).

• Follow-up

The radiographical and clinical follow-up 20 months (Fig. 9) and 24 months (Fig. 10, 11) after trauma were uneventful with no signs of periapical pathology, resorption or ankylosis.

Discussion

To minimize the negative effects of a possible second trauma, the use of a sports mouthguard was recommended. Most replanted teeth exhibit root resorption, whereas the appearance of periodontal healing in comparison is low. If replacement resorption and ankylosis occur, the physiological growth of the alveolar bone will be interrupted[3]. Therefore, treatment alternatives depending on the patients age have to be considered. The event of external infection-related root resorption can be prevented by early root canal treatment[4]. If the apical fragment becomes non-vital and apical pathologies become radiographically visible, surgical removal is indicated[1].

Conclusion & Clinical Relevance

In the present case, the management strategy after traumatic dental injury led to good clinical and radiographic results two years after trauma. Nevertheless, the long-term prognosis depends on the occurrence of root resorption and ankylosis. Close monitoring is necessary to detect complications at an early stage.

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Intentional replantation as treatment option for invasive cervical resorption

CP103

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Aim: To report a clinical case of successful intentional replantation of a tooth with invasive cervical resorption (Class 4, Heithersay 1999) and severe apical periodontitis after 3-year follow-up.

Introduction: Invasive cervical resorption (ICR) is external root resorption which, in its advanced stadium (Class 4, Heithersay 1999), is almost impossible to treat, and when it is complicated by severe apical periodontitis, extraction of the tooth is required.

Case Presentation A 26-year-old female patient, with history of orthodontic therapy, came with pain and swelling in the region of papilla incisiva after an unsuccessful RTC of tooth 21. RA radiography showed deffuse area of tooth loss and severe periapical radiolucency. Cone-beam tomography (CBCT) (Fig. 1-3) revealed invasive cervical resorption (Class 4), the entry point of the lesion was located in cervical region on the mesial side of the rooot, subcrestally (8mm in extension) and severe periapical bone loss. Extraction was indicated, but, since it was the first incisor in a young patient and ther ewas no enough bone for dental implant placement without additional surgical procedures (GBR and soft tissue augmentation) , we opted for intentional replantation.

At first, atraumatic extraction of tooth 21 was performed using periotomes and forceps. In order to prevent dehydration of the root surface and consequential apoptosis of the vital cells of periodontium and cement, during the endodontic treatment, root of the tooth was wrapped in gauze that has been soaked in saline solution. RCT was performed extraorally. Canal was instrumented with XP-endo Shaper and XP-endo Finisher (FKG Dentaire, Switzerland) and irrigated with 2,5%NaOCl directly suctioned by sauger. Endodontic space was obturated with a bioceramic sealer (MTA-Fillapex, Angelus) and gutta-percha points. Following obturation, perforation of lateral wall was closed with Biodentin (Septodont, France). After endodontic treatment, coagulum from the socket was rinsed with saline solution, tooth was replanted in the socket and it was splinted with composite splint for the next four weeks.

The tooth was out of its socket for 17 minutes. Definite restoration was done after removing the splint with glass-ionomer cement and composite filling. RA radiographs were done immediately after replantation (Fig. 6), 6 months (Fig. 7), 12 months (Fig. 8), 24 months (Fig. 9) and 36 months after the procedure. Three years follow up showed clinically asymptomatic, functional tooth and CBCT showed significant resolution of periapical radiolucency (Fig. 10-13).

Discussion: Invasive cervical resorption (ICR) is an aggressive form of external root resorption. The treatment should remove the resorbing tissue, prevent its reoccurrence and restore tooth's function and aesthetics. ESE Position Statement listed several treatment options: external or internal repair of the resorptive defect, intentional replantation, periodic review and extraction. Intentional replantation is the last option before the extraction of affected tooth due to its sensitive technique and uncertain outcome. Bioactive materials based on calcium silicate poses biocompatibility, antibacterial properties, hydrophilic nature, marginal adaptation and sealing properties which makes them ideal for root resorption therapy.

Conclusion & Clinical Relevance- Intentional replantation in cases of invasive cervical resorption when external (surgical) and internal (endodontic) approach or a dental implant are not possible, may be sustainable treatment option.

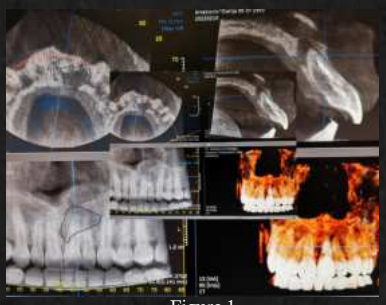
Figure 1.


Figure 2.


Figure 3


Figure 4


Figure 5


Figure 6


Figure 7.


Figure 8


Figure 9

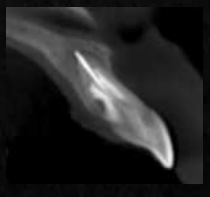
Figure 10


Figure 11


Figure 12


Figure 13

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PRESERVATION OF PULPAL SENSITIVITY IN THE MAIN CANAL OF A MANDIBULAR DENS INVAGINATUS WITH PERIAPICAL LESION USING DIGITAL WORKFLOW

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WINNER AWARD

CP147

INTRODUCTION

- *Dens invaginatus* (DI)[1], also known as "dens in dente," is a dental development anomaly characterized by an invagination of enamel and dentin into the dental papilla before its mineralization phase[2]. The invagination often communicates with the oral environment, leading to pulp necrosis and peri-invagination periodontitis (PIP)[3]. Most cases occur in the maxilla and are detected during routine clinical or radiographic examinations. In 1957, Oehlers[4] classified DI into three categories based on the extent of penetration into the periodontal ligament.

AIM: To present the clinical management of a complexmandibular Type IIIb Oehlers DI using cone beam computed tomography (CBCT), a 3D printed replica, and bioceramic sealer.

CASE PRESENTATION

A 10-year-old male patient with no reported systemic conditions was referred by the Orthodontics department due to a radiographic finding of a periapical lesion in tooth #32 and an anatomical coronal variation.

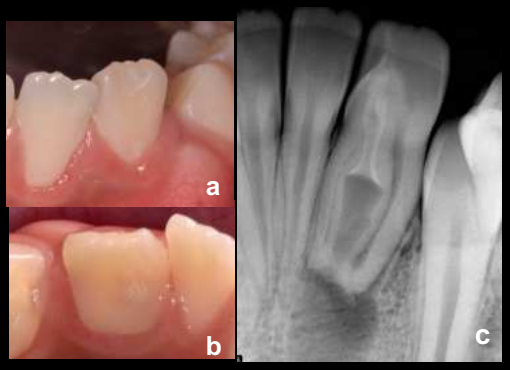

Fig. 1. (a and **b),** Preoperative clinical image. **(c),** Initial X-ray.

DIAGNOSTIC TOOLS

- On clinical inspection, a crown of atypical size, grayish color and an abnormal cingulum are observed (Fig. 1a and 1b).
- To the sensitivity tests (cold and electrical) he responded negatively in the cingulum and positively in the buccal face in the cervical third, while all the adjacent teeth responded positively.
- The periapical radiograph shows tooth #32 with a DI with an open apex and an extensive periapical lesion (Fig. 1c).
- In the tomographic sections, the invagination is observed extended to the apical third; a wide canal, located centrically in relation to the one of tooth #32, is connected with a 7.5 mm periapical lesion (PAI 4) (Fig. 2 a-d).

Tooth #32	DI
Sensitivity tests +	Sensitivity tests -
Percussion tests -	Percussion tests -
Probing depth x	Probing depth x
Mobility x	Mobility x

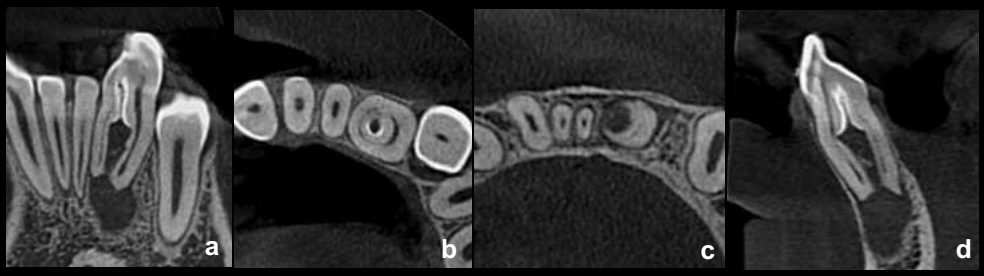

Fig. 2. (a), Coronal tomographic section**. (b and c),** Axial tomographic section**. (d),** Sagittal tomographic section.

DIAGNOSIS

PULP: Tooth #32 (normal pulp); **DI** (pulp necrosis)

P.T: Asymptomatic apical periodontitis.

TREATMENT PLAN

Necropulpectomy of the DI and clinical, radiographic, and tomographic follow-up.

PROGNOSIS

Reserved

ENDODONTIC PROCEDURE

The patient was anesthetized with 2% mepivacaine (Medicaine®), isolated, and coronary access was performed, controlling it through multiple x-rays; the DI canal was located and the conductometry was taken (Fig. 3a and 3b).

Fig. 3. (a), Access. **(b),** Conductometry x-ray.

DI was debrided with a #40 K file and XP-EndoFinisher® irrigating with 2.5% NaOCl. Final irrigation was performed with PUI, 17% EDTA was placed for 3 min, washed with physiological solution, dried with sterile paper points, and $Ca(OH)_2$ was placed in aqueous paste.

Replacements of $Ca(OH)_2$ were made at 15 and 30 days, and at 2 and 4 months; the patient was asymptomatic and responded positively to sensitivity tests at all follow-up appointments, and bone repair began to be observed (Fig. 4a). A 3D printed replica was made and obturation was practiced (Fig. 4b).

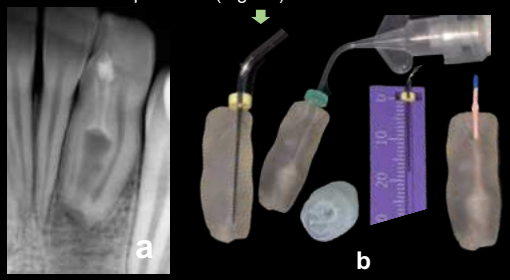

Fig. 4. (a), x-ray at 4 months**. (b),** Obturation practice.

At 6 months, bone healing was observed, and the DI was filled with gutta-percha and Ceraseal® bioceramic sealer. Adequate obturation of the DI canal is observed (Fig. 5a and 5b).

The final restoration was performed.

Fig. 5. (a), Condensation x-ray. **(b),** Final obturation x-ray.

CLINICAL, RADIOGRAPHIC AND TOMOGRAPHIC CONTROL AT 2 YEARS

Fig. 5. (a), Initial X-ray. **(b),** Control x-ray at 2 years**. (c),** Initial coronal section. **(d),** Coronal section at 2 years**. (e),** Initial sagittal section**. (f),** Sagittal section at 2 years. **Complete bone healing and apical closure are observed.**

Sensitivity tests +
Percussion tests -
Probing depth x
Mobility x

DISCUSSION

- DI prevalence ranges from 0.2–12%, with a bilateral occurrence of 43%, and it is most commonly found in permanent teeth, particularly in the maxillary lateral incisors (90% of cases, with 3.3% classified as type III)[2,5]. Although previous studies have primarily reported DI in the maxilla, this case is presented in the mandible as a unilateral type IIIb DI, making it even rarer.
- If peri-invagination periodontitis occurs within a healthy pulp, the main goal is to preserve pulp vitality. Treatment should focus on independently managing the invagination canal from the main one whenever possible[6,7], as shown in this case.
- Various treatment modalities have been proposed, from prophylactic restorations to extraction. In this case, bioceramic sealer was used for its excellent flow and biological properties, ensuring optimal canal obturation. Digital workflow facilitated a minimally invasive approach, helping preserve pulp vitality.

CLINICAL RELEVANCE

- In complex cases like this, digital tools such as CBCT and 3D replicas were essential for accurately analyzing canal anatomy, improving biomechanical preparation, disinfection, and obturation.
- At the 2 years control the preservation of pulp vitality in tooth #32 and complete bone healing and apical closure are observed, despite the presence of a Type IIIb DI with a periapical lesion; this represents a significant challenge due to the lack of established protocols for such conditions.

REFERENCES

Universität Basel

CP152

UZB

Synodontia, dentes concreti, hyperdontia? Vital pulp therapy of a dental anomaly

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Aim

This case report aims to demonstrate a vital pulp treatment strategy for a rare growth anomaly. The anomaly posed a particular challenge for interdisciplinary treatment planning due to its complexity.

Introduction

Dental twin anomalies are categorized into four types: schizodontia, gemination, synodontia, and dentes concreti. Schizodontia results in the formation of an independent twin tooth, while gemination describes the incomplete division of a single tooth germ. In contrast, synodontia and dentes concreti involve the fusion of dental hard tissues from two distinct tooth germs. Among these, only schizodontia leads to a numerical excess of teeth. Reported prevalence rates range from 0.1% to 3% (Pereira et al., 2000). In synodontia, fusion of dental hard tissue occurs, and in rare cases, even the pulp chambers may be fused— a feature typically associated with gemination (Pereira et al., 2000). Hyperdontia represents a numerical dental anomaly characterized by variations in morphology and position. In orthodontic treatment, extraction is often necessary as a definitive space-creating measure. Its prevalence is reported to range between 0.3% and 3.2% (Rueppell et al., 2015). The simultaneous occurrence of these anomalies, as seen in this case, is extremely rare and presents a significant clinical challenge.

Case Presentation

The twelve-year-old male patient was referred to the University Clinic for orthodontic treatment with an otherwise unremarkable general medical history. The patient presented with skeletal Angle Class II, a traumatic skeletal deep bite with combined ankyloglossia. Furthermore, a synodontia in region 21 and a supernumerary tooth in region 22 were diagnosed. Radiographic analysis revealed a fusion of the pulp chambers of tooth 21 and adhesion of tooth 22 to tooth 21. The separation and extraction of the distal part of tooth 21 was planned as a space-creating measure. For this purpose, the clinically healthy tooth was pretreated with pulp-preserving measures. The fused pulp chamber was separated by means of a partial pulpotomy and capping of the pulp with a calcium silicate-based hydraulic cement under a rubber dam. The pulp tissue was resected to such an extent that an adhesive composite seal was possible mesial to the planned separation. Subsequently, the distal part of the tooth was extracted in the same session. Despite cement adhesion, there were no complications. One week after the procedure, tooth 21 was reconstructed with a composite build-up. Following the frenotomy procedure, the patient underwent continuous orthodontic treatment with a fixed device. Clinical and radiographic follow-ups over 20 months revealed no complications, and the tooth responded positively to thermal sensitivity testing (cold). Adjustments to the anterior composite build-up may be required after completion of the orthodontic therapy.

Discussion

Identifying dental anomalies can be challenging in clinical practice, particularly when there are rare variations and multiple anomalies present. Synodontia, the fusion of two teeth, primarily occurs in the region of the dental crown and is often associated with hypodontia. The extent of fusion is likely influenced by the timing of crown development and may present bilaterally (Pereira et al., 2000). In the present case, the total number of teeth remained normal due to the presence of an additional supernumerary tooth. Both synodontia and dentes concreti are believed to originate from tissue compression caused by spatial constraints, making these anomalies rare yet pathophysiologically plausible (Gängler P et al., 2010). Partial pulpotomies, particularly in non-inflamed teeth, have positive prognoses and should be pursued. By preserving tooth vitality, complications such as esthetic impairments due to tooth discoloration after a traditional approach like root canal treatment can be averted (Krastl et al., 2021).

Clinical Relevance

A comprehensive clinical examination and radiographic imaging are essential for identifying uncommon variations in twin anomalies, enabling a treatment plan that preserves tooth vitality.

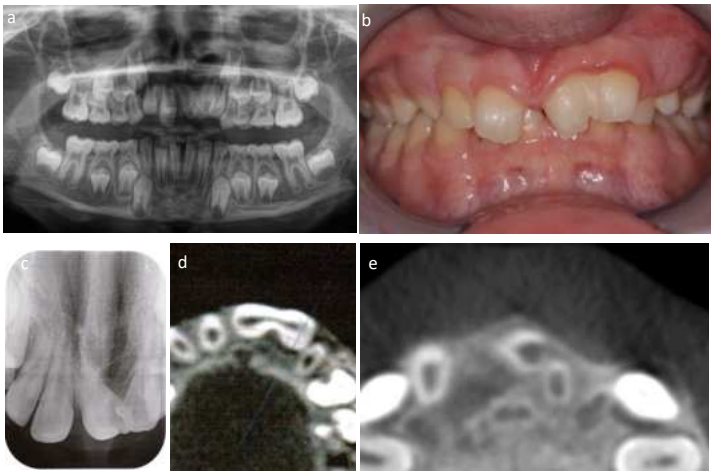

Fig 1: Preoperative clinical and radiographic situation (a-c). In the CBCT, the synodontia (d) and dens concreti (e) are evident in the occlusal sectional plane.

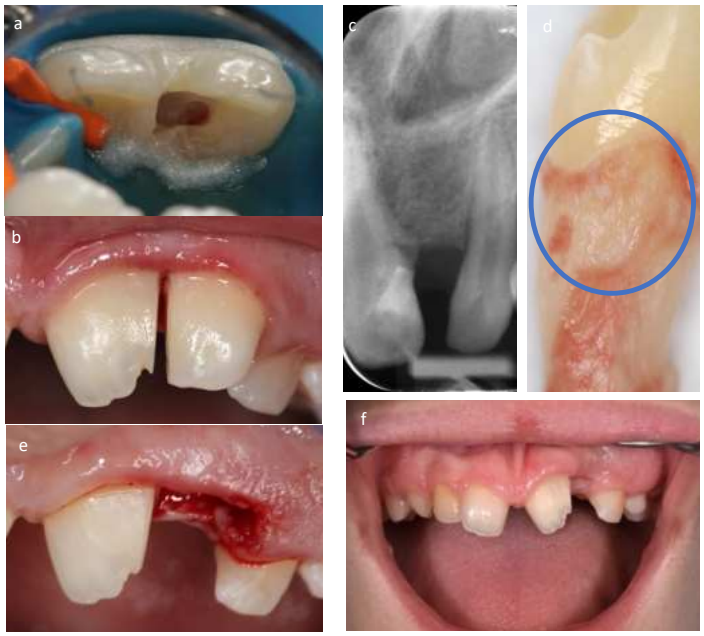

Fig 2: Separated pulp chamber of tooth 21 (a). After capping with hydraulic silicate cement and adhesive sealing, the teeth were separated (b) and extracted (e). In the postoperative examination, the cement fusion is apparent (d). The follow-up shows an uneventful healing process (c, f).

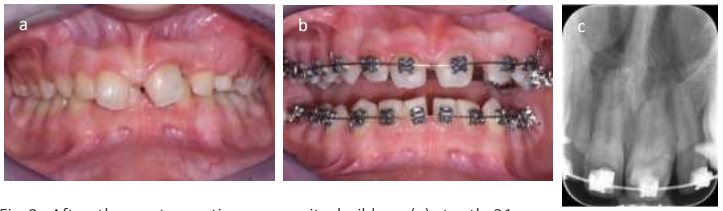

Fig 3: After the postoperative composite build-up (a), tooth 21 was aligned using a fixed orthodontic appliance (b). The x-ray (c) and clinical check-up showed that the tooth was symptom-free after one year and four months.

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PARIS

CHALLENGES, OPPORTUNITIES AND NEW PERSPECTIVES IN ENDODONTOLOGY

3-6 SEPTEMBER 2025 ese

Clinical Posters

SELECTIVE RETREATMENT OF TOOTH 2.7: A CBCT-GUIDED APPROACH WITH PROGNOSTIC CONSIDERATIONS

CP002

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AIM

The purpose of this case report is to illustrate a conservative approach to endodontic retreatment using CBCT to guide selective intervention.

INTRODUCTION

Cone-beam computed tomography (CBCT) has demonstrated superior accuracy over conventional radiography in detecting apical periodontitis (1). Selective endodontic retreatment is an emerging conservative approach justified by microbiological studies showing different microbial populations within separate canals (2,3). Recent retrospective studies have confirmed favorable outcomes in selective retreatment cases, with a reported success rate of up to 86.7% per tooth and 92.6% per retreated root (5).

CASE PRESENTATION

A 45-year-old patient presented with discomfort in the left maxillary posterior region. Clinical examination revealed percussion tenderness, and CBCT identified an untreated 2nd mesiobuccal canal with a periapical radiolucency and a perforation in the palatal canal. Other canals appeared well-obturated.

TREATMENT

- CBCT-guided access cavity preparation.
- Selective retreatment of 2nd mesiobuccal and palatal canals.
- Ultrasonic irrigation and calcium hydroxide dressing.
- Bioceramic sealer obturation and warm vertical condensation.
- Palatal perforation sealed with MTA.

RESULTS/FINDINGS

Postoperative CBCT confirmed adequate canal obturation and perforation sealing. Six-month follow-up revealed reduced periapical radiolucency and symptom resolution.

DISCUSSION

Microbiological studies indicate different microbial compositions in separate root canals, supporting selective retreatment (2,3). Enterococcus faecalis has been identified as a key pathogen in persistent endodontic infections. Retrospective data suggest that selective retreatment yields high success rates, with 91.5% tooth survival at 12–48 months(5). Prognostic studies report 75-85% success rates in retreatments without major complications, whereas fractures and perforations in the apical third decrease predictability (4).

CONCLUSION

This case highlights CBCT's role in precise diagnosis and treatment planning for selective retreatment. A targeted approach can effectively manage endodontic failure while preserving structurally sound canals.

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CP004

LMU HOSPITAL

Brave new reality

Virtual reality assisted preoperative visualization and consecutive planning for a surgical repair of an external cervical resorption

Scan me for seeing the case in VR!

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Aim

Demonstrating the benefit of using CBCT and intraoral scan data to create a case-individual virtual reality (VR) model for treatment planning and patient communication exemplified on a surgical approach to repair an external cervical resorption.

Introduction

External cervical resorptions pose challenges for the endodontic practitioner as the extent and accessibility of the resorptive process may vary greatly (Patel Foschi et al. 2018). Especially the threedimensional understanding of the defect is crucial for adequate treatment planning (Patel Lambrechts et al. 2018). VR-based models and simulations are promising methods for training under- and postgraduate doctors to improve clinical skills in a controlled environment (Reymus Liebermann et al. 2020; Lin Chen et al. 2024), especially with complex cases. VR models offer visualization and threedimensional insights, which facilitate complex preoperative treatment planning and execution (Sytek Inglehart et al. 2021), also for endodontic microsurgery (Suebnukarn Rhienmora et al. 2012).

Case presentation

A 28 year old patient presented with an external cervical resorption on tooth 11, probably associated with a traumatic tooth injury 20 years earlier, to our university hospital (Fig. 1 ab). While the asymptomatic apical periodontitis on tooth 21 and 23 were root canal treated in the undergraduate course, tooth 11 was referred to the subdepartment of endodontics for specialist treatment. After clinical examination (Fig. 1d.), CBCT analysis (Patel classification 2Ap; Fig. 1e.f.) and informed consent from the patient, the decision for a tooth-preserving approach was made, following an intraoral scan of the front teeth of the upper jaw (Omnicam, Dentsply Sirona, Bensheim, Germany).

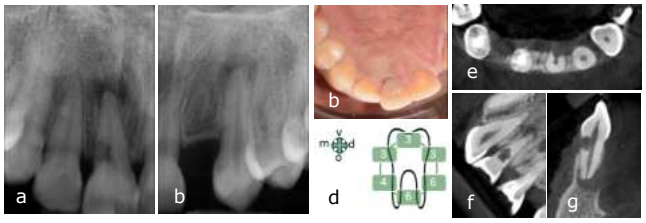

Fig. 1a. + b. preoperative radiographs of the teeth 11, 21 and 23 c. preooperative picture d. periodontal status of tooth 21 e. + f. +g. preoperative CBCT cross section images

The CBCT was exported as a DICOM-file, loaded into 3D slicer (The Slicer Community, www.slicer.org) using Dental Segmentator for the segmentation to differentiate between pulp tissue, root canal filling, tooth and bone. The segmentation was manually corrected and exported as STL file.a. The Surface scan was exported as an STL-file and merged with the segmented CBCT-model. Textures and transparency of the different tissues were customized in Blender (Blender Foundation, www.blender.org). Subsequently, the data was converted into a glp-format for creating a virtual reality-model using adobe aero desktop (Adobe Inc., San José, California, USA) (Fig. 2.).

Fig. 2. VR model from different perspectives

The case was discussed with the supervising doctors of the postgraduate endodontic program. The VR-model was used for visualizing the area of the defect and the lesion extent. The VR-model supported the discussion of the surgical access, especially as the defect extented into the distal interapproximal space. However, due to the insights of the the threedimensional visualization, a more minimally-invasive single flap approach was planned.

The surgery was executed, in local anaesthesia, according to the preoperative treatment plan:

1. Surgical access in a single-flap approach using intrasulcular incisions, a simplified papilla preservative approach and an extension of the incisions to tooth 13 for better mobilization of the flap and improved visualization of the resorption site (Fig. 3a.).

2. The resorptive tissue was removed, the site was cleaned with diamant burs and NaCl (Fig. 3b.).

3. Due to a large perforation of the resorptive tissue into the root canal, the canal was rinsed with NaOCl, dried with sterile paper points and aqueous calcium hydroxide (Ultracal, Ultradent, München-Brunnthal, Germany) was administered into the root canal. The canal was secured using Cavit (Solventum Germany GmbH, Kamen, Germany) (Fig. 3c.).

4. Hemostasis was achieved using Teflon tape and Racestyptine (Septodont GmbH, Niederkassel, Germany).

5. The defect was restored using Scotchbond Universal adhesive (Solventum Germany GmbH, Kamen, Germany) and Tetric evoceram Bulkfill (Ivoclar Vivadent, Schaan, Liechtenstein). The filling was thoroughly polished (Fig. 3d.).

6. The flap was reattached using two horizontal papilla-preserving sutures (6.0 Prolene monofile, Ethicon, Norderstedt, Germany) (Fig. 3e.).

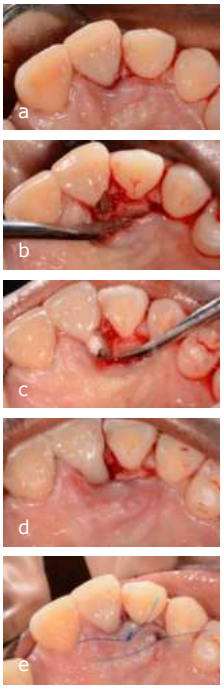

Fig. 3 a.+b.+c.+d.+ e. Intraoperative images of the surgical repair

Two weeks after the surgery, the root canal treatment of tooth 11 was begun with a conservative coronal access. The treatment was executed in multiple visits with prolonged calcium hydroxide dressing as the fistula wouldn't heal after the first visit and second visit. The root was filled with an apical Plug using BC RRM Putty (FKG Dentaire SA, La Chonds-de-Fonds, Switzerland) and back fill guttapercha. A fiber post (3M RelyX fiber post 3D, Solventum Germany GmbH, Kamen, Germany) was passively inserted in the resorptive defect area and adhesively bonded with RelyX Unicem 2 (Solventum Germany GmbH, Kamen, Germany). Coronal seal was achieved with Scotchbond Universal and Filtek One Bulk Fill in shade A2 (Solventum Germany GmbH, Kamen, Germany).

Fig. 4a. endometric length radiograph b. working length radiograph after canal preparation c. control radiograpgh after apical plug d. control radiograpgh after insertion of a fiber post and coronal seal with a resin composite filling

Discussion

VR models and simulations aid to communicate complex clinical cases and their individual challenges to the patient. Moreover, preoperative planning of these cases is facilitated. In this case, the preoperative insights given by the VR model helped to execute a more minimally invasive access approach while still fully exposing the defect area. A widespread use is yet to be developed, not only due to the lack of an automated integration of the basis data into a VR model, but also because the basis technologies as an intraoral surface scan device or a CBCT are not broadly available in dental offices. Furthermore, with the processing of sensitive medical data, ethical concerns concerning data security have been raised (Singh Vig et al. 2024).

Clinical relevance

VR offers new possibilities for education, treatment planning and patient communication, especially in specialist practices or universities, where the basis technologies as CBCT and intraoral scanning devices are mostly available. For future applications and widespread use, software that automatically merges the STL-data of a CBCT and an intraoral scan, segments the tissues, adds textures and transforms the data automatically into a VR model is needed.

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Experience with X-Guide Dynamic Navigation System in Endodontic Microsurgery and Autotransplantation: A Case Series

Universidad de los Andes
FACULTAD DE ODONTOLOGÍA

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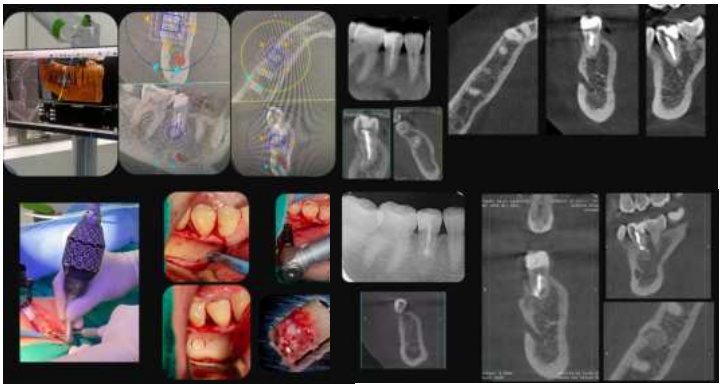
CP005

Aim: This report aims to present the clinical outcomes of using the X-Guide dynamic navigation system in endodontic microsurgery and dental autotransplantation at the Universidad de los Andes, Santiago, Chile.

Introduction: Dynamic navigation systems are a groundbreaking advancement in guided dental procedures. They enable real-time CBCT data superimposition onto the surgical field, allowing for precise localization of anatomical structures. This technology is particularly beneficial in cases where access is limited or when procedures are close to vital structures.
In endodontic microsurgery, this technology enhances precision when accessing root apices and avoiding critical anatomical structures. For autotransplantation procedures, it facilitates optimal recipient site preparation while preserving adjacent structures.
This level of precision is crucial for successful outcomes in complex endodontic procedures, particularly in anatomically challenging areas. The integration of this technology at Universidad de los Andes represents a significant step forward in advancing minimally invasive endodontic procedures and improving the predictability of surgical outcomes.

Case Presentation	Case 1: Microsurgery	Case 2: Autotransplantation
Patient Demographics	Adult patient with symptomatic apical periodontitis.	9-year-old patient with maxillary anterior agenesia.
Clinical Presentation	Previously treated tooth with severe curvaturem and a separated instrument in the apical third.	Multiple anterior agenesis with unerupted canines. Patient in ongoing orthodontic treatment for maxillary hypoplasia.
Preoperative Planning	CBCT scan with X-Guide virtual planning Dynamic navigation system setup	CBCT scan with X-Guide virtual planning Digital positioning análisis. CARP model.
Microsurgical Procedure	Conservative guided osteotomy Precise apex location Autogenous bone graft preservation.	Guided recipient site preparation with pilot guide burs Protected developing canines Precise donor tooth positioning.
Follow-up Results	Complete bone healing at 1 year Patient asymptomatic Maintained nerve integrity.	Successful bone formation Optimal tooth positioning Protected developing structures.

Case 1



Case 2

Discussion: The Dynamic navigation system provided:

Enhanced Surgical Precision:
- The system's real-time CBCT data integration enables an accuracy of (±0.5mm), significantly reducing the risk of iatrogenic damage.

Advanced Visualization Capabilities:
- 360° real-time visualization of anatomical structures
- Three-dimensional representation of surgical trajectories
- Continuous monitoring of instrument position relative to critical anatomical landmarks

Operative Benefits:
- Reduced surgical access requirements compared to conventional approaches
- Precise osteotomy preparation with evidence of accuracy rates up to 98%.
- Improved control during apex localization and resection.

Workflow Optimization:
- Elimination of static guide fabrication time
- Intraoperative flexibility for surgical plan modifications
- Reduced chairside time after initial system setup

Limitations and Considerations:
- Initial Investment and Operating Costs:
- Learning Curve
- (Requires dedicated training period , estimated 15-20 cases).
- Technical Limitations
- (System calibration requirements before each procedure)

Clinical Relevance : The integration of dynamic navigation technology represents a significant advancement in endodontic microsurgery and autotransplantation procedures.
The system's precision and real-time guidance capabilities are particularly valuable when dealing with complex anatomical cases, especially in procedures near the inferior alveolar nerve, cases with limited access or visibility, and management of anatomical variations.
In terms of clinical outcomes, the technology enhances procedural predictability, reduces complications, and improves healing potential. This innovative approach effectively bridges the gap between preoperative planning and clinical execution, offering a more predictable and less invasive approach while maintaining high standards of precision and safety in complex endodontic procedures.

- Conflict of Interest: The authors declare no conflicts of interest.
- Ethical Considerations: All procedures were performed under informed consent approved by the Ethics Committee of Universidad de los Andes.
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Apical Root Resection of Teeth with Apical Persistent Lessions : Two Case Reports

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CP007

AIM

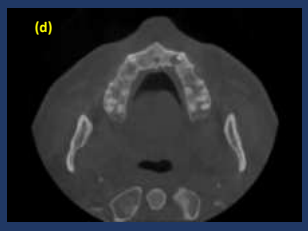
Apical surgery performed after unsuccessful endodontic non-surgical retreatment approach due to periapical lesions and sinus tract was presented in this case reports.

INTRODUCTION

In the presence of an endodontic failure or persistent apical pathology, non-surgical endodontic retreatment is the first treatment option. If endodontic non-surgical retreatment fails, surgical treatment consists the removal of the apical portion of the root is preferred to ensure apical healing (Dioguardi, M, ., Stellacci, C ,2022).

CASE 1

(a) Initial Ortopantomographic and (b) periapical radiograph showing the apical pathology related to the teeth-22



(c,d) Saggital and axial CBCT ssections taken after removal of root canal filling

(e) Periapical radiograph after the root-end resection

(f) Periapical radiograph of 6 months follow up

A 35-year-old male patient referred to our clinic with the complaint of a sinus tract on the upper left anterior region of the gingiva. Radiographic examination revealed the presence of a lesion at the apex of tooth #23. Clinical examination showed no tenderness to percussion and apical palpation. Non-surgical retreatment was planned and the root canal filling material was removed by using Protaper Universal (Dentsply, Maillefer, OK, ABD) retreatment files. Subsequently, the length was determined with the Root ZX Mini (J Morita Corp., Kyoto, Japan) apex locator, and the root canal was prepared up to a #50 K file with 2.5% NaOCl irrigation and filled with calcium hydroxide medicament after final irrigation with 17% EDTA, 2.5% NaOCl and distilled water. The sinus tract was still visible and purulent drainage was observed during the second visit. After removing the calcium hydroxide from the root canal, a Cone Beam Computed omography (CBCT) scan was requested to better visualize the limits of the lesion. The patient was referred to the Periodontology Department for the surgical treatment. After filling the root canal with gutta-percha and AH Plus sealer (Dentsply, Konstanz, Germany) by using lateral condensation method, apical root resection was performed. The ProRoot White MTA (Dentsply, Tulsa, OK, ABD) was used as a retrograde filling material, and the patient was scheduled for follow-up. At the 6-month follow-up examination, no swelling and no sinus tract was observed. Radiographic images showed increased trabeculation of bone.

CASE 2

A 32 years old male patient referred to our clinic with spontaneous pain in tooth #25. Radiographic examination revealed an apical lesion related to tooth #25. Clinical examination showed tenderness on percussion. Non-surgical retreatment was planned and the root canal filling material was removed by using Protaper Universal (Dentsply, Maillefer, OK, ABD) retreatment files. Subsequently, the length was determined with the Root ZX Mini apex locator, and the root canals was prepared up to a #45 K file with 2.5% NaOCl irrigation and filled with calcium hydroxide medicament after the final irrigation with 17% EDTA, 2.5% NaOCl and distilled water. The root canals were filled with gutta-percha and AH Plus sealer (Dentsply, Konstanz, Germany) by using lateral condensation method. At three months follow-up visit, a sinus tract was observed related to tooth #25 during the clinical and radiographic examination. The patient was referred to the Department of Oral and Maxillofacial Surgery. Apical resection for tooth #25 was planned. Biodentine (Septodont, St Maurdes-Fouses, France) was used to fill retrograde cavity after root apical resection and the patient was scheduled for follow-up. At the 3-month follow-up examination, no swelling and no sinus tract was observed. Radiographic images showed increased trabeculation.

(a) Initial periapical radiograph (b)Periapical radiograph after retreatment (c)Intraoral images of the follow up visit after 3 months (d)Placement of gutta -percha through the sinus tract (e)intraoral images of retrograde filling material (f)Post -op periapical radiograph (g)3 months follow up

DISCUSSION

If the non-surgical endodontic retreatment fails apical surgery might be an alternative treatment to ensure the healing of apical pathology. CBCT and periapical radiographs play a crucial role for diagnosis and treatment planning. Mineral Trioxide Aggregate (MTA) and Biodentine are widely used as a retrograde filling materials in apical surgery due to their high biocompatibility and sealing ability. (Chogle S., Zuaitar M,2020).

CLINICAL RELEVANCE

- Accurate diagnosis and appropriate treatment planning are crucial in managing persistent sinus tracts of endodontic origin.
- CBCT imaging provides valuable information for assessing periapical pathology and planning surgical interventions.
- When non-surgical retreatment fails, apical surgery using biocompatible materials as MTA can preferred to enhance treatment outcomes by ensuring effective sealing and promote periapical healing.

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PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE

CP008

Clinical Case Series: Microsurgery in Teeth with Persistent Apical Lesions

Alessandra Poli H., Constanza Osorio A.

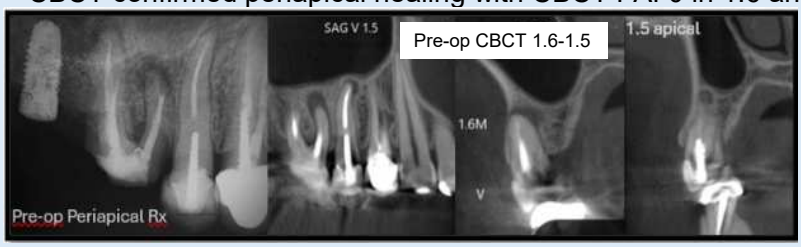
AIM.- Present microsurgery as an alternative option for treating teeth with persistent apical lesions.

INTRODUCTION.- Endodontic microsurgery enables precise management of persistent apical lesions in cases where conventional retreatment has failed or is not viable, with a reported success rate up to 92%, with complete periapical healing in approximately 74% of cases after one year (Setzer et al., 2021). The development of technology and materials has significantly improved surgical outcomes (Tsesis et al., 2022). This report describes two cases in which microsurgery successfully preserved compromised teeth and promoted periapical healing.

CASE PRESENTATION

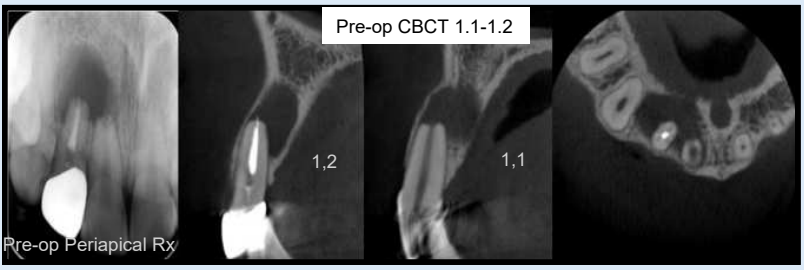
Case 1.- A 45-year-old female was referred for persistent pain in the upper right posterior region. The patient had undergone endodontic retreatments on teeth 1.6 and 1.5(FDI), with crown restorations. CBCT revealed periapical lesions affecting MB root of 1.6 (CBCT-PAI 4+E) and 1.5 (CBCT-PAI 3+E). Given the history of failed retreatments, apical microsurgery was planned.

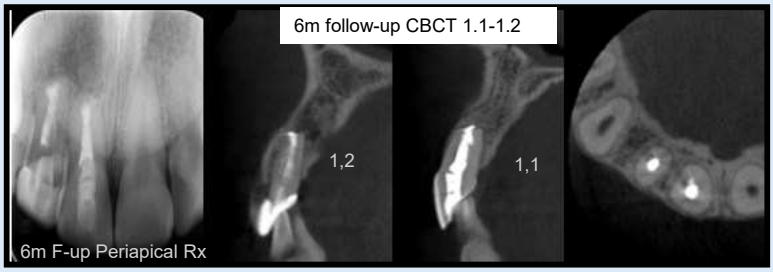
Surgical Procedure.- A submarginal incision with a mesial release was made for surgical access. Osteotomy and apical resection of 3 mm were performed under magnification. Root-end preparation was completed using ultrasonic tips, followed by retrograde obturation with TotalFill BC RRM Fast Set Putty® (FKG). No membranes or grafts were used. The surgical site was sutured with 5/0 monofilament. At the 18-month follow-up, the patient remained asymptomatic, and CBCT confirmed periapical healing with CBCT-PAI 0 in 1.6 and CBCT-PAI 1 in 1.5.



Case 2. A 25-year-old male was referred due to a persistent sinus tract following endodontic retreatment of tooth 1.2 (FDI), with crown restoration. CBCT revealed an extensive apical lesion affecting teeth 1.2 and 1.1 (CBCT-PAI 6+D) with external root resorption in both. After 1.1 underwent conventional endodontic treatment, microsurgery was planned for both teeth.

Surgical Procedure.- A submarginal incision with distal release was made. Under magnification, a minimally invasive osteotomy was performed. Granulomatous tissue was removed, and 3 mm of the roots of 1.1 and 1.2 were resected. Methylene blue confirmed no root fractures. Root-ends were prepared with ultrasonic tips and filled with Bio-C Repair® (Angelus). The flap was repositioned and sutured with 5/0 monofilament. At 6 months, the patient was asymptomatic. CBCT showed CBCT-PAI scores of 0 (1.1) and 1+E (1.2) since 1.2 showed slight vestibular cortical discontinuity, but restoration of palatal cortical; Periapical Rx showed complete bone healing in 1.1 and limited healing in 1.2 (Schloss et al. 2017).





DISCUSSION.- The presented cases show favorable outcomes, with complete cortical healing in one case and near-complete healing in the other. Recent studies confirm that while periapical tissue often heals predictably, cortical bone regeneration may be delayed or incomplete (Setzer FC, et al.2022) . CBCT is a valuable tool for monitoring this process. Techniques that preserve cortical bone and bioceramic materials enhance healing. These findings underscore the importance of minimally invasive approaches and advanced imaging in optimizing outcomes of endodontic microsurgery.

CLINICAL RELEVANCE.- These cases illustrate the potential of microsurgical techniques in managing persistent apical lesions and preserving compromised teeth. The combination of magnification to maximize the preservation of cortical tissues, ultrasonic root-end preparation, and calcium silicate-based filling materials enhances treatment predictability and success. Clinicians should consider this approach as a viable alternative to extraction when retreatment has failed, offering patients a minimally invasive solution with favorable long-term outcomes.

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DIAGNOSING ROOT FRACTURES IN ENDODONTICALLY TREATED TEETH USING CONE BEAM COMPUTED TOMOGRAPHY – A CASE SERIES

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CP009

Aim

To help diagnose root fractures in endodontically treated teeth using cone beam computed tomography (CBCT).

Introduction

Many endodontically treated teeth with seemingly adequate root canal treatments return with clinical signs and symptoms of a recurrent infection. The use of CBCT can help detect a root fracture that is not apparent on a periapical radiograph, allowing the clinician to understand the cause of the failure and to make the appropriate treatment recommendations for the patient.

Case Presentation – case 1

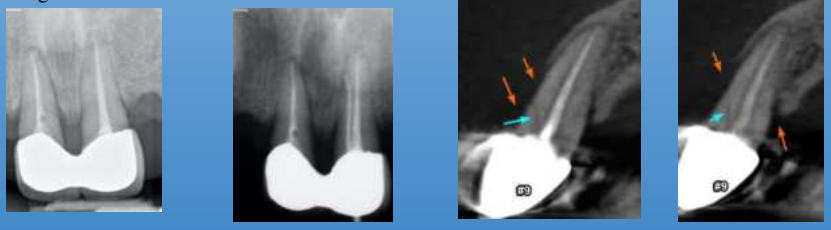
A 56-year-old male patient presented with pain from the maxillary right first molar (tooth #1.6). Endodontic therapy was completed several ago and the tooth has been restored with a composite restoration. Upon clinical examination, an intraoral swelling was noted on the palatal gingiva with a 7mm probing depth on the mesio-lingual surface. The tooth was tender to percussion and to the bite test. A periapical radiograph was taken and a faint radiolucency was suspected around the apex of the mesio-buccal root. A limited view CBCT scan was then acquired to help assess the area in more detail; two radicular fractures were observed on tooth #1.6 on the CBCT scan, one on the mesio-buccal root and one on the palatal root. Due to the poor prognosis, extraction was recommended for this tooth.

Case Presentation – case 2

A 39-year-old male patient presented with the chief complaint of a "bump on my gums" next to the maxillary right second premolar (tooth #1.5). Endodontic therapy was completed over five years ago and the tooth has been restored with a porcelain fused to metal crown. Upon clinical examination, an intraoral sinus tract was observed on the palatal surface of tooth #1.5. The tooth was not tender on percussion or on palpation. A periapical radiograph was taken and a large radiolucency was observed between the roots of teeth #1.4 and #1.5. A limited view CBCT scan was then acquired to help evaluate the area further; a suspected oblique fracture was visualized in the coronal third of the palatal root of tooth #1.5 on the CBCT. Patient was referred to oral surgery for extraction of tooth #1.5.

Case Presentation – case 3

A 61-year-old male patient presented with the chief complaint of a "bump on my gums next to my top front teeth". Endodontic therapy of the maxillary left central incisor (tooth #2.1) was completed about four years ago and the tooth has been restored with a splinted full coverage crown. Tooth #2.1 showed slight tenderness to percussion and to palpation; an intraoral sinus tract was noted on the buccal gingiva which traced to tooth #2.1 (second picture from left below). Probing depths were 3-4mm. No evident periapical radiolucency or abnormalities were observed around tooth #2.1 on the periapical radiograph and a CBCT scan was subsequently taken for further assessment. A thin faint oblique line extending from the crown to the buccal surface of the root was observed on the CBCT, a finding suggesting a radicular fracture, with accompanying angular bone loss. Patient was referred to an oral surgeon for extraction of tooth #2.1.



Discussion

Vertical root fractures (VFT) can be a challenge for clinicians to diagnose. In cases where clinical and periapical assessment is inconclusive, a CBCT scan may be indicated to confirm periradicular signs of bone loss.[1] According to Wang et al, CBCT appears to be more accurate than conventional dental radiography in the detection of root fractures.[2] In the clinical cases above, the conventional periapical radiographs failed to demonstrate the existing root fractures whereas their CBCT counterparts illustrated the fractures clearly, allowing the clinician to make a more accurate diagnosis and the proper treatment recommendations for the patient.

Clinical Relevance and Conclusion

CBCT imaging has a significant effect in determining the etiologic factors that contribute to endodontic pathosis and in making treatment recommendations.[3] Clinicians should therefore consider the use of cone beam computed tomography when diagnosing and treating challenging cases, including those involving possible root fractures in endodontically treated teeth.

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RAMBAM Health Care Campus

European Society of Endodontology

Combined Non-Surgical and Surgical Management of a Maxillary Lateral Incisor Fused to a Supernumerary Tooth

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CP010

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Aim:

To present comprehensive management of a maxillary lateral incisor fused to a supernumerary tooth, emphasizing the importance of a multidisciplinary approach integrating non-surgical endodontic therapy and surgical intervention.

Introduction:

Endodontic treatment of fused teeth presents several challenges due to their complex anatomical structures and variations in morphology. Fused teeth often exhibit abnormal root canal systems, including intricate anatomy as mid-root connections that complicate access and cleaning during endodontic procedures, increasing the risk of treatment failure and subsequent complications such as periapical periodontitis([1] [2] [3]). The unique challenges posed by these anomalies underscore the importance of advanced imaging techniques, such as cone-beam computed tomography (CBCT), to aid in the diagnosis and management of fused teeth[4].

Case Presentation:

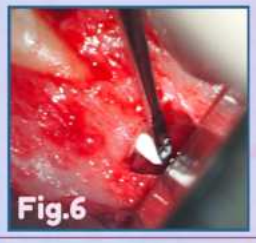
A 20-year-old patient presented with a history of persistent pain and sinus tract in the region of a fused right maxillary lateral incisor. Endodontic treatment had been performed two years prior, but symptoms and periapical radiolucency persisted (fig.1). CBCT analysis revealed four separate canals coronally–mesial and distal canals remained separate throughout, while the buccal and palatal canals merged apically creating a single, enlarged, irregular canal (fig.2).

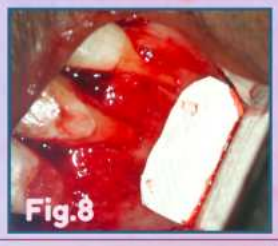
PHASE I : Non-Surgical Management

Untreated buccal and palatal canal orifices were identified (Fig.3). Gutta-percha was removed from the mesial and distal canals using ProTaper Retreatment files and hand files (Fig.4). Thorough debridement was performed with ProTaper Ultimate and hand files. The mesial and distal canals were enlarged to an apical size 40. Irrigation was performed with 4% NaOCl and 17% EDTA, activated ultrasonically and with XP-Finisher R. Calcium hydroxide dressing was placed for one month between sessions. Canals were filled with TotalFill BC Sealer and gutta-percha. Access cavity was sealed using a composite restorative material (Fig.5).

PHASE II : Surgical Management

The tooth was monitored for one year following retreatment. Persistent symptoms and lack of healing were observed, prompting the decision to proceed with surgical intervention. Hence, a surgical approach was utilized. The procedure involved the resection of the apical portion of the root, retrograde preparation, along with the removal of the infected periapical tissue. A retrograde Totalfill BC RRM filling was placed to seal the canal and prevent reinfection (Fig.6,7). Resorbable collagen barrier membrane was placed (Fig.8). Post-operative 2-year follow-up revealed incomplete healing and resolution of clinical symptoms (Fig.9).





Discussion:

This case underscores endodontic challenges in fused teeth. CBCT imaging was critical for identifying the atypical anatomy, enabling precise treatment planning[4]. Initial orthograde therapy failed due to untreated buccal and palatal canals, permitting persistent infection. Retreatment was hindered by irregular, enlarged apical anatomy, compromising cleaning and sealing. Persistent symptoms necessitated surgical intervention. For highly complex canal systems, immediate post-orthograde surgery should be considered[5], as untreated/unsealed areas are likely.

Clinical Relevance:

The management of fused teeth, particularly when associated with supernumerary teeth, presents unique challenges. This case reinforces the need for individualized treatment plans tailored to the specific anatomical and clinical conditions presented by fused teeth.

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HELLENIC REPUBLIC
National and Kapodistrian University of Athens

CP012

Surgical Management of a Two-Rooted Maxillary Lateral Incisor Using a Multidisciplinary Approach: A Clinical Case Report

M. Merzioti, D. Giannakoulas, E. Papamanoli, X. Petridis, N. Kerezoudis

AIM: To present the surgical management of a two-rooted maxillary lateral incisor performed at the Postgraduate Endodontic Clinic, School of Dentistry, National and Kapodistrian University of Athens.

INTRODUCTION: A two-rooted maxillary lateral incisor is a rare anatomical variation. Anatomical studies report a single root in nearly 100% of cases, with only a few case reports documenting this anomaly. Accurate diagnosis and appropriate management are essential when such variations are encountered.

CASE PRESENTATION: A 27-year-old female presented to the Postgraduate Endodontic Clinic, University of Athens, with pain on biting in the upper right lateral incisor (#12). Clinical examination revealed sensitivity to percussion, a normal cold test, probing depths up to 3mm, and a sinus tract (Fig. 1). Periapical radiography was inconclusive; CBCT revealed a second, smaller palatal root with apical periodontitis and an obliterated root canal (Fig. 2,3). The diagnosis of dens invaginatus was excluded due to the absence of characteristic radiographic features typically associated with this anomaly. Surgical resection of the palatal root was planned. A palatal flap was raised, the root was resected, and Emdogain was applied for regeneration based on the bony defect (Fig. 4–7). One month later, pulp necrosis and AP were diagnosed in tooth #12. Root canal treatment was completed in two visits using calcium hydroxide as intracanal medication (Fig. 8). At the 12-month follow-up, complete healing was observed, and the tooth was asymptomatic (Fig. 9).

Fig. 1. Initial clinical examination

Fig. 2. PA X-ray #12

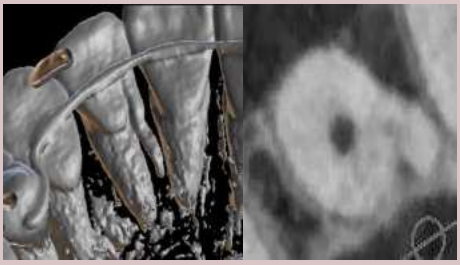
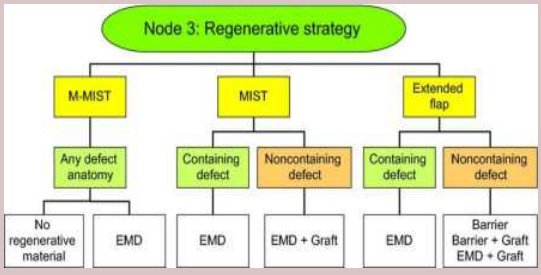


Fig. 3. CBCT image of tooth #12

Fig. 4. Palatal flap and resection of palatal root.



MIST: Minimally invasive surgical technique
Intrabony defects with great regenerative capacity:

- Radiographic angle <37°, ideally <25°
- Intrabony component ≥3 mm
- 3- or 2-wall defects

The combination of a Single Flap Approach (SFA) and 2-wall narrow defect allowed the application of EMD as a monotherapy

Fig. 5. Decision tree on periodontal regeneration and definition of MIST intrabony defects (*Cortelinni et al.*, 2015)

Fig. 6. Pre-suturing the distal papilla of #12 and application of Emdogain

Fig. 7. Suturing with Laurell vertical mattress suture in #12 and simple interrupted sutures in the rest interdental spaces

Fig. 8. Root canal treatment #12

Fig. 9. 1-year recall

DISCUSSION AND CLINICAL RELEVANCE: A second root in a maxillary lateral incisor is an extremely rare anatomical variation. CBCT plays a critical role in accurate diagnosis and surgical planning. The clinician must be prepared to manage the resultant bone defect following root resection and select an appropriate regenerative technique based on current protocols. Regular monitoring of pulp status is essential.

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CHALLENGING CASES IN ENDODONTICS: SUCCESSFUL TREATMENT OF HORIZONTAL ROOT FRACTURES - TWO CASE REPORTS

CP013

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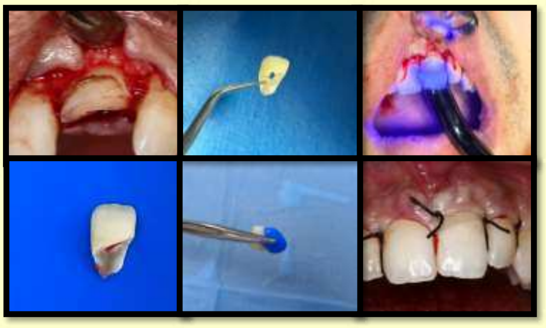
AIM: This case report aims to present successful treatment strategies for challenging horizontal root fractures through two different clinical cases.

INTRODUCTION: Horizontal root fractures represent a significant dental trauma, often affecting the pulp, dentin, and cementum. Predominantly observed in maxillary anterior teeth with closed apices, these fractures are particularly prevalent in central incisors, accounting for approximately 75% of cases. Prognosis is contingent upon several factors, including patient age, fracture location, coronal fragment mobility, and the stage of root development. Contemporary endodontic interventions and adhesive restorative techniques facilitate the long-term maintenance of teeth with complex horizontal root fractures.

CASE PRESENTATION 1: A 28-year-old male presented with fracture and pain in his upper central incisor due to trauma. Clinical examination revealed a horizontal fracture at the cervical area of tooth number 21, which radiographically extended from the crown's cervical region to the root on the palatal side. Based on these findings, flap surgery and adhesive cementation of the fragments were planned. Flap surgery was performed, and the crown fragment was extracted. Grooves were created on both fragments using a fissure bur, followed by etching with 37% orthophosphoric acid and applying a bonding agent. The fragments were adhesively bonded with flowable composite resin. An access cavity was created under rubber dam isolation. The working length of the root canal was determined radiographically due to the fracture. The canal was prepared with the Protaper Next (Dentsply, Maillefer, Ballaigues, Switzerland) rotary system to an apical diameter of X5, with 2.5% NaOCl used as an irrigant. Final irrigation included 2.5% NaOCl, 17% EDTA, and 2% chlorhexidine. The root canal was filled with a resin-based sealer and gutta-percha. Intraradicular splinting was performed using a fiber post to stabilize both fracture fragments. The restoration was completed with composite resin. At the patient's follow up appointment, it was observed that the tooth was asymptomatic and functional.

Preoperative Intraoral Photography

Preoperative Cone-Beam Computed Tomography Imaging



Surgical Flap and Adhesive Cementation

Postoperative Periapikal Radiography

12 Months Follow up Radiography

CASE PRESENTATION 2: A 23-year-old male presented with pain in the upper anterior teeth following trauma three weeks prior. The patient's history revealed that tooth number 21 was avulsed, reimplanted after being stored in milk, and stabilized with a splint. Clinical examination showed that both teeth number 21 and 22 were non-responsive to electronic pulp and cold tests and sensitive to percussion. Radiographic examination revealed a horizontal root fracture in the apical third of tooth number 21.In the first session, access cavities were prepared for both teeth under rubber dam isolation. The working length for tooth number 21 was determined radiographically due to the fracture, while the working length for tooth number 22 was measured using an electronic apex locator (Woodpex V, Woodpecker, China). Root canals were prepared with the Protaper Next (Dentsply, Maillefer, Ballaigues, Switzerland) rotary system to an apical diameter of X5, with 2.5% NaOCl as the irrigant. Calcium hydroxide (Ultracal; Ultradent Products, Inc, USA) was placed in the canals, and the teeth were temporarily restored. The patient was scheduled for follow-up in two weeks.In the second session, the patient reported symptom improvement. The splint was removed, and tooth number 21 was found to have continued mobility. Final irrigation was performed with 2.5% NaOCl, 17% EDTA, and 2% chlorhexidine. Tooth number 22 was filled with a resin-based sealer and gutta-percha and restored with composite resin. The apical portion of tooth 21 was filled with a bioceramic-based sealer. Intraradicular stabilization was performed with a fiber post, uniting the fractured segments, followed by restoration with composite resin. Follow-up could not be performed as the patient moved abroad.

Preoperative Intraoral Photography

Preoperatitive Periapical Radiography

Preoperative Cone-Beam Computed Tomography Imaging

Postperatitive Periapical Radiography

Postoperative Intraoral Photography

DISCUSSION: Various treatment strategies have been developed based on the localization of root fractures. For fractures in the coronal region, options include bonding of crown-root fragments and post-core restorations. Resin adhesive and post systems are commonly used for bonding, providing a strong, durable connection to dentin. Bonding crown-root fragments offers good aesthetics, requires less time, and is more cost-effective compared to other restorative options. Additionally, fiber posts help prevent shrinkage and deformation by effectively distributing stress.

CLINICAL REVELANCE: In cases of horizontal root fractures, intraradicular splinting can be achieved using fiber posts. While short-term success has been observed with this technique, long-term follow-up is required for a more comprehensive evaluation of its effectiveness.

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Management of Traumatic Dental and Soft Tissue Injury: A Case Report

CP014

Saadet Elpe DDS, Öznur Sarıyılmaz DDS,MSc

AIM - The aim of this case report is to evaluate the diagnostic, therapeutic, and prognostic processes of traumatic dental and soft tissue injuries through a a detailed case evaluation.

INTRODUCTION - Traumatic dental injuries and associated soft tissue injuries are common consequences of facial trauma, often resulting in complex clinical scenarios that require and accurate management. The prognosis of such injuries depends on timely diagnosis, appropriate treatment, and regular follow-up. This case report discusses the management of a patient with uncomplicated crown fractures, lateral luxation, maxillary buccal cortical bone fracture, and soft tissue injury, highlighting the role of endodontic treatment and interdisciplinary collaboration.

CASE PRESENTATION - A 25-year-old healthy male patient presented with upper incisor and lower lip injuries following facial trauma seven days earlier. Initial emergency care included lip suturing for lacerations caused by the upper incisors. Clinical and radiographic examinations revealed uncomplicated crown fractures in teeth 11, 21, and 22, lateral luxation, and a maxillary buccal cortical bone fracture. Periapical radiographs showed lower lip swelling and two embedded tooth fragments. Vitality tests confirmed non-vital teeth, with positive percussion and palpation responses.

Teeth 13 to 23 were splinted to stabilize the buccal cortical bone.

Endodontic treatment was initiated with calcium hydroxide

medication, renewed after 14 days.

The patient was referred to plastic surgery for embedded tooth fragments removal. Root canal treatment was completed, the splint removed after four weeks, and teeth restored with composite resin.

Fig. 1: Preoperative

Fig. 2: Preoperative

Fig. 3: Preoperative Lower Lip

Fig. 4: Postoperative Lower Lip

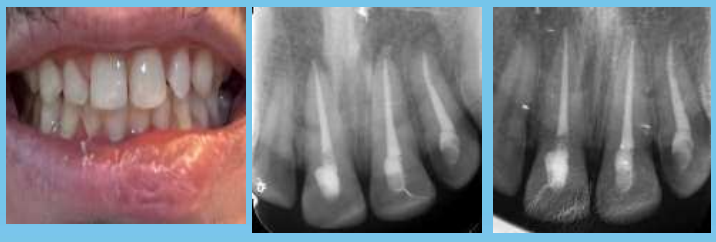

Fig. 5: Postoperative

Fig. 6: 2 Year Follow-up

DISCUSSION - A multidisciplinary approach is essential in managing traumatic dental injuries. In this case, endodontic treatment and splinting ensured tooth stabilization and preservation. Calcium hydroxide, used as an intracanal medicament, promoted healing while preventing infection and resorption. The 1-year follow-up confirmed the success of the treatment, with the teeth remaining functional and asymptomatic.

CLINICAL RELEVANCE -This case report highlights the clinical significance of accurate diagnosis, timely intervention, and a multidisciplinary approach in effectively managing traumatic dental injuries.

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ARISTOTLE UNIVERSITY OF THESSALONIKI

CP015

ENDODONTIC DIAGNOSIS AND MANAGEMENT OF A MAXILLARY SECOND MOLAR WITH PARASTYLE

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[1]DDS, Postgraduate Student, Department of Endodontology, AUTH, Greece, [2]Assistant Professor, Department of Endodontology, AUTH, Greece

AIM - To present the endodontic management of a case associated with a rare morphological trait called "Parastyle".

INTRODUCTION -The parastyle is a tubercle located on the buccal surface of the mesio-buccal cusp of the upper molars *(Turner II et al. 1991)*. It is usually unilateral and is most frequently found on the second and third maxillary molars (2.8% - 4.7%) *(Ceinos et al. 2024)*. In some cases, the parastyle may be connected to an endodontic canal, or shared with other root canals *(Colakoglu et al. 2019)*. This structure is probably a vestige of molars found in lower primates. Due to its location, this anatomical feature is prone to periodontal and carious pathology, as it tends to retain plaque *(Ceinos et al. 2024)*. Its rarity enhances its importance in forensic anthropology and dental anthropology, particularly in cases where other identification markers are unavailable or insufficient *(Sureshbabu et al 2024, Ceinos et al. 2024)*.

CASE PRESENTATION - A 28-y.o. fit and well patient was referred for his UR7, diagnosed with **pulp necrosis and acute apical periodontitis**. He also presented bruxism and low mouth opening. The referring dentist managed to negotiate only one canal before referral.

The pre-operative x-ray confirmed the occurrence of **unusual root canal anatomy** (Figs. 1&2) and a **CBCT** was taken in the first visit with the endodontist (Figs 3&4).

Vitality test on UR6 confirmed normal response to ethyl chloride, despite the secondary periodontal involvement.

Root canal treatment on UR7 was performed in 3 visits, under operating microscope (Figs 5). Mechanical preparation was performed in a **crown-down** manner with rotary NiTi files and the canals were irrigated with **NaOCl 3% and EDTA 17%**, followed by ultrasonic activation. **Calcium hydroxide** was used as an intracanal medicament, and root canal obturation with a **calcium silicate hydraulic sealer** (CeraSeal, MetaBiomed) and **lateral condensation of gutta percha**.

A **permanent composite core** was added (Fig. 6), and the patient was scheduled for **6- and 12-month follow-ups. After 6 months, tooth was functional and periradicular healing began.**

Fig.1a : Clinical image area #17-14. Note the presence of Parastyle

Fig.1b : Clinical image area #27-24. Note the absence of Parastyle

Fig.2: Pre-operative Xray

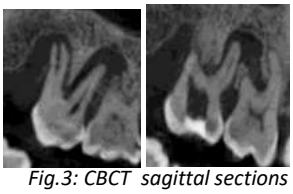
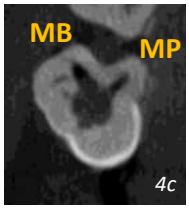
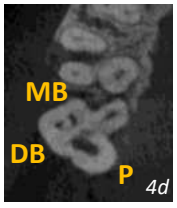
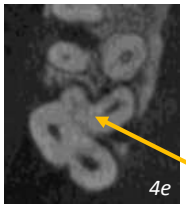
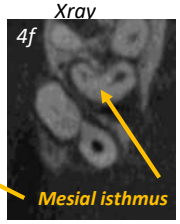


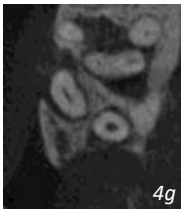
Fig.3: CBCT sagittal sections

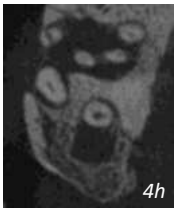




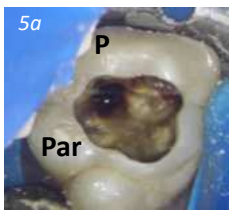


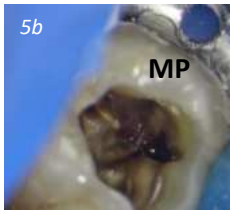


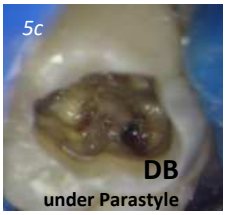


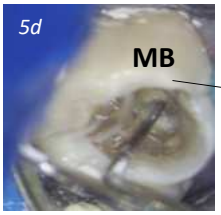


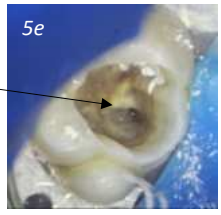
Figs.4a-h: CBCT axial sections











Figs.5a-e: Mapping of the canals under operating microscope

Fig.6: Post-operative Xray

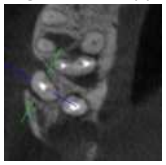
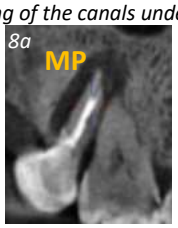
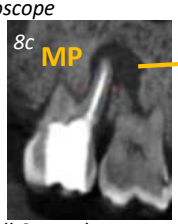


Fig.7: CBCT axial section (6-month follow-up)





Figs.8a-c: CBCT sagittal sections, recall 6 months

Fig 9: CBCT sagittal section 6 months post-op, showing apical lesion on UR6

Fig.10: Clinical image area #17-16 (6-month follow-up).

Fig.11: Six-month follow-up x-ray

DISCUSSION - In the present case Parastyle was associated with the existence of a complex root canal system quiet different form the usual root canal system of a second upper molar. Due to the limitations of conventional two-dimentional x-rays, CBCT plays a key role in managing these kind of cases successfully *(Colakoglu et al. 2019)*.

CLINICAL RELEVANCE - Scientific community should be aware of the existence of this rare morphological trait and of the difficulties that may arise while managing endodontically cases like that.

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UNIVERSITI MALAYA

FAKULTI PERGIGIAN
Faculty of Dentistry

CP018

CEMENTAL TEAR: DIAGNOSTIC AND TREATMENT CHALLENGES

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AIM - To highlight the challenges in diagnosing and managing teeth with cemental tears.

INTRODUCTION - Cemental tear is a type of root surface fracture, characterised by the partial or total separation of the cementum from the root surface, at the cemento-dentinal junction (CDJ) or within the body of the cementum (Lee et al. 2021). It has a prevalence of <2% (Lee et al. 2021), but if undiagnosed, it can lead to localised periodontal breakdown and eventually tooth loss. Unfortunately, it poses a significant diagnostic challenge, often the culprit of persistent infection and frequently misdiagnosed as a vertical root fracture, endo-perio lesion or periodontitis (Zhao et al. 2024).

CASE PRESENTATION - A 45-year-old female presented with gingival recession, sinus tract, and discolouration on teeth 11 and 21. She disclosed a history of dental trauma many years ago, but no treatment was provided. Clinical examination revealed pulp necrosis in teeth 11 and 21. Non-surgical root canal treatment (NSRCT) was performed, but a persistent sinus tract associated with tooth 11 recurred two months post-treatment.

Consultation with an endodontist revealed a 9 mm deep narrow pocket on the disto-labial aspect of tooth 11 with grade 2 mobility, which was not present prior to the RCT. The patient declined exploratory surgery and opted for tooth extraction, followed by immediate denture placement. Micro-CT (figure 2) confirmed a type 4A cemental tear (Lee et al. 2021), in which the 3D reconstruction of the cemental tear space shows multiple areas of connections to the root surface, making it a well-protected hiding area for bacteria to adhere and grow. This seems to be the main cause for the persistent infection. Histopathological assessment was also performed which revealed the presence of *Streptococcus sp.* within the cemental tear (figure 3). The sinus tract resolved following tooth extraction.

Tooth 21 underwent NSRCT followed by two rounds of internal bleaching with 35% hydrogen peroxide (Opalescence Endo). The patient opted for a cobalt-chromium removable partial denture as a long-term solution due to financial constraints. The immediate denture was relined twice for better retention and stability.

DISCUSSION - The failure to detect the cemental tear on the pre-operative periapical radiograph highlights the diagnostic challenges of this condition. Cemental tears may be subtle and difficult to identify due to their orientation, size or overlap with other structures. Prognosis depends on clinical characteristics, particularly tear extension, accessibility, and treatment techniques (Lin et al. 2014). These lesions primarily affect a single root surface (75% of cases) and present as sheet-like, thin, prickle-like, tear-like, or ledge-like hard tissue fragments (Lin et al. 2012). The key clinical signs include deep probing depths (>6 mm), bleeding on probing, gingival swelling, suppuration, abscess formation, mobility, fremitus, and persistent or recurrent root canal infections (Watanabe et al. 2012). Since conventional radiographs have limitations in detecting cemental tears, advanced imaging such as CBCT could be helpful. Diagnosis relies on radiographic assessment, exploratory surgery, or histological examination (Lin et al. 2010). Treatment depends on the tear's location and accessibility (Luo et al. 2024). Options range from conservative debridement to surgical intervention, including cementum removal, guided tissue regeneration, or extraction. In this case, the 9 mm periodontal pocket developed only after the completion of NSRCT, accompanied by the recurrence of the labial sinus tract. This suggests that residual bacteria remained within the cemental tear, potentially introduced into the periapical tissues during NSRCT through the patent lateral canal and apical foramen. These factors may have contributed to the persistent infection. Unfortunately, the tear extends to the apical third, making extraction a viable option. Early diagnosis and thorough clinical assessment are crucial for achieving better treatment outcomes.

CLINICAL RELEVANCE: Cemental tear is a challenging complication following dental trauma. Persistent infection is the main cause for RCT failure. In cases where complications arise, extraction followed by an immediate denture is a viable treatment option. Micro-CT is a valuable tool to understand the complex nature of the cemental tear area.

Figure 1: a, b) Clinical photographs showing discoloured teeth 11 and 21, and a sinus opening (yellow arrow). c, d) Pre- and post-operative periapical radiographs. e, f) CBCT findings were non-conclusive but a radiolucency was identified on the disto-palatal aspects (yellow arrow). g, h) The sinus resolved (yellow arrow) after extraction of tooth 11, and an immediate denture was placed.

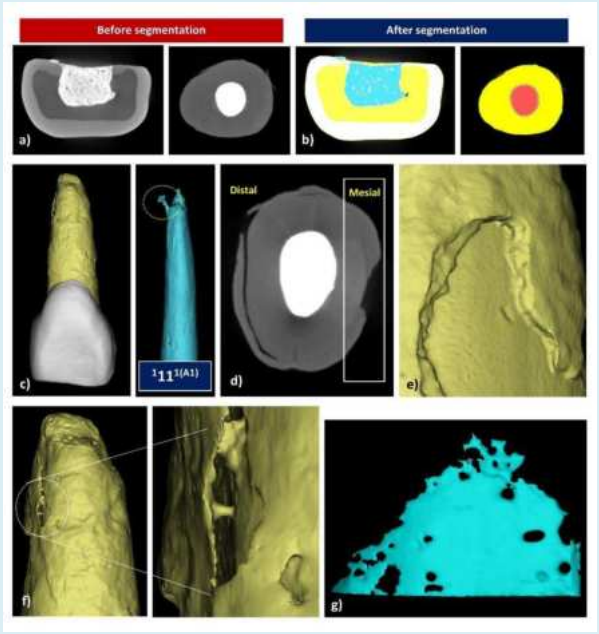

Figure 2: a, b) After micro-CT scanning and segmentation of enamel (white), dentine (yellow) and root canal filling (red), c) Tooth after 3D reconstruction, d) Root canal filling classified using Ahmed et al coding system ($^{1}11^{1(A1)}$ – refers to single rooted tooth 11 with 1 canal and 1 patent accessory canal), d) Axial section showing the cemental tear in the distal aspect compared to uneven cementum formation on the mesial aspect as shown in the 3D reconstructed image in (e). f) The space developed from the cemental tear can be seen in the 3D reconstructed image at the distal aspect. g) 3D reconstruction of the cemental tear space shows the presence of uneven areas of separation and connections with the root which can be a suitable environment for bacteria to adhere and grow.

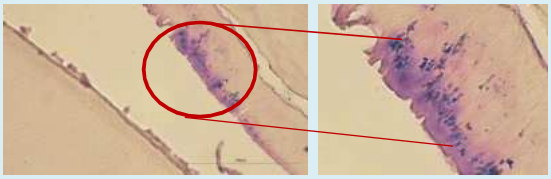

Figure 3: Histological slides showing the associated torn cemental section with growth of Gram-positive *streptococci sp.*

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ARISTOTLE UNIVERSITY OF THESSALONIKI

CP019

Non-Hodgkin Lymphoma and Potential Mis-Diagnosis in Endodontics: A Case Report

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Aim

To present a case of appropriate management in the differential diagnosis of persistent periradicular disease and oral manifestations of non-endodontic origin. Furthermore, the case demonstrates the significance of interdisciplinary collaboration in managing complex cases, starting from early diagnosis and proper treatment, as well as the prevention of serious life-threatening complications.

Introduction

Non-Hodgkin Lymphoma (NHL) is a malignant neoplasm of the lymphatic tissue, in 90% of the cases (Weber *et al.* 2003). The disease primarily affects the lymph nodes (60%), while in 40% of the cases, it is localized in distant areas of the body (Weber *et al.* 2003). The oral cavity is rarely affected (2%), with the palate being more frequently involved than the maxilla and gums. Regarding prognosis, statistics show a 5-year survival rate of 71% for patients (Shilkofski *et al.* 2017). The presentation of intra-oral lesions associated with NHL is associated with a combination of clinical signs, including persistent swelling, ulceration and pain (Dolan *et al.* 2017, Nostrat *et al.* 2021). These manifestations may be accompanied by diffused pattern of bone loss, increased tooth mobility, and paresthesia (Weber *et al.* 2003). Such a constellation of symptoms typically raises concern for an underlying pathology that warrants thorough diagnostic investigation and timely intervention.

CASE PRESENTATION

A 50-year-old male with clear medical history was referred for endodontic treatment of tooth #13, diagnosed with acute, persistent apical periodontitis. Due to swelling persistence, he had teeth #14 and #15 extracted in hospital, but no further records or justification were provided.

Clinical examination revealed a well-orientated swelling in the area #13-#15 with signs of fluctuance (Figs. 1,2); notably, endodontic treatment of tooth #13 was previously initiated by the referring dentist. A periapical radiograph confirmed the presence of periradicular lesion on #13 and bone loss in the area of the extracted teeth (Fig. 3) .

In the first appointment, cleaning and shaping was performed, as well as incision of the abscess, with no significant drainage. During the second appointment, swelling persisted and antibiotics and corticosteroids were prescribed. By the third session, the clinical condition remained unchanged, prompting an indication for the delivery of a CBCT scan, which clearly demonstrated an independent periradicular lesion on #13 and diffused pattern of cortical and trabecular lysis in the regions corresponding to the extraction site (Figs. 4-6). The combined clinical manifestations and radiographic findings resulted in the decision for hospital referral (University Clinic of Oral and Maxillofacial Surgery, G. Papanikolaou Hospital). Soft tissue biopsy, blood tests and PET-scan confirmed a diagnosis of **Non-Hodgkin Lymphoma**. Before the patient's admission for treatment to the local Oncology & Haematology Hospital Department, a fourth appointment was scheduled, to complete the root canal treatment and place a composite core (Figs. 7-9). Patient was reviewed after 6 months with no signs or symptoms (Figs. 10-12), whilst he was due for a second round of assessment and chemotherapy.

Fig. 1:Clinical photograph during 1st treatment session

Fig. 2:Clinical photograph during 1st treatment session

Fig. 3:Periapical radiograph during 1st session

Fig 7: Clinical photograph during 3rd session

Fig 8:Clinical photograph during 3rd session

Fig 9:: Periapical radiograph during 3rd session

Fig. 4:Axial slice in middle root third

Fig.5: Axial slice in apical root third

Fig. 6:Sagital slice

Fig 10: Clinical photograph at 6 months

Fig 11:Clinical photograph at 6 months

Fig 12:Periapical radiograph at 6 months

DISCUSSION

This case underscores the complexity of diagnosing lesions that mimic common endodontic pathologies. Non-Hodgkin Lymphoma, for instance, can present with clinical and radiographic features nearly identical to those of an acute periapical abscess, thereby complicating the diagnostic process. Research by Nosrat *et al.* (2021) and Shilkofski *et al.* (2020) illustrates the indispensable role of advanced imaging modalities such as CBCT in distinguishing malignant lesions from endodontic infections. Furthermore, the comprehensive evaluations described by Weber *et al.* (2003) and Dolan *et al.* (2017) highlight the necessity of adopting an interprofessional approach—collaborating among endodontists, oral surgeons, and oncologists—to secure timely referrals, accurate diagnoses, and optimal treatment outcomes. By broadening the differential diagnosis and utilizing advanced diagnostic tools, clinicians can significantly enhance patient care and avoid potentially dangerous delays in treatment.

Clinical Relevance

This case highlights the critical importance of maintaining a broad differential diagnosis when managing periradicular lesions that fail to respond to conventional endodontic treatment. Malignant conditions, such as Non-Hodgkin Lymphoma, may mimic the clinical and radiographic signs of common dental infections, including swelling, bone loss, and periapical radiolucencies. The use of advanced imaging modalities like CBCT is essential in uncovering the true extent of the lesion and identifying features that are not apparent on standard radiographs. This case underscores the need for interdisciplinary collaboration among endodontists, oral surgeons, and oncologists to ensure timely referral, accurate diagnosis, and appropriate management, ultimately enhancing patient outcomes.

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CP020 The Effect of Irrigation Activation Techniques on Periapical Healing: A Case Series with Single-Visit Retreatment

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Aim

The aim of this case series is to show the impact of different irrigation activation techniques on radiographic lesion healing in single-visit root canal retreatment.

Introduction

Root canal retreatment (RCRT) is performed when initial root canal therapy fails, typically due to persistent infection, inadequate disinfection, or coronal leakage. The success of RCRT depends on the complete removal of previous root canal fillings, effective irrigation, and the elimination of microbial biofilms to promote periapical healing (Sjogren Hagglund et al. 1990; Schilder 2006). Conventional needle irrigation (CNI) is commonly used but has limitations in reaching complex canal anatomy (Ng Mann et al. 2007; Tabassum & Khan 2016). Advanced activation techniques such as passive ultrasonic irrigation (PUI), EDDY, and shock wave-enhanced emission photoacoustic streaming (SWEEPS) enhance disinfection by boosting irrigant penetration, disrupting biofilms, and removing debris, thereby potentially improving periapical healing outcomes (Stabholz & Friedman 1988; Paik Sechrist et al. 2004). This case series shows the effects of different irrigation activation techniques on radiographic lesion resolution.

Case Presentation

Patients aged 18 to 50 years with previously treated single-rooted, single-canaled teeth and symptomatic apical periodontitis were clinically and radiographically diagnosed with periapical radiolucencies, with no systemic diseases. Prior to the procedure, rubber dam isolation was applied, and any existing restorations and caries were removed. The previous root canal filling was then carefully removed using EasyinSmile X Retreatment (EasyinSmile International Corp., New Jersey, USA) files under magnification. The root canals were subsequently enlarged to the working length using a Reciproc R40 files (VDW, Munich, Germany) with 15 mL of sodium hypochlorite (NaOCl) (Microvem, Istanbul, Turkey) for irrigation.

Case 1: CNI was performed using a 30G side-vented needle positioned 1 mm short of the working length, with three cycles of 6 mL 2.5% NaOCl (Microvem) and 5 mL 17% ethylenediaminetetraacetic acid (EDTA) (Microvem, Istanbul, Türkiye).

Case 2: PUI was applied using an Irrisafe ultrasonic tip (Helse, Ribernao Preto, Brazil) at 5 power setting for 30 seconds per cycle with the same irrigant volumes.

Case 3: EDDY activation was performed with a 25.04 polymer tip (VDW, Munich, Germany) at 6000 Hz frequency for 30 seconds per cycle, utilizing identical irrigant volumes.

Case 4: SWEEPS was performed using an Er: YAG laser (Fotona, Ljubljana, Slovenia) in Auto-SWEEPS mode with 20 mJ energy at 15 Hz for 30 seconds per cycle, with the same irrigation volumes.

Following irrigation activation step, the root canals were dried with sterile paper points and obturated using a matching gutta-percha cone and bioceramic-based sealer (Bio-C Sealer; Angelus, Londrina, Brazil). Finally, a final composite (Palfique Estelite Paste; Tokuyama Dental Corp, Tokyo, Japan) restoration was placed to ensure coronal sealing. After treatment completion, postoperative radiographs were taken immediately, and a follow-up radiograph was obtained six months later to assess lesion healing over time.

Discussion

All four cases demonstrated radiographic healing of periapical lesions, highlighting the significance of irrigation activation techniques in retreatment procedures. Effective activation can enhance irrigant penetration, facilitating thorough disinfection and debris removal, which are crucial for periapical healing. Given that this case series involved single-rooted, single-canaled teeth with relatively simple anatomy, further studies should explore outcomes in more complex root canal systems, and controlled clinical trials will be essential to validate these findings more reliably.

Clinical Relevance

Irrigation activation techniques enhance disinfection and debris removal, supporting periapical healing in retreatment cases. Clinicians should consider their use to optimize outcomes, though further studies are needed to confirm efficacy in complex anatomies.

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SODIUM HYPOCHLORITE EXTRUSION ACCIDENTS: MANAGMENT OF A CLINICAL CASE

CP021

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AIM: To present two clinical cases involving sodium hypochlorite (NaOCl) extrusion accidents, so as to help clinicians understand the expected complications, appropriate management strategies, and key preventive measures to avoid this serious iatrogenic event.

INTRODUCTION: Sodium hypochlorite (NaOCl) is considered the most widely used irrigant in Endodontics, due to it's effective antimicrobial activity and tissue-dissolving ability. While generally safe within the root canal system, unintended periradicular extrusion can lead to severe complications.

CASES PRESENTATION

Case 1: A 55-year-old female patient was referred to the army clinic with apical periodontitis and external cervical resorption in tooth #23 (Fig.1) . The treatment plan involved first a root canal treatment , followed by a surgical flap procedure to clean and seal the resorptive defect.
Local anesthesia (articaine 1:100,000) was administered, and root canal treatment was performed under rubber dam isolation, using 3% NaOCl. Hand files were used for mechanical debridement, with the master apical file being ISO 30.
During irrigation, an open-ended needle (gauge 27) was used and it got stuck in the resorptive defect, causing immediate and intense pain to the patient. The procedure was stopped, the root canal was thoroughly rinsed with saline, and a temporary restoration was placed. The patient was prescribed amoxicillin 500 mg for 7 days and NSAIDs.

Follow-up timeline:

Day 1: The patient experienced swelling. discomfort, and initial bruising.
Day 2: Extraoral hematoma and intraoral ulceration of the periapical soft tissues developed.
1 Week: Reduction in swelling and pain; hematoma remained but began to subside(Figs. 2-3).
2 Weeks: Significant healing observed, with resolution of hematoma and ulceration.
1 Month: The patient reported no discomfort, and root canal treatment was successfully completed (Fig.4).

Fig.2

Fig.3

Fig.1

Fig.4

DISCUSSION: NaOCl extrusion is a serious complication that can cause severe tissue damage. Prevention is key to avoiding such accidents.

Preventive measures:
•Use side-vented needles and irrigate passively.
•Ensure the needle is loose in the canal and does not bind.
•Seal resorption defects before irrigation.

If extrusion of NaOCl occurs, then the following plan is proposed:
•Immediate aspiration of NaOCl and replacement by saline
•Allow blood flow to help flush out the extruded irrigant
•Administration of supplementary anesthesia for pain relief
•Prescription of antibiotics, NSAIDs
•Cold compresses for the first 24 hours
•Notify patient about clinical symptoms/complications
•Transitioning to warm compresses after the first week
•Re-evaluation within 1–2 weeks before completing treatment

CASE RELEVANCE: NaOCl extrusion accidents can be distressing for both the patient and the clinician. Dentists must be aware of potential complications and adhere to fundamental endodontic principles to minimize risks. In the event of an extrusion, a calm and systematic approach is essential for effective management and patient recovery.

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A Shrapnel Injury As a cause of an Oblique Root Fracture

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CP022

Aim

Present the diagnosis and management of a unique shrapnel trauma.

Introduction

Root fractures are relatively uncommon dental injuries and account for 1.2% to 7.0% of all dental injuries in permanent dentition (1). The more apical fractures generally require the least management and have the best prognosis (1). A combat officer who was injured at the battlefield, sustained multiple shrapnel wounds (Fig.1), one of which penetrated the Maxilla and caused an oblique root fracture in the apical third of tooth #11. There is no information in the literature on the treatment of such cases, and therefore the following report will describe the treatment decided upon in this unique case.

Fig. 1

Case Presentation

A 24-year-old, healthy male, was referred to the Endodontics Department at Tel Hashomer medical center one month after he was wounded. His chief complaint was pain during biting. Initial treatment at the general practice clinic included debridement, dressing with calcium hydroxide, temporary coronal filling and a referral to an endodontist.

On clinical examination, the tooth exhibited significant sensitivity to percussion and palpation and no mobility. A periapical radiograph revealed an 8x7 mm shrapnel and an oblique fracture in the apical third of tooth #11 (Fig.2, yellow arrow). A vestibular sinus tract was present that traced to the area of shrapnel and fracture line (Fig.3 a, b). CBCT scan showed the shrapnel was in close proximity with the apical root fragment (Fig.4 a, b, c) thus suggesting it may have caused both an oblique root fracture and a localized infection.

Fig. 2

Fig. 3.a

Fig. 3.b

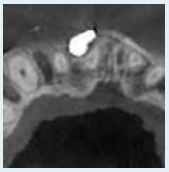

Fig. 4.a

Fig. 4.b

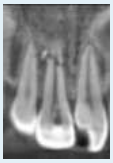

Fig. 4.c

Due to these findings, we have decided to perform root canal treatment to the coronal segment followed by a surgical removal of the apical root fragment and shrapnel. The obturation was made using Tri-calcium silicate sealer (FKG TotalFill BC Sealer) and gutta-percha (Fig.5) Two weeks later, the shrapnel and apical root fragment were removed surgically (Fig.6 a,b) followed by a retro-grade filling using Tri-calcium silicate putty (FKG TotalFill BC RRM fast set putty). The bony defect was filled with DFDBA bone graft (LifeNet) and covered with a collagen membrane (Geistlich), followed by placement of nylon sutures. Fig.7 was taken at the end of the surgical procedure.

Fig. 5

Fig. 6.a

Fig. 6.b

Fig. 7

Fig. 8.a

Fig. 8.b

One week later, no ST was evident (Fig.8a) . At 4 months follow up, the patient had no complains and the tooth exhibited no sensitivity to percussion. Radiograph reveals an increased radiopacity at the treated site. (Fig.8b).

Discussion

According to the International Association of Dental Traumatology (IADT) guidelines, when managing a root fracture in the apical third, endodontic treatment is typically required only for the coronal segment. This is because the apical segment rarely undergoes pathological changes (2). In the presented case, a ST did not respond to calcium hydroxide dressing of coronal fragment. We identified the shrapnel as the primary cause of the infection. Therefore, we have decided to perform endodontic treatment of the coronal segment and later to remove the shrapnel and the apical root fragment. The shrapnel caused an irregular bony defect with involvement of the buccal cortical plate. Therefore, a bone graft was placed in order to promote bone regeneration and prevent the formation of a depression in this esthetically critical region.

Clinical Relevance

This case illustrates how unique circumstances can modify the conventional treatment approach. Following the IADT guidelines is essential, coupled with a thorough understanding of the specific injury can alter the treatment plan to fit the specific case and characteristics of the trauma.

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Endodontic Management of Gemination: Benefits of Digital Tools in Dental Anomaly Treatment

CP023

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Aim

Use of CBCT & 3D printing in the endodontic management of a gemination

Case presentation

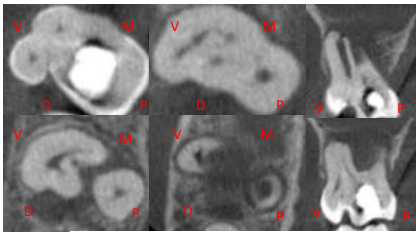
M., 15 years old, no medical history.
Referred by her orthodontist: previous infectious episodes & chronic sinusitis related to 16.
Therapeutic options:

In favor of conservative treatment
Agenesis 18/28/38/48
Residual growth potential
Technical facilities in the department

In favor of avulsion
Endodontic complexity
Uncertain outcome

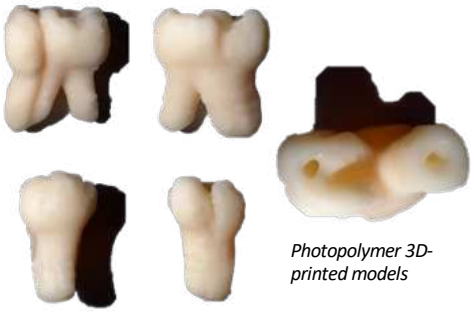
Case study & 3D printing

Removal of previous restorations and decay.



Pre-op CBCT analysis

STL files



Photopolymer 3D-printed models

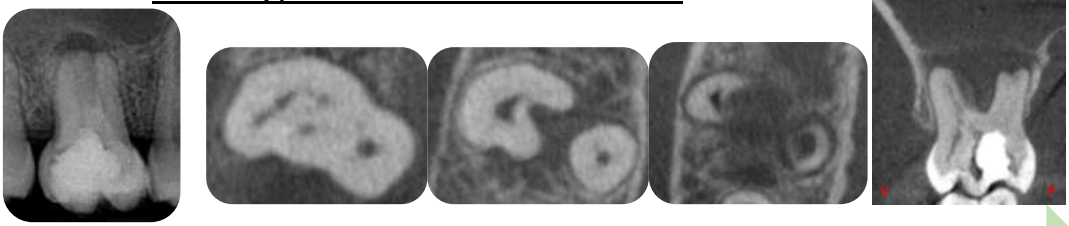
Endodontic clinical steps

Access cavities training and root canal detection on printed models

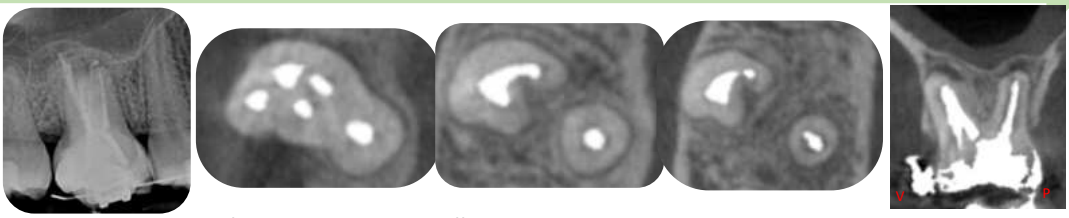
Detection of 5 root canal orifices, shaping with WaveOne®G. Primary, hydraulic condensation with calcium silicate-based (Endosequence®BC Sealer)

Follow-up, discussion & clinical relevance

Coronal seal with injected composite and protection of the dental structure with a composite onlay bonding at 4 weeks post endodontic obturation



Comparison between the initial situation and the one-year review showing significant bone regeneration and maxillary sinus condition improvement



The management of a rare shape anomaly was effectively achieved using advanced digital tools, including CBCT, segmentation, and 3D printing. The 3D-printed models played a crucial role in the treatment planning process. After one year of clinical follow-up, the patient, M., is no longer experiencing pain. This case highlights significant bone healing, offering a valuable temporizing solution, particularly as the patient is too young for an implant at this stage.

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MICROSURGICAL APPROACH FOR A SEVERELY COMPROMISED MAXILLARY PREMOLAR: AN ALTERNATIVE TO EXTRACTION AND IMPLANT PLACEMENT

CP024

dr Ilja Pestov

AIM – The aim of this case report is to encourage dentists to carefully evaluate different treatment options and consider saving teeth that might have previously been recommended for extraction. One such option is a microsurgical approach.

INTRODUCTION – This case report describes a tooth that was saved from extraction through endodontic microsurgery and proper coronal restoration. It highlights the importance of considering multiple treatment options, as the choice can significantly impact the prognosis of a diseased tooth

CASE PRESENTATION – A 57-year-old male patient sought a second opinion regarding tooth D15. He had previously been advised to have the tooth extracted due to a periapical lesion and a poor prognosis.

The tooth had an inadequate composite resin filling covering the occlusal, mesial, distal, and palatal surfaces. Additionally, a fiber post was present in the tooth (Fig. 1a).

A preoperative intraoral periapical X-ray revealed only a small periapical radiolucency (Fig. 1b). However, a CBCT scan showed that the fiber post had been incorrectly placed, perforating the root in the mesiobuccal direction (Fig. 1c). The patient was given two treatment options: extraction followed by implant placement or microsurgery with subsequent crowning. He opted for the latter.

During the intraoral examination, the tooth showed no response to vertical or horizontal percussion or palpation (both buccally and palatally). There was no probing depth exceeding 3 mm around the tooth, and the bite test was also negative.

The patient received preoperative pain management with 1000 mg of paracetamol. Before the surgery, he rinsed his mouth with a 0.12% chlorhexidine solution for one minute.

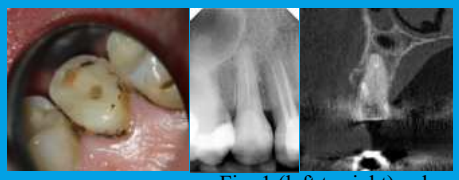

Fig. 1 (left to right): a,b,c

Anaesthesia was administered using a total of 5.4 ml of Dentocaine 40 mg/0.01 mg/ml solution (articaine with epinephrine). The patient was covered with a sterile surgical drape. A 15C scalpel was used to make an incision, consisting of a vertical incision distal to D15 and an intrasulcular incision extending from D13 to D15. The flap was elevated, and 3 mm of the root tip was resected using a Zekrya bur. After that, the granulation tissue was removed, and the root canal was cleaned with the ultrasonic diamond-coated tip of an Acteon Newtron P5 XS (3 mm).

Next, the site of the root perforation was addressed. After removing the granulation tissue, part of the fiber post was also removed. Both the root canal at the resected root tip and the perforation site were filled with TotalFill BC RRM Fast Set Putty. The flap was then repositioned and sutured using Seralene 7/0 sutures (Fig. 2a-f).

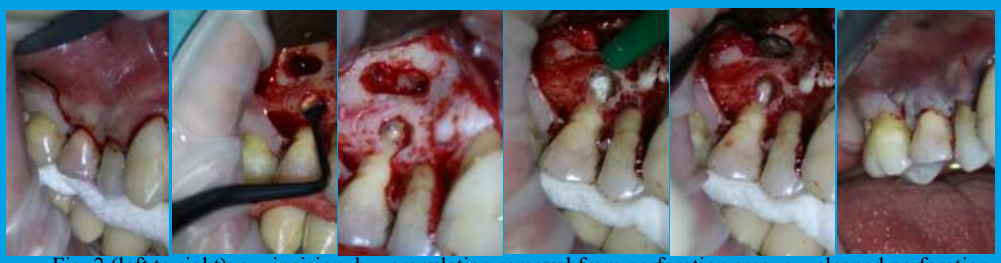

Fig. 2 (left to right): a – incision, b – granulation removal from perforation area, c – cleaned perforation area and resected root tip, d – filled perforation area, e – root-end filling, f - sutures

A follow-up CBCT scan taken six months later showed good periapical healing and a well-healing surgical site (Fig. 3a). Since the patient was asymptomatic and imaging confirmed continued healing, a zirconia crown was fabricated for D15 (Fig. 3b).

The most recent scan, taken two years after the surgery, demonstrated good healing and stability of the obturated areas (Fig. 3c).

Fig. 3 (left to right): a,b,c

DISCUSSION – Endodontic microsurgery provides an effective solution for managing infected or structurally compromised teeth when conventional endodontic treatment is insufficient. In this case, preserving the patient's tooth has already delayed the need for implantation by two years, and hopefully, it will extend its function for much longer. CBCT iaging, magnification, and careful treatment planning are crucial for successful microsurgical interventions.

While extraction and implantation were always viable options, the preferred approach in this case was to retain the natural tooth.

CLINICAL RELEVANCE – According to Torabinejad et al., single implants have higher survival rates than teeth treated with endodontic microsurgery over a 4- to 6-year period. However, the difference in survival rates is not substantial, and both treatment modalities offer high success rates. When there is a significant possibility of retaining a tooth for an extended period through microsurgery, dentists should strongly consider it as a viable alternative to implantation.

In fact, recent literature supports the long-term predictability of microsurgical outcomes when modern techniques and biocompatible materials are employed. Kang et al. found a cumulative success rate of over 90% at 2 years for endodontic microsurgery using contemporary protocols, underlining its reliability as a treatment option. Moreover, the decision to preserve a natural tooth rather than replace it should consider both biological and psychological factors. According to von Arx and AlSaeed, maintaining natural dentition can improve patient satisfaction and avoid complications associated with implants, especially in anatomically complex regions.

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CP025

MANAGEMENT OF LATERAL LUXATION INJURY OF THE MAXILLARY CENTRAL INCISORS: A CASE REPORT

Aim

To describe the management of lateral luxation injury associated with the upper central incisors in a 20-year-old male patient.

Introduction

Traumatic dental injuries impact approximately 25% of school-aged children and 30% of adults worldwide, with permanent incisors most frequently involved[1, 2]. Among these injuries, lateral luxations are defined by the displacement of a tooth in a labial or lingual direction due to traumatic forces, often in conjunction with an alveolar bone fracture[3]. Typically, the tooth's apex is displaced buccally while the crown tilts lingually, resulting in occlusal interference and functional impairment. This displacement may lead to rupture of the periodontal ligament (PDL) and compression of the neurovascular bundle at the root apex, leading to ischemia and subsequent pulp necrosis[4]. Consequently, timely and accurate diagnosis, treatment planning and follow-up are essential to achieve a favorable clinical outcome[2].

Case Presentation

A twenty-year-old man presented at the hospital emergency department following trauma sustained during a basketball game a few hours earlier. Both maxillary central incisors were displaced lingually and interfered with occlusion (Fig 3), although they exhibited no mobility. Radiographic examination, including computed tomography, confirmed the diagnosis of lateral luxation (Fig 1, 2).

In the emergency setting, treatment involved repositioning of the teeth followed by splinting with a passive and flexible splint (Fig 4).

Approximately two weeks post-trauma, the patient was re-evaluated. The teeth no longer responded to cold stimuli and remained slightly tender upon biting. Given that these were mature teeth with fully closed apices and the pulp became necrotic, endodontic treatment was initiated. Cleaning and shaping was performed using Protaper Next files. Following copious irrigation and sonic activation (EDDY, VDW, Munich, Germany), the canals were dried and a calcium hydroxide dressing was placed (Fig 5, 6).

At the second appointment, four weeks post-trauma, grey discoloration was present (Fig 8). Canal preparation was finalized followed by obturation with gutta-percha and AH-plus sealer using warm vertical condensation (Fig 7). The access cavity was restored with composite resin (Fig 8) (Filtek Supreme, 3M ESPE, USA). All treatment stages were performed with the help of rubber dam and operating microscope (PICO, Carl Zeiss, Germany).

At the 1-year follow-up, the teeth were asymptomatic. Minor discoloration persisted, particularly in the cervical region, although the patient did not consider it problematic (Fig 9, 10).

Discussion

Luxation injuries may result in a transient loss of pulp sensibility, with subsequent pulp healing in certain cases. However, in mature teeth with fully developed roots and significant displacement, pulp necrosis is a common outcome (44.2%), often leading to root canal infection and apical periodontitis. Other complications, including surface resorption (14.0%), inflammatory resorption (8.5%), pulp canal obliteration (8.1%) and replacement resorption (0.9%), occur less frequently[3].

In this case, pulp survival or healing was considered unlikely due to the extent of the luxation injury and closed apices. Furthermore, at the two-week review, the teeth exhibited a negative response to cold testing and had developed a grey discoloration.

Consequently, early endodontic treatment is advocated to mitigate the risk of external infection-related resorption[4].

Comparing treatments and interventions for traumatic dental injuries is challenging due to the substantial heterogeneity in reported outcomes, which hampers systematic reviews and meta-analyses. Particularly, patient-related outcomes, such as quality of life and psychological impact, are often underreported. The adoption of the core outcome set (COS) developed by Kenny et al. provides a standardized framework that would enhance consistency in research, improves evidence synthesis, and reduces outcome-reporting bias[5].

Conclusion and Clinical Relevance

Lateral luxation injuries demand immediate clinical intervention, prioritizing anatomic repositioning and flexible splinting to optimize periodontal ligament healing. Greater severity of the luxation and fully formed apices are factors that favor endodontic intervention.

Fig. 1: Preoperative periapical radiograph

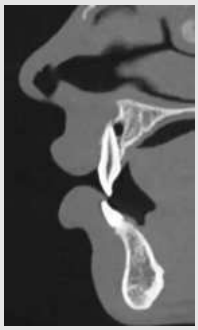

Fig. 2: Preoperative CT

Fig. 3: Clinical image before repositioning

Fig. 4: Clinical image after splinting

Fig. 5: temporary endodontic treatment with $Ca(OH)_2$, 2 weeks post-trauma

Fig. 6: Clinical image 2 weeks post trauma

Fig. 7: post-obturation radiograph with gutta percha and AH-plus sealer

Fig. 8: Clinical image during endodontic treatment, 4 weeks post-trauma

Fig. 9: 1-year follow-up radiograph

Fig. 10: Extraoral photograph at 1 year follow-up

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Christian Klein

CP026

Management of *dentes invaginati* type IIIa of two maxillary 2nd molars responsible for chronic maxillary sinusitis

AIM This poster demonstrates the management of *dentes invaginati* of maxillary 2nd molars.

INTRODUCTION A *dens invaginatus* is a rare dental malformation that is thought to result from the invagination of the enamel organ into the papilla during tooth development. However, the aetiology remains unclear, although genetic factors may play a role. The prevalence ranges from 0.3 to 10%. The upper lateral incisors are most commonly affected. A *dens invaginatus* of molars is an extremely rare event. Based on a literature search, only eight case reports have been published[1-8]. In all but one case[8], the teeth were extracted.

CASE PRESENTATION A 29-year-old female patient with a natural, healthy dentition and no relevant general medical history had been suffering from a bilateral chronic maxillary sinusitis for several years. Treatment included an unsuccessful sinus surgery in 2015. Osteolysis at the roots and a radiopaque structure in the pulps of teeth 17 and 27 were seen on a CT scan performed in March 2023 on the advice of her ENT specialist (Fig. 1). In May 2023, she was referred to our private healthcare center by her family dentist for root canal treatment.

The teeth 17 and 27 were not sensitive to percussion or apical palpation. However, they did not respond to cold spray. The probing depths were within the normal range. A sinus tract was present on the palate of tooth 27. Due to the availability of the CT scan, there was no need for further preoperative radiographs.

The treatment involved removal of the *dentes invaginati in toto* after preparation of an access cavity (e.g., tooth 27 Fig. 2). This revealed that the invaginations had perforated the pulp chamber floor (e.g., tooth 27 Fig 2: D) and had thus gained access to the root area. The root canals were prepared with *ProTaper Gold* up to file size F3 and irrigated with ultrasound-activated 3% sodium hypochlorite solution. After drying, a calcium hydroxide dressing was placed in the root canals and on the perforations. The teeth were temporarily sealed with *Cavit W*.

A week later, the teeth were asymptomatic and the sinus track had closed. The root canals were obturated with warm gutta-percha, the perforations were closed with *Medcem MTA*, and the teeth were restored using *SDR* and *Tetric EvoCeram* (e.g., tooth 27 Fig. 3: A-F).

At the one-year follow-up examination, the patient was free of complaints and the bilateral maxillary sinusitis had healed. The teeth 17 and 27 were insensitive to percussion and palpation. Control radiographs were inconspicuous (Fig. 3: G & H). Therefore, a CBCT was not justified.

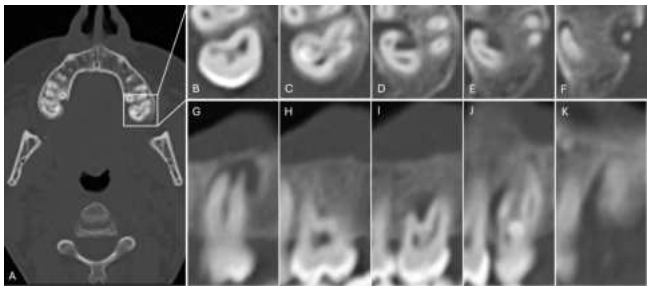

Fig. 1: CT with details of tooth 27, (C) and (J) showing a *dens invaginatus* type III.

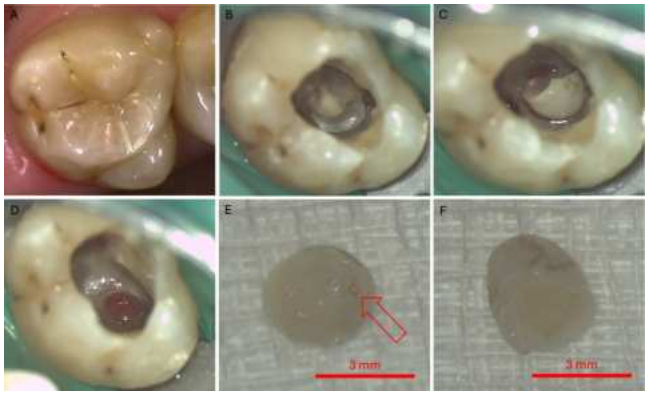

Fig. 2: As an example, removal of the *dens invaginatus* of tooth 27 *in toto* (A-C), the resulting perforation of the pulp floor (D), (E) invagination from the apical direction with apex (arrow), and invagination from the coronal direction (F).

Fig. 3: As an example, (A-C) Root canal filling, (D) Perforation closure, (E) Masterpoints (F) Postoperative control of tooth 27, and 1-year follow-ups of tooth 17 (G) and 27 (H).

DISCUSSION It is understandable that a young patient with a natural, healthy dentition is not suspected to have a dental cause for chronic maxillary sinusitis. Type III invaginations apparently allowed bacteria from the oral cavity to enter the root area, where they caused both inflammatory osteolysis and maxillary sinusitis. This path was closed by the *in toto* removal of the *dentes invaginati* and the adhesive sealing of the cavities. Mineral trioxide aggregate (MTA) was used as the material of choice for covering the perforations of the pulp floor. It can therefore be assumed that the prognosis for the treated teeth and the maxillary sinuses is good, as the follow-up examination after one-year shows.

CLINICAL RELEVANCE Since a *dens invaginatus* of molars is an extremely rare event, the relevance of this case report is limited.

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A clinical presentation and non-surgical treatment protocol for an immature conical lateral incisor with dens invaginatus type II malformation

CP027

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Background

Dens invaginatus (DI) is a developmental anomaly characterised by the invagination of the enamel organ into the dental papilla prior to the completion of calcification in the dental tissues. This infolding of enamel into the dentine creates a space susceptible to bacterial ingress, caries development and may lead to pulpal necrosis.[1]

DI predominately present in the maxillary lateral incisors, with bilateral involvement reported in up to 43% of cases.[1] This highlights the importance of assessing the contralateral tooth should dens invaginatus be identified. DI has reported associations to other dental anomalies such as microdontia and supernumerary teeth.[2,3] Teeth affected with DI can present with no clinical evidence of malformation or can exhibit abnormal crown morphology including a peg-shaped and barrel-shaped form, talon cusps or deep palatal pits.[4-6]

DI Classification

Oehler's classification[7] categorises DI into three distinct categories based on the extent of the invagination on two-dimensional imaging:

- **Type I** – confined to the coronal aspect, not extending to the CEJ
- **Type II** – extends beyond the CEJ into root, may involve the pulp as only thin layer of enamel+/-dentine, no communication with PDL
- **Type IIIa** – extends into the root, communicates with PDL through a pseudo-foramen , sometimes involves pulp
- **Type IIIb** – extends into root, communicates with PDL through apical foramen, sometimes involves pulp

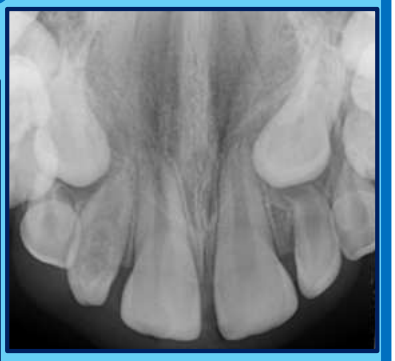
Case Presentation

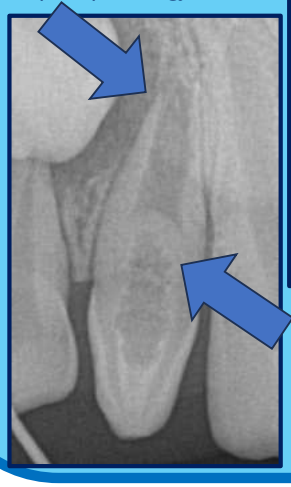
History and Examination

- 10-year-old female
- Presents with a history of a painful and recurring gum boil near a small front tooth
- Medically: fit and well
- Conical and diminutive maxillary lateral incisors - no other abnormal features in crown morphology
- Caries-free
- UR2: draining sinus tract, negative response to ethyl chloride and tenderness to percussion

Radiographs

Wide open apex with evidence of periapical pathology

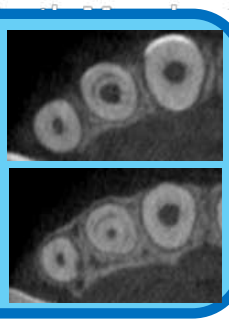




Wide type II DI malformation extending into the coronal 1/3rd of root and creating a corono-radicular obstruction

CBCT

Three-dimensional imaging was utilised to determine the location and nature of the defect and the connection between the invagination and the main canal.



Treatment

Appt 1

1. Local anaesthesia and rubber dam isolation
2. Incorporation of the malformation into the access cavity
3. Only the entrance of the invagination was visualised based on its position and connection to the main canal
4. Utilisation of ultrasonic tips and gooseneck burs to instrument through apical portion of invagination to create one single main canal
5. Removal of coronal remnants of the invagination and chemo-mechanical shaping using hand instruments
6. Copious irrigation with 1% NaOCl
7. Radiographic working length confirmation
8. Intra-canal medication ($Ca(OH)^2$) and temporisation

Appt 2

1. Asymptomatic UR2 since initial visit
2. Same access protocol
3. NaOCl irrigation with a penultimate rinse of EDTA
4. TotalFill BC Putty incrementally placed using MAPs and Machtou pluggers.
5. Backfilled canal system using thermoplasticised gutta-percha via the Elements System
6. Access restored using composite resin

Discussion and Clinical Relevance

This case highlights:

- The need for vigilance for and understanding of dens invaginatus
- The benefit of CBCT to diagnose, visualise and plan endodoontic therapy.
- The importance of good armamentarium and flexibility with materials to optimise instrumentation and obturation.
- The recognition that such cases may be successfully treated without recourse to extraction.

3-month review

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Non-Surgical Treatment of a Large Lateral Perforation in the Apical Third: A Case Report

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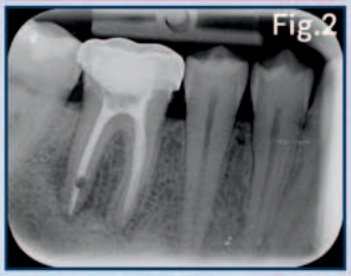
CP028

Aim:

To present a clinical case of the orthograde treatment of a large lateral perforation in the apical third using a Bioceramic filling material. The case is accompanied by a 12 months follow-up.

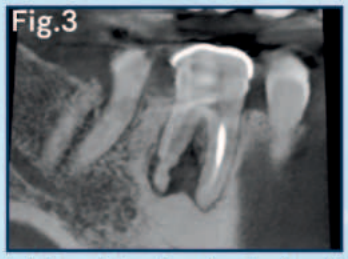


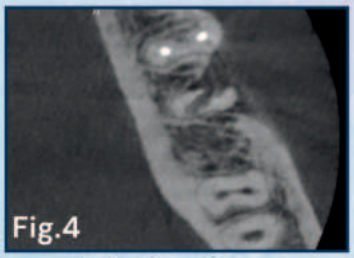
Introduction:

Root perforations are significant complications during endodontic treatment, often leading to treatment failure and tooth loss if not appropriately managed. The prognosis of teeth with perforations largely depends on the perforation's location, the size of the perforation, the timing of the intervention and the materials used for repair[1,2]. Bioceramic materials are widely recognized for their favorable properties in sealing perforations[3]. Diagnosing root perforations requires a combination of clinical evaluation and advanced imaging techniques. CBCT has emerged as a superior diagnostic tool as it allows clinicians to assess the extent of the perforation and the surrounding structures, which is critical for the effective management of the perforation.

This case report discusses the non-surgical management of a mandibular first molar with a large lateral perforation located in the apical third of the root.

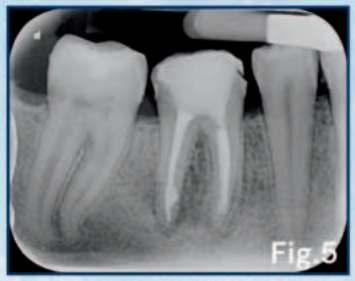
Case Presentation:





A 26-year-old male patient, with a history of multiple surgical orthognatic treatments due to a developmental disorder affecting the size of the mandible, was referred from the Maxillofacial department as he presented with persistent pain and swelling associated with tooth #46. Radiographic and CBCT examination revealed a large perforation in the distal root (about 4mm BL and 1.3 mm MD) apparently caused by a Titanium Plate screw or Zekrya bur, accompanied by a lateral and apical radiolucency indicative of Symptomatic Apical Periodontitis (Fig. 1,2,3,4).

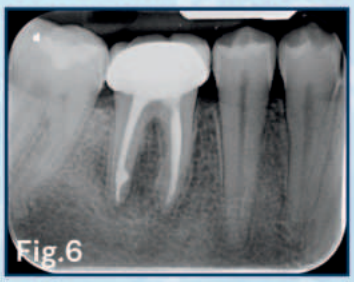
Methodology:

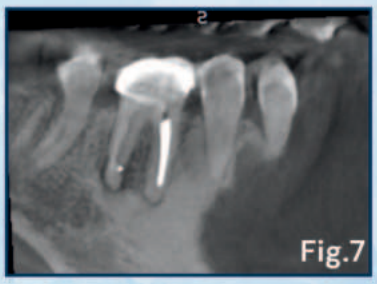


Treatment involved a mutilple visit non-surgical approach utilizing bioceramic material for the perforation's repair with the aid of an operating microscope. Access cavity was prepared under rubber dam isolation. Gutta-Percha was removed using Protaper Universal Retreatment files (D1,D2,D3).

The procedure commenced with thorough debridement of the root canal system, followed by copious irrigation with NaClO 4% to ensure disinfection. Calcium hydroxide was used as an intracanal medicament between visits. The perforation site and the apical third of the distal root were carefully dried, then sealed with bioceramic material (NeoPutty) ensuring it filled the defect completely. The root canals were filled with Gutta-Percha and and Calcium-Silicate based sealer (NeoSealer) (Fig.5). A coronal restoration was placed.

At the 12 month follow-up, clinical examination revealed resolution of symptoms, and radiographic/CBCT evaluation showed a reduction in periapical lesion size, indicating a successful healing process of the periapical tissues.(Fig.6,7)





Discussion:

The successful management of this case highlights the importance of the use of appropriate materials in the treatment of root perforations. Bioceramics have been extensively used in repairing root canal perforations, showing 92% healing rate[4]. Additionally, the non-surgical approach allowed for the preservation of the tooth structure and avoidance of complications associated with surgical interventions.

Conclusion:

This case underscores the potential for non-surgical management of teeth with large lateral perforations, particularly when utilizing biocompatible materials such as Bioceramics. With careful planning and execution, it is possible to achieve favorable outcomes even in challenging endodontic scenarios.

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MANAGEMENT OF A PERFORATION COMPLICATION IN ENDODONTIC RETREATMENT OF MAXILLARY ANTERIOR TEETH WITH PERIAPICAL LESIONS: A CASE REPORT

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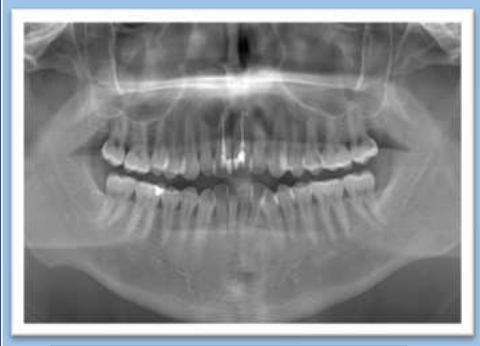
CP029

AIM: This case report describes the clinical management of maxillary anterior teeth with periapical lesions and sinus tracts, including the successful treatment of a perforation complication.

INTRODUCTION: Endodontic retreatment aims to restore periapical tissue health in teeth with previous root canal treatment that failed or became reinfected. This is achieved by removing previous root canal fillings, ensuring thorough disinfection, and obtaining complete three-dimensional obturation. However, complications may arise during the procedure.

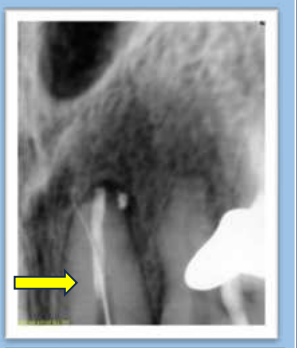
CASE PRESENTATION: A 27-year-old healthy male patient presented to our clinic with complaints of pain in his upper anterior teeth. The patient's history revealed that root canal treatment had been performed on #11 and #21 ten years earlier. Clinical and radiographic examination revealed percussion sensitivity, a sinus tract, and a periapical lesion associated with #11, #12, and #21. Primary root canal treatment was indicated for tooth #12, while retreatment was planned for #11 and #21. During retreatment of #21, a perforation occurred in the apical region. In the first session, chemo-mechanical preparation was completed for all teeth, followed by the placement of calcium hydroxide. In the second session, calcium hydroxide was removed, and final irrigation was performed using 2.5% NaOCl and 17% EDTA with ultrasonic activation. The canals were obturated with gutta-percha cones and bioceramic-based root canal sealer, effectively sealing the perforation. Follow-up examinations showed resolution of symptoms, and the teeth remained asymptomatic and functional.



Preoperative Panoramic Radiograph

Preoperative Radiograph

Preoperative Intraoral Photograph Showing Sinus Tract



Radiographic View of Perforation

Postoperative Radiograph

Follow-up Radiograph

Follow-up Intraoral Photograph

DISCUSSION: Disinfection is one of the key factors in periapical healing in root canal treatment and retreatment therapy. Bioceramic-based root canal sealers may be used to seal narrow small perforations due to their fluidity, biocompatibility, and sealing properties. However, for larger or more severe perforations, bioceramic cements offer improved mechanical strength and sealing.

CLINICAL RELEVANCE: This case highlights the successful management of a perforation during endodontic retreatment, emphasizing the efficacy of bioceramic-based root canal sealers in achieving predictable obturation and sealing.

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CP030

MANAGEMENT OF DEEP ROOT PERFORATIONS (ADVANCED TECHNIQUE)

Stanislav Heranin PhD

AIM - To master the simplified technique for MTA placement in the deep root perforations during non-surgical root canal re-treatment

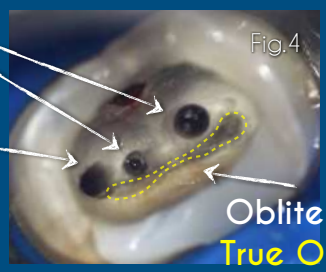
INTRODUCTION - Perforations can occur as an iatrogenic accident during a root canal instrumentation and is the second cause of failed endodontic treatment. Placement of the MTA apical plug in long curved root canals can be quite sensitive, thus making it challenging in clinical practice.

CASE PRESENTATION - Patient, 32 yo, 1.4 Chronic Apical Abscess. Presence of sinus tract. Previously treated a week ago with unsuccessful attempts to finish the root canal treatment. Diagnostic radiograph - periapical radiolucent area. Pulpal floor examination - 3 suspected pulpal floor perforations & obliterated true orifices. True Orifices revealed with carbide long-neck bur. Cleaning, Shaping & Obturation of the root canal system. Placement of the MTA apical plugs in long curved canals with special plastic Thermafil carriers. Using a specialised endodontic file holder facilitates the manipulations under the microscope. 1,5 y follow-up shows complete healing. According to Strindberg's criteria Clinical (no symptoms) & Radiographic (contours and width of the periodontal ligament (PDL) are normal; lamina dura is intact) success of endodontic treatment is evident.

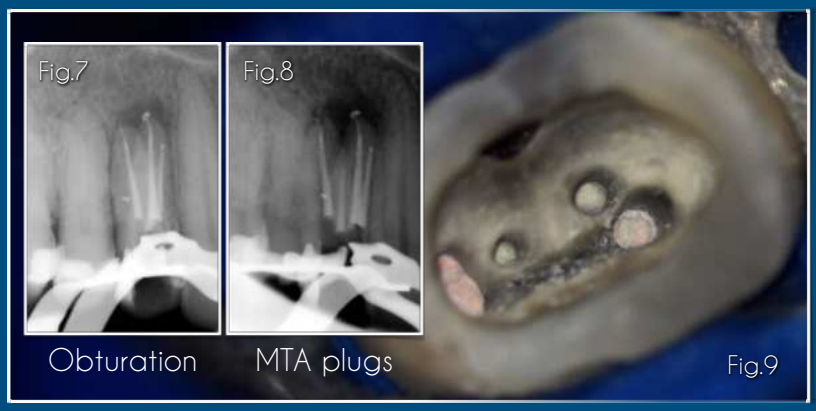
Initial appearance

X-Ray

Tracing



DISCUSSION - Root perforation is an artificial communication between the root canal system and the periradicular space. Iatrogenic root perforations may occur during access cavity opening, root canal preparation or during post preparation. Procedural errors may cause the treatment fail. Factors that may affect the prognosis of root perforations and its treatment are as follows, extent and location, timeline, material, technique and operator experience. Placement of the MTA apical plug in long curved root canals is quite sensitive, thus making it challenging in clinical practice.



1,5 y Follow-up

CLINICAL RELEVANCE - Placement of the traditional MTA plug in a long curved root canals can be quite challenging for the operator. Success or failure depend on the ability to access the perforation area and promote an appropriate sealing. Visual control of every single manipulation under the operational microscope is the crucial factor in daily endodontics.

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MANAGEMENT OF MULTIPLE PERFORATIONS IN A RETREATMENT CASE: A CLINICAL REPORT

CP031

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Aim:

This study aims to present a case of endodontic retreatment in a previously root canal-treated maxillary first molar with multiple perforations and to discuss the clinical approach taken for their repair.

Introduction:

Endodontic retreatment is often required when previous therapy fails due to persistent infection, missed canals, or procedural errors such as perforations. Root perforations pose a significant challenge and may compromise treatment success if not properly managed. The prognosis of perforation repair depends on various factors, including the location, size, duration of exposure, and the sealing material used. Early detection and appropriate treatment can help maintain the integrity of the tooth and surrounding structures. This case highlights a multi-perforation retreatment approach and discusses the critical factors influencing success.

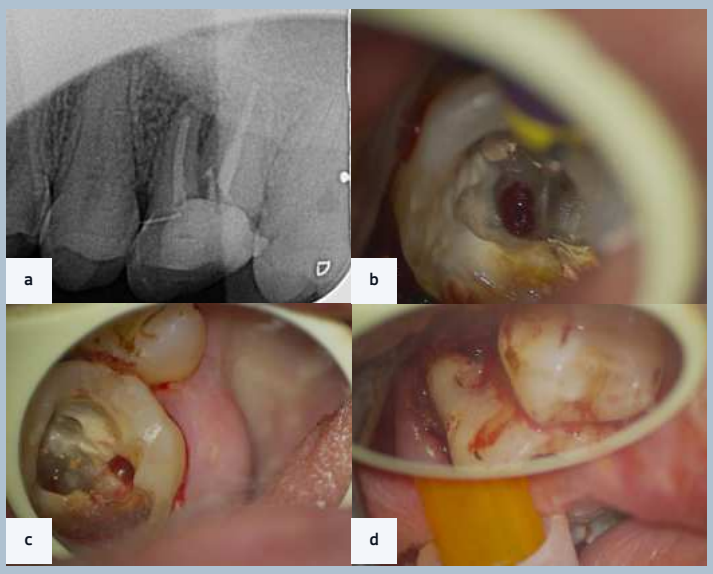

Fig 1: (a) Preoperative, (b) Distal root perforation, (c) Palatinal root perforation, (d) Mesiobuccal root perforation

Case Presentation:

A patient presented to our clinic with pain and swelling in the buccal and palatal regions of the maxillary left first molar, which had previously undergone root canal treatment. The patient had no systemic conditions or history of medication use. Clinical examination revealed tenderness to percussion, and radiographic imaging confirmed the presence of a periapical lesion along with suspected perforations.

The patient was informed about the benefits and risks associated with attempting to treat a molar presenting multiple perforations. Despite the guarded prognosis, the patient expressed a strong desire to preserve the tooth and declined the option of extraction. Consequently, endodontic retreatment combined with perforation repair was initiated.

During the first session, previous restorations and canal fillings were removed, revealing three perforation sites: mesiobuccal root, palatinal root, and distobuccal root. A surgical flap was elevated for direct visualization and repair of the mesiobuccal and palatinal root perforation with resin-modified glass ionomer cement.After flap repositioning, rubber dam isolation was achieved, and the distobuccal perforation, accessible via the access cavity, was repaired with MTA. The repair materials were selected based on perforation location: GIC was used subgingivally for its resistance to fluid wash-out, while MTA was chosen for the distobuccal site due to its sealing ability and biocompatibility under proper isolation.

Calcium hydroxide was applied as an intracanal medicament, and the patient was scheduled for a second session.

At the second visit, the patient reported no symptoms, indicating positive healing progress. The canals were obturated using gutta-percha and bioceramic sealer.The tooth was restored using composite filling. 2 year follow-up visits confirmed that the tooth remained asymptomatic and continued to function effectively within the oral cavity.

Fig 2: Perforation repair

Fig 3: (a) Postoperative radiograph, (b) 2 year follow up

Discussion:

Managing root perforations effectively requires accurate diagnosis and appropriate treatment strategies. Although the prognosis of teeth with multiple root perforations is generally considered poor, when a hermetic seal is achieved and proper case selection is made, long-term retention in the oral cavity is possible.

Clinical Relevance:

A well-planned retreatment approach is crucial for ensuring optimal healing and long-term prognosis in endodontic therapy.In this case, perforation repair enabled the tooth to be preserved, potentially avoiding the need for extraction and more invasive or costly procedures such as implant placement. This emphasizes the importance of individualized treatment planning and respecting patient preferences.

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Apicoectomy of a Mandibular Lateral Incisor with Persistent Periradicular Disease: A Case Report

CP032

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Aim

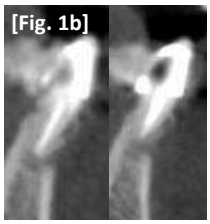
This case report aims to present that endodontic microsurgery (apicoectomy) is good treatment option for teeth with persistent periradicular diseases of endodontic origin when nonsurgical endodontic retreatments have failed or are not feasible.

Introduction

This case presents apicoectomy of a mandibular lateral incisor with persistent periradicular disease which was served as a fixed prosthesis bridge abutment. The source of infection of the tooth was a missed lingual canal as well as apical perforation and gutta-percha overfilling of a buccal canal which could not be managed by nonsurgical endodontic retreatments.

Case Presentation

A 73-year-old male patient presented with a complaint of gingival swelling of the lower left anterior teeth region. The patient had received nonsurgical endodontic retreatment on teeth #32, #33 and a 9-unit PFM bridge restoration on teeth #44, #43, #32, #33, #35 as abutments 10 years ago. At the clinical examination, a lower left lateral incisor revealed an absence of tenderness to percussion and palpation, with normal probing depths (buccal 333/ lingual 333) ; however, a buccal sinus tract was present [Fig. 1a]. Tooth #32 was diagnosed as a previously treated tooth with chronic apical abscess. Considering that tooth #32 functioned as a critical abutment for a long-span prosthesis, the prosthesis removal for nonsurgical endodontic retreatment was an economic burden for the patient. Besides, the small coronal dimensions increased the risk of perforation during intra-coronal access for nonsurgical endodontic retreatment. Moreover, nonsurgical endodontic retreatment had failed once. The cause of the lesion could not be identified based on CBCT evaluation [Fig 1b]. For all these reasons, apicoectomy was indicated for this case.



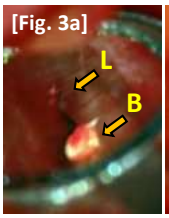
[Fig. 1a] Initial periapical radiograph with gutta-percha cone tracing.
[Fig. 1b] Initial CBCT images of #32.

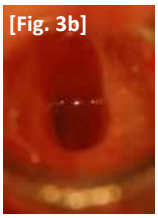
[Fig. 2] Intra-oral clinical photograph after flap elevation, ostectomy and granulation tissue curettage.

Surgical procedures are described below. Local infiltration anesthesia was administered in the mandibular anterior region using 2% lidocaine with 1:100,000 epinephrine, followed by disinfection with chlorhexidine. A submarginal flap was designed with an incision placed approximately 2 mm apical to the gingival sulcus, extending from a tooth #31 to #33, using a #15 surgical blade. Upon flap reflection, granulation tissue associated with periapical bone resorption at the apex of tooth #32 was evident.

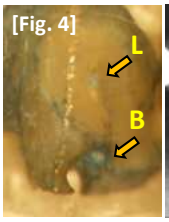
Using a round bur, an ostectomy was performed and the granulation tissue was removed by curettage [Fig. 2]. Inspection revealed an apical perforation and extruded gutta-percha in the buccal canal. A diamond bur was then used to perform a 3-mm root-end resection. The resected surface was stained with methylene blue and examined under a dental operating microscope, which revealed the presence of a missed lingual canal and an isthmus exhibiting microleakage. No additional structural defects such as vertical root fractures were detected [Fig. 3a]. Retrograde cavity preparation was delicately performed using ultrasonic tips to a depth of approximately 3 mm, ensuring inclusion of both the buccal and lingual canals as well as the interconnecting isthmus [Fig. 3b]. The prepared cavity was then retro-filled with Endocem MTA (Maruchi, Korea) to obtain apical sealing [Fig. 3c]. After setting of MTA, a periapical radiograph was obtained to confirm the adequacy of the retrograde filling [Fig. 5]. The surgical site was irrigated with sterile saline and the flap was repositioned and sutured with 5–0 nylon. Suture removal and post-operative dressing were performed after one week.

Follow-up evaluations at 1, 3, and 6 months confirmed that the tooth #32 remained asymptomatic and the sinus tract had resolved. Radiographic examination at 6-month follow-up demonstrated significant periapical osseous healing [Fig. 6].

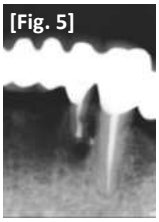




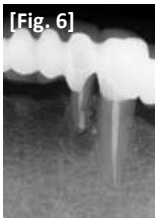
[Fig. 3] Dental operating microscopic photograph after root-end resection [Fig. 3a], Retrograde cavity preparation [Fig. 3b], and retrograde filling [Fig. 3c].



[Fig. 4] Resected apical part of root. Perforation at a buccal canal and a missed lingual canal can be observed.



[Fig. 5] Periapical radiograph after retrograde filling.



[Fig. 6] 6-month follow-up periapical radiograph.

Discussion

According to several studies analyzing the root canal anatomy of mandibular incisors, the prevalence of two canals in these teeth ranges from 0.3% to 13% [1]. The presence of a missed canal can lead to persistent apical periodontitis. In this case, retrograde cavity preparation and filling was performed to include the missed lingual canal and the isthmus, thereby optimizing the apical seal.

Clinical Relevance

Persistent and recurrent periradicular disease can be resolved with endodontic surgery when nonsurgical endodontic retreatment is limited. Modern surgical endodontic treatment can achieve a good prognosis by using a dental operating microscope, ultrasonic tips, and biocompatible apical filling materials [2].

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Endodontic and Surgical Management of a Maxillary Second Molar with a Trifid Crown

CP033

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Aim

This report describes a maxillary second molar with a fused trifid crown, presenting with pulpal infection and odontogenic sinusitis. The treatment approach involved endodontic management of the supernumerary crowns while preserving the vitality of the UL7, followed by surgical resection and restoration.

Introduction

Abnormal tooth morphology can result from developmental aberrations, such as fusion or gemination, known as a double tooth (Knežević *et al.* 2002, Akitomo *et al.* 2023). The prevalence of double tooth in the permanent dentition is 0.1%, occurring more commonly in the anterior region (Duncan *et al.* 1987). Although a double tooth is often asymptomatic, the deep grooves at the interface increase the risk of caries and pulpal infection. Additionally, groove extensions may lead to periodontal disease (Aryanpour *et al.* 2002).

Case Report

The 32-year-old female was referred for the management of left maxillary second molar (UL7) with abnormal anatomy. The patient reported a left temporal headache and spontaneous pain in the upper left dentition. Extraoral examination revealed mild tenderness in the left preauricular area. Intraoral examination showed the UL7 with atypical morphology consisting of three intact crowns (Figure 1A). Probing depths of 4 mm were noted along the developmental groove between the crowns. The UL7 showed a positive response to sensibility tests, with no tenderness to percussion or palpation. Periapical radiographs showed no periradicular radiolucency (Figure 1B). However, Cone-Beam Computed Tomography (CBCT) revealed a periradicular radiolucency associated with the UL7 and thickening of the sinus membrane, suggestive of odontogenic sinusitis (Figure 1C). CBCT displayed a separate pulp chamber for the smaller buccal crown, with its canal connecting to the MB canal of the UL7, indicating type I morphology of a double tooth (Figure 1D-F). The distal buccal crown exhibited a type IV morphology of a double tooth. The pulp chamber was isolated with a Vertucci type V canal system, and the palatal canal joined the D canal of the UL7 (Figure 1C, E-H). The diagnosis was a fused tooth with asymptomatic pulpitis and asymptomatic apical periodontitis, accompanied by odontogenic sinusitis. After local anaesthesia, the two endodontic access cavities were prepared via the extra crowns (Figure 2A). Canal patency was achieved in three canals; working lengths were determined and confirmed radiographically (Figure 2B, C). All canals were prepared, and calcium hydroxide paste (Calcicur®) was applied for three weeks. Prior to obturation, the patient was asymptomatic and no longer reported headaches. Biodentine (Septodont, Saint-Maur-des-Fosses, France) was placed into three canals. Flap surgery was performed at the next appointment. The two buccal crowns were fully exposed and sectioned at the bone level (Figure 2D, E). The sectioned surface was covered with glass ionomer cement (Fuji II) and the wound was closed with 5-0 nylon sutures (Figure 2F, G). At the one-week review, the patient reported no discomfort. The UL7 crown was recontoured with composite. Three months post-treatment, the patient remained asymptomatic, the UL7 responded positively to sensibility tests, and periodontal pocket depths were within normal limits. At the 14-month and 30-month reviews, the patient remained symptom-free, the UL7 was free of plaque, and radiographic examination revealed a normal periradicular appearance (Figure 2H-J).

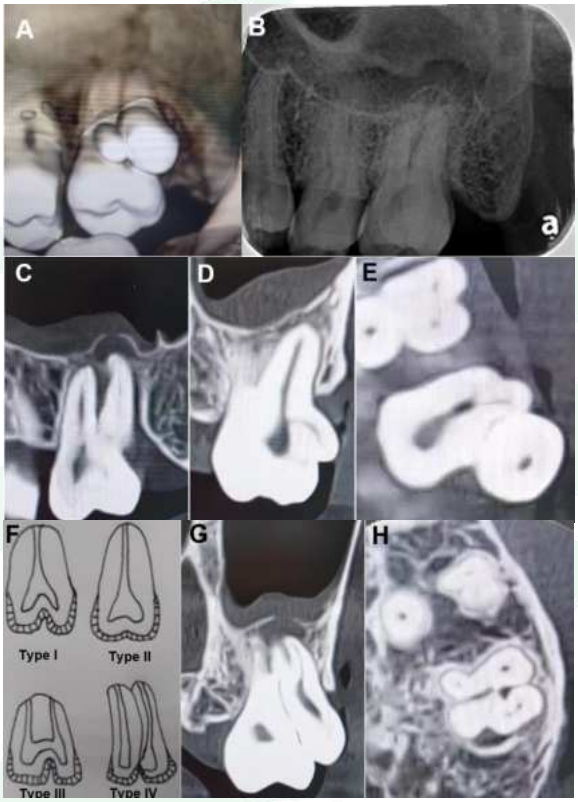

Figure 1. (A) 3D reconstructed image of atypical crown morphology. (B) Periapical radiograph. (C) Sagittal view, a periradicular radiolucency involving the fused root—comprising the D root of the UL7 and the root of the extra disto-buccal crown—extended into the sinus, causing membrane thickening. (D) Coronal view, isolated chamber in extra buccal crown. (E) Axial view, trifid crown. (F) Types of double teeth (Redrawn from Sperduti *et al.* 2021) . (G) Coronal view, canal morphology of the extra disto-buccal crown. (H) Axial view, Canal morphology of the fused complex In the apical third.

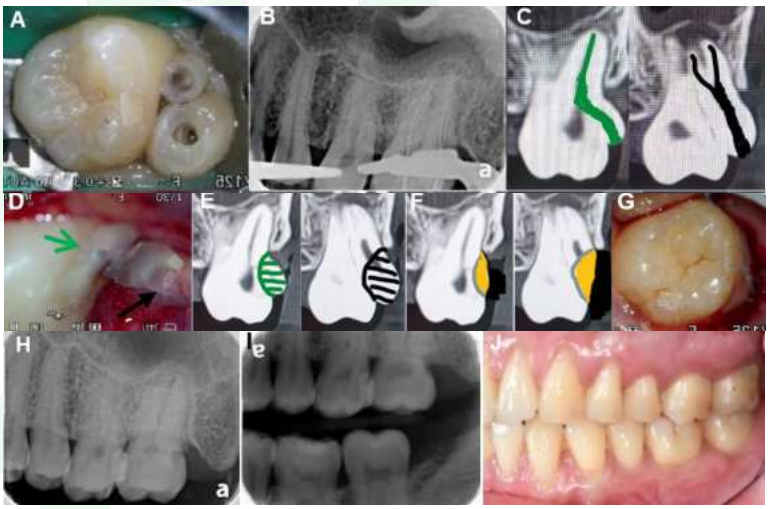

Figure 2. (A) Access cavities preparation. (B) Working length radiograph. (C) Diagrams illustrating the prepared canal configuration (green: smaller buccal crown ; black: distal buccal crown). (D) Resection surface of the extra crowns, showing the smaller buccal crown (green) and the distal buccal crown (black). (E) Cutting lines for crown resection. (F) Post-resection restoration with glass ionomer cement (yellow-shaded). (G) Postoperative photograph. (H, I) Follow-up radiographs at 30 months demonstrating normal periradicular conditions and a healthy periodontium. (J) Clinical photograph at 30-month follow-up showing good periodontal maintenance.

Discussion

Despite being rare, a double tooth can pose aesthetic and functional challenges, requiring a multidisciplinary approach. Enamel deficiencies or undetected cracks along the gemination grooves may have allowed bacterial invasion into the pulp (Aryanpour *et al.* 2002). In this case, the UL7 presented no symptoms and responded positively to tests. With the assistance of CBCT, it was determined that the infection was confined to part of the root canal system, allowing for treatment that preserved the vitality of the UL7. Due to periodontal considerations, the two extra crowns were resected; although, the limited surgical field increased the difficulty. As a result of the treatment, the patient remained asymptomatic until the 30-month review, with the periodontal condition of the UL7 well-maintained.

Conclusion & Clinical Relevance

In cases of tooth fusion, even with complex malformations or limited accessibility, proper coordination of non-surgical root canal treatment aided by CBCT and surgical resection should be considered. To ensure a favourable long-term prognosis, it is necessary to eliminate pulpal infection and promote the maintenance of healthy periodontal conditions.

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Salvage Through Endodontic Surgery: A Case Report on Effective Management

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CP034

AIM

This case report emphasizes the potential for a successful outcome of surgical endodontic treatment following the failure of non-surgical treatment of a lateral maxillary incisor.

Figure. 1 initial photo

Figure. 10 final photo

INTRODUCTION

The major reason for failed periapical healing after primary endodontic therapy is the presence of bacteria and diseased tissue[1]. Orthograde retreatment is the first treatment choice for such cases, but there are situations where it is not feasible, too complicated or unsuccessful. In such circumstances, apical surgery has proved to be a sound treatment option to save the tooth[2]. Modern technology, materials, and techniques have improved the prognosis of endodontic surgery[2]. Cone-beam computed tomography (CBCT) enabled more accurate determination of the root anatomy and its proximity to critical anatomical structures which led to better planning of the surgical approach[3,4, 5]. When the root-end resections and retrograde fillings are performed using microsurgical instruments with current materials and techniques, the success rates was 85% to 97% [6].

CASE PRESENTATION

A 45-year-old female patient was referred for an endodontic evaluation of the right maxillary lateral incisor (Fig.1). The patient was complaining about pain on biting in that area. The dentist requested a CBCT scan and referred the patient to our clinic. During this time, the prosthetic crown fell off. Clinically, tooth 11 presented a well-adapted crown, tooth 12 had a mesial restoration, the sensitivity test was negative, probing was normal, axial percussion showed tenderness, and tooth 13 responded normally to sensitivity tests. CBCT (Figs. 2a, b, c) revealed that tooth 11 had a crown and apparently a correctly performed root canal treatment; on the tooth 12 we noticed , an internal inflamatory type resorption. We could notice also a large radiolucency extended from tooth 11 to 13. Based on the clinical and radiographic findings, a chronic apical abscess was diagnosed on tooth 12. The treatment plan involved performing root canal treatment on tooth 12, accordind the ESE Statement **[7 ,8].** We performed the treatment in two visits. In the first session access opening was done, the pus was coming (Fig.3), following the working length estimation, a thorough chemo-mechanical preparation was performed. The root canal was irrigated with combination of sodium hypochlorite and sterile saline solution. The canals were dried with sterile paper points, we placed calcium hydroxide and the access cavity was sealed with intermediary restorative material. In the second session we removed the intracanalar medication, we performed an 4mm apical plug with biomaterial (Biodentine,Septodont,France) and rest of the root canal and the resorption were obturated with gutta-percha and bioceramic sealer (Bioroot RCS,Septodont,France), we recomended a final X-ray (Fig.4),and restored the tooth crown with a composite filling and provisional crown and we followed up with the case.

After two months , the tooth became symptomatic, so we scheduled it for endodontic surgery. Since the tooth was already obturated apically with bioceramic material, during the surgical phase, we only cut 3mm from the root using a piezotome Cube (Acteon) and tip (B55,Acteon) and we removed the periapical lesion (Fig.6). Since the defect was through-and-through, we choose a PRF membrane (Fig7 a,b,c), and we performed a final X-ray (Fig.8). The material collected from the lesion was sent for histopathological examination, and the result was a cyst. At the 8-month follow-up, the patient was completely asymptomatic, and the bone was healing (Fig. 9a,b,c).

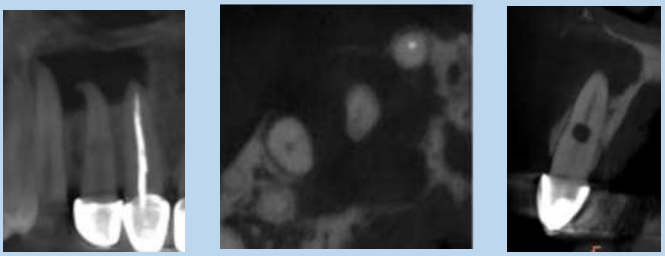

Figure. 2 a,b,c Initial CBCT sections

Figure. 3 First visit,pus

Figure. 4 Final root canal obturation X-ray

Figure. 6 Apical surgery,removing 3mm of root and granulation tissue

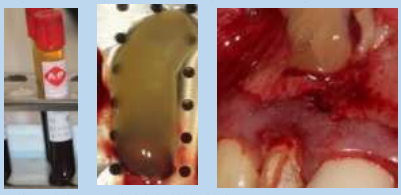

Fig.7 a,b,c PRF membrane

Fig.8 a,b,c Final X-Ray

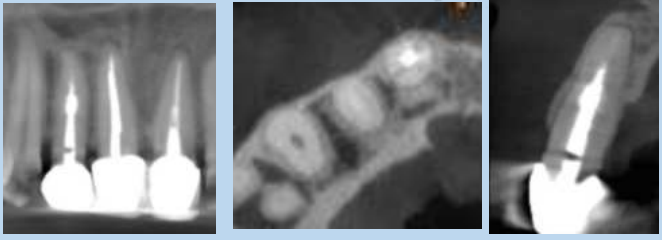

Fig. 9 a,b,c CBCT slices 8 months recall.

DISCUSSION

Non-surgical endodontic treatment was found to be successful in the management of dental periapical lesions [9,10]. However, a few cases cannot be managed by a non-surgical approach alone and require surgical intervention such in the cyst type ones [1,6].

CLINICAL RELEVANCE

Clinicians must balance the risks and benefits, and when traditional endodontic therapy fails or is ineffective, alternative methods should be considered. Apical surgery can be a predictable option compared to tooth extraction, given proper case selection.

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Endodontic and periodontal considerations for splinting periodontally compromised traumatized teeth: A case report

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CP035

Aim

To describe a case of splinting periodontally compromised teeth that were also subjected to traumatic dental injury.

Introduction

To our knowledge, there is no current data regarding splinting periodontally compromised teeth that were also subjected to traumatic dental injury. This case report aims to present a patient with mobile teeth due to Periodontitis stage IV grade C. In the absence of specific endodontic or periodontic literature on this scenario, the clinician applied a clinical interpretation of existing guidelines to achieve a favorable outcome.

Fig. 1. Emergency buccal splint

Case Presentation

A 19-year-old male with Periodontitis stage IV grade C suffered dental trauma to teeth #11-#22 during sports activity. The patient repositioned tooth #11 himself and received emergency care within two hours. Clinical and radiographic evaluations (Fig. 2) confirmed lateral luxation of tooth #11 and significant vertical bone loss in the anterior maxilla. An emergency splint using K-files was placed for teeth #12-#22 (Fig. 1). Follow-up assessments at two and four week(1,2) showed positive sensibility responses, and stable periodontal conditions. After splint removal at four weeks as recommended by IADT(1,2), increased mobility and patient discomfort led to the bonding of a permanent rigid palatal splint (Fig. 3) . Three years of follow-up demonstrated no signs of ankylosis or resorption, and successful periodontal management (Fig. 4).

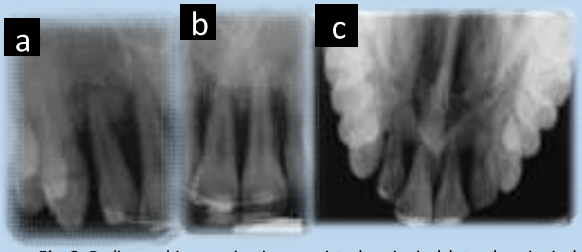

Fig. 2. Radiographic examination consisted periapical, lateral periapical (a,b) and occlusal radiographs (c)

Fig. 3. rigid splint

Fig. 4. Clinical (a) and radiographic (b) images of the anterior teeth three years post the traumatic dental injury.

Discussion

The present case highlights the clinical challenge of splinting periodontally compromised traumatized teeth. While flexible splints are typically recommended, severe periodontal involvement may necessitate rigid permanent stabilization.

Conclusion & Clinical Relevance

The findings support the potential application of prolonged rigid splinting in periodontally compromised traumatized teeth, though further studies are needed to confirm its long-term effectiveness.

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HEALING OF LESIONS WITH NON-SURGICAL RETREATMENT AFTER FAILED ENDODONTIC APICAL SURGERY: A CASE REPORT

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CP036

Introduction

Although non-surgical endodontic treatment is a highly predictable option, surgical treatment may be indicated for teeth with persistent periradicular pathologies that do not respond to non-surgical approaches. However, if proper apical sealing is not achieved, the success rate of surgical treatment significantly decreases.

Objective

The aim of this case report is to present the follow-up of lesion healing in a case where endodontic apical surgery had been previously performed but failed due to inadequate apical sealing, and which was subsequently treated successfully with non-surgical retreatment.

Case Report

A 37-year-old systemically healthy female patient presented to the Department of Endodontics, Faculty of Dentistry, Atatürk University with a complaint of pain in the mandibular anterior region. The patient's anamnesis revealed that apical resection had been performed on teeth #31 and #41 (FDI classification) 18 years ago. Clinical and radiographic examinations indicated that proper apical sealing had not been achieved, and a large periradicular lesion was present in the affected region. Non-surgical retreatment was planned as the initial approach.

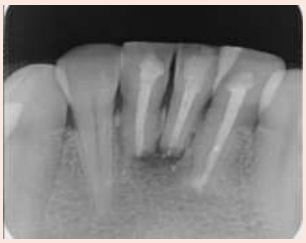
- Infiltrative anesthesia was administered (Ultracaine, D-S Forte).
- Endodontic access cavities were prepared for teeth #31 and #41.
- Rubber dam isolation was achieved.
- For non-surgical retreatment, the canal orifices were irrigated with 17% EDTA.
- Root canal preparation was performed using R#25.06 and R#40.06 files (NIC, Guangoong, P.R.C., China), ensuring complete removal of the gutta-percha.
- Final irrigation was performed with 2.5% NaOCl.
- An intracanal medicament containing $Ca(OH)_2$ (Calcicur, Cuxhaven, Germany) was placed for 14 days.
- The root canal was obturated with a bioceramic-based sealer (Bioserra, Meta Biomed) and appropriate gutta-percha (Raito 40.06, Shenzhen Rogin Medical).
- Composite restoration was performed to complete the treatment.
- Follow-ups at 3 and 6 months showed a reduction in the lesion size, and the patient remains under observation.

pre-op

emptied root canals

post op

Post-op 3rd month



post-op 6th month

Clinical Relevance

In cases of failed endodontic apical surgery, performing non-surgical endodontic retreatment instead of repeating surgical treatment may yield favorable outcomes for the prognosis of the affected teeth.

Discussion

Although endodontic apical surgery is a commonly used method for the treatment of persistent periradicular infections, it may fail if proper apical sealing is not achieved. In such cases, rather than repeating the surgical procedure, non-surgical retreatment has been shown to be a successful alternative.
Further clinical studies are needed to compare the advantages and disadvantages of surgical and non-surgical endodontic treatments.

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Long-Term Outcomes of Root Buccal Perforation Management: A 6-Year Follow-Up Case Series

CP037

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AIM

This case report aims to demonstrate the long-term outcomes of root buccal perforations treated with mineral trioxide aggregate (MTA), highlighting the effectiveness of this treatment through a 7-year follow-up.

INTRODUCTION

A root canal perforation involves an opening in the root structure, defined by the American Association of Endodontists as a connection between the root canal and the tooth's external surface [1]. This complication can compromise the structural integrity of the root and damage surrounding periodontal tissues [2]. Perforations can occur accidentally during treatment or due to causes such as iatrogenic factors, resorption, or dental caries [2]. Successful management relies on the defect's size, location, and prompt sealing with biocompatible material [3].

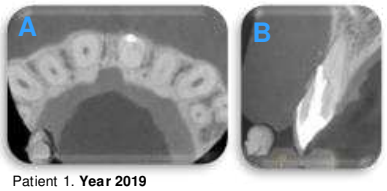
CASE PRESENTATION

Case Overview:

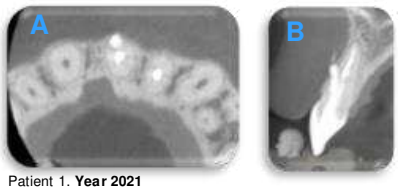
Two female patients were referred to the RSU Institute of Stomatology Endodontic Department by their general dentists due to complications from recent treatment at another clinic. Cone Beam Computed Tomography (CBCT) scans revealed buccal perforations in the affected teeth: tooth #11 in one patient and tooth #21 in the other.

Treatment:

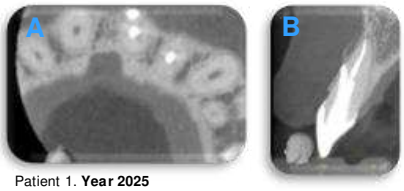
Single-visit root canal therapy was performed under the Zeiss OPMI Pico microscope. The true root canal was located, and mechanical preparation was executed using ProTaper Gold. Irrigation was completed with 2.5% NaOCl2 and 17% EDTA, followed by perforation cleaning with Chlorhexidine 2%. A final rinse with activation was conducted, and the root canal was obturated using AH Plus sealer and the Gutta Percha vertical condensation method, perforation was closed with MTA. A Lime Lite liner was applied, and the cavity was sealed with IRM. The patient was subsequently referred for permanent restauration. Treatment was done by 1st year postgraduate student.



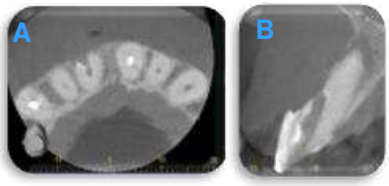
Patient 1. **Year 2019**
D21 Preoperative CBCT. (A) Axial view. (B) Sagittal view.



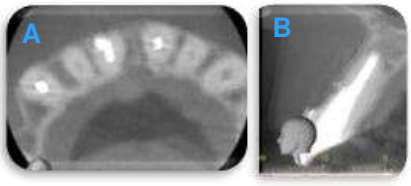
Patient 1. **Year 2021**
D21 – 1st Follow Up CBCT. (A) Axial view. (B) Sagittal view



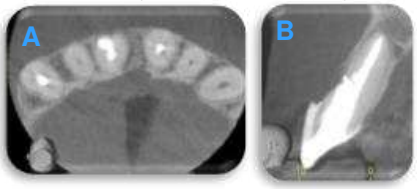
Patient 1. **Year 2025**
D21 – 2nd Follow Up CBCT. (A) Axial view. (B) Sagittal view.



Patient 2. **Year 2019**
D11 Preoperative CBCT. (A) Axial view. (B) Sagittal view.



Patient 2. **Year 2021**
D21 – 1st Follow Up CBCT. (A) Axial view. (B) Sagittal view.



Patient 2. **Year 2025**
D11 – 2nd Follow Up CBCT. (A) Axial view. (B) Sagittal view.

DISCUSSION

A conservative approach was chosen to preserve the natural teeth rather than opting for extraction. MTA provides a cost-effective solution for sealing perforations, significantly contributing to the overall success of the treatment [4]. Key factors for successful management included timely diagnosis of the perforations, the use of biocompatible sealing materials, and advanced techniques such as magnification with a microscope to ensure precision during the procedure [5].

CBCT provided essential information for enhancing treatment precision by accurately locating the buccal perforations. The effectiveness of MTA in promoting healing and maintaining tooth structure underscores its value in endodontic practice, especially over the long term. By prioritizing conservative treatment and utilizing high-quality materials, it is possible to achieve favorable outcomes and enhance the longevity of affected teeth [6].

CLINICAL PREVALENCE

This case series highlights the importance of careful case selection and appropriate endodontic intervention in managing root canal perforations. By utilizing MTA to effectively seal these perforations, the successful retention of teeth can be achieved, preventing the need for extraction. Emphasizing these factors demonstrates the potential for favorable outcomes in preserving natural dentition.

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Endodontic Management of Dens Invaginatus Using Biodentine: A Case Report

CP038

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Aim

The aim of this case report is to present the endodontic management of a dens invaginatus tooth using Biodentine (Septodont, Saint-Maur-des-Fossés, France).

Introduction

Dens invaginatus is a developmental anomaly marked by the invagination of enamel and dentin into the pulp cavity, resulting in a uniquely complex canal anatomy. In this case report, the root canal treatment of a dens invaginatus tooth with a complex canal anatomy is presented.

<Case 1>

A 9-year-old boy presented with pain in the maxillary left lateral incisor (#22). Clinical and radiographic examinations revealed dens invaginatus in #22 with an open apex and a periapical radiolucency (Fig. 1*D*). The tooth was diagnosed with pulp necrosis and symptomatic apical periodontitis, and endodontic treatment was planned. At the first visit, after local anesthesia, an access cavity was prepared and the pulp was removed. The canal was shaped up to ProTaper Next X3 (Dentsply Sirona, York, USA), irrigated with 1.5% sodium hypochlorite (NaOCl), and dried with paper points. Calcium hydroxide (Calcipex II; Nippon Shika Yakuhin Co., Ltd., Shimonoseki, Japan) was placed, and the tooth was sealed with cotton and CAVITON (GC Corporation, Tokyo, Japan). At the second visit, the invagination was removed using an Endo CPR ultrasonic tip (Obtura Spartan, St. Louis, USA) and EndoTracer (Komet Dental, Lemgo, Germany). After irrigation and drying, Calcipex II was applied in the coronal third, and the tooth was sealed with cotton and CAVITON. At the third visit, the patient was asymptomatic. Local anesthesia was given using mepivacaine (Scandonest; Septodont, Saint-Maur-des-Fossés, France), and the tooth was isolated with a rubber dam. The canal was irrigated with 10 mL of 17% ethylenediaminetetraacetic acid (EDTA) using passive ultrasonic irrigation (PUI), and dried with paper points. Intentional bleeding was induced 2–3 mm below the cementoenamel junction (CEJ) using a #20 K-file (Fig. 1*A*). After confirming blood clot formation under a microscope (Fig. 1*B*), Biodentine was placed up to 4 mm thickness (Fig. 1*C, E*), and the cavity was sealed with wet cotton and CAVITON. At the final visit, Biodentine setting was confirmed, and the tooth was permanently restored using a dual-cure composite resin (LuxaCore Z Dual; DMG, Hamburg, Germany). At the 3-month follow-up (Fig. 1*F*), the patient remained asymptomatic, and radiographic examination showed apical healing.

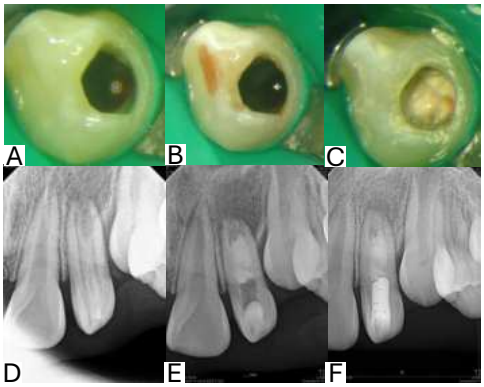

Figure1.
(*A*) Induced bleeding microscopic image. (*B*) Blood clot formation.
(*C*) Biodentine filling. (*D*) Preoperative radiograph.
(*E*) Radiograph after Biodentine application. (*F*) Follow-up radiograph at 3 months.

<Case 2>

An 11-year-old girl presented with pain in the maxillary left lateral incisor(#22). Clinical and radiographic examination revealed dens invaginatus in the #22 with open apex (Fig. 2*D*). The tooth was diagnosed with pulp necrosis, symptomatic apical periodontitis, and endodontic treatment was planned. At the first visit, an access cavity was prepared, and a mesial accessory canal, a central invaginated portion, and a distal main canal were identified (Fig. 2*A*). The canals were irrigated with 2.5% sodium hypochlorite and saline. After drying with paper points, Calcipex II was placed in the distal main canal, and the cavity was sealed with cotton and CAVITON. At the second visit, symptoms had improved but the tooth still showed a positive response to percussion. Patency was achieved in the distal main canal, working length was determined, and canal shaping was completed up to ProTaper Next X3. Following irrigation, Calcipex II was placed and the access cavity was sealed again with cotton and CAVITON. CBCT was performed to evaluate the anatomy of the mesial accessory canal. At the third visit, symptoms had resolved. The invaginated portion was completely removed using an Endo CPR Ultrasonic Tip (Fig. 2*B*). The canal was irrigated with saline and 17% EDTA using PUI, then dried with paper points. Biodentine was applied into the canal with an amalgam carrier, and a 5 mm apical plug was formed using a hand plugger (Fig. 2*C*). Any excess material along the canal walls was removed with paper points, and the cavity was sealed with wet cotton and CAVITON. A week later confirmation of Biodentine setting, GP backfilling and resin core restoration were completed (Fig. 2*E*). A 3-month follow-up appointment was scheduled, but the patient did not appear.

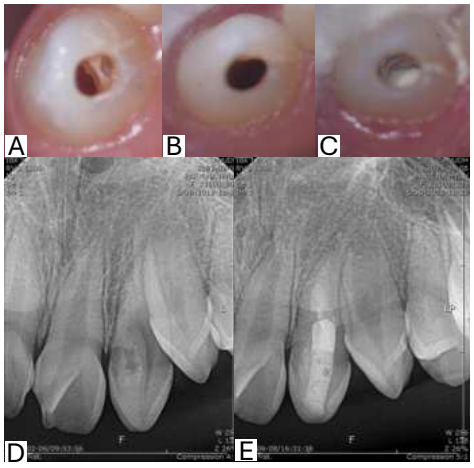

Figure2.
(*A*) Detected invagination. (*B*) After removal of invagination.
(*C*) Biodentine filling. (*D*) Preoperative radiograph.
(*E*) Postoperative radiograph.

Discussion

In Case 1, revascularization was selected due to the patient's young age, open apex, and thin dentinal walls, with the goal of promoting continued root development. In contrast, Case 2 involved a more mature tooth with nearly complete apical closure and structurally thick dentinal walls, making further root development less necessary. Additionally, the limited apical opening in Case 2 was less favorable for successful revascularization, and apexification offered a more predictable outcome[1-2].

Clinical relevance

These cases show that treatment choice depends on root maturity, apical anatomy, and healing potential.

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USE OF MTA IN ENDODONTIC RETREATMENT: A CLINICAL APPROACH IN TOOTH 21

CP039

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AIM

Presentation of a case report of a retreatment of a tooth with an external apex resorption and evaluation of the clinical and radiographic outcomes using Mineral Trioxide Aggregate (MTA) as a root filling material.

INTRODUCTION

External root resorption is a pathological process triggered by an imbalance between osteoclastic and osteoblastic activity, often resulting from trauma, chronic inflammation, or excessive mechanical forces on the periodontal ligament. Mineral Trioxide Aggregate (MTA) is widely used in endodontics due to its biocompatibility, bio-inductive properties, and ability to promote periodontal and bone regeneration. Its clinical application in cases of resorption has shown successful outcomes, particularly due to its capacity to provide a stable and durable barrier. This case highlights the effective use of MTA in endodontic retreatment, demonstrating favorable clinical and radiographic evolution

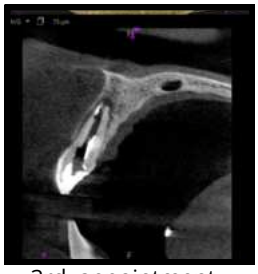
CLINICAL CASE

The patient was a 26-year-old ASA I male with esthetic concerns regarding his upper anterior tooth. Upon clinical examination, the patient reported no pain, however the tooth exhibited a different sensation upon percussion. No swelling or sinus tract was observed, though the gum around tooth 21 appeared inflamed. Radiographic findings revealed that the tooth had been previously treated and showed signs of asymptomatic apical periodontitis. The patient recalled a history of trauma from a bicycle accident approximately 15 years prior. Given the condition of the tooth and the patient's esthetic concerns, various treatment options were considered, including extraction, endodontic retreatment with gutta-percha filling, endodontic retreatment with MTA filling, or apical surgery. The decision was to proceed with endodontic retreatment using MTA, followed by internal bleaching and subsequent restorative treatment to achieve the desired esthetic result.

The treatment plan was carried out in multiple sessions. During the first appointment, only the visual examination, percussion test, and periapical radiograph were performed to confirm the diagnosis and establish the treatment plan. In the second appointment, under absolute isolation, the previous obturation material was removed using a Reciproc R25 file under sodium hypochlorite irrigation, and intracanal calcium hydroxide was placed for two weeks before sealing the tooth temporarily.

During the third appointment, a Cone-Beam Computed Tomography (CBCT) scan was performed as the radiographic image used to determine the working length did not match the clinical findings (apical locator). The CBCT confirmed the presence of external root resorption. Following this, obturation was performed using ProRoot MTA after manually calibrating the canal up to K50. The MTA was placed with the MAP One system, followed by the application of an IV barrier and a temporary filling. Additionally, internal bleaching was initiated and continued over three sessions spanning three weeks. After these three sessions, the bleaching material was removed, and a temporary sealing with Polytetrafluoroethylene tape and glass ionomer filling was placed for an additional three weeks to ensure adequate sealing and stabilization before proceeding with the final restoration.

Finally, in the last appointment, a control X-ray was taken, and the final restorative phase was completed with composite filling. Follow-up evaluations were conducted at 3 and 6 months afterwards, showing favorable evolution with proper sealing.



3rd appointment

DISCUSSION

External root resorption compromises tooth structure, making it essential to use a material that provides a strong apical seal to prevent bacterial infiltration. MTA also promotes bone and periodontal ligament regeneration, improving long-term prognosis. Its resistance to resorption ensures treatment stability over time. The main challenges were removing the previous obturation material, achieving a proper apical seal with MTA, and ensuring shade stability after bleaching. Despite these challenges, the biological properties of MTA and the precision of the treatment resulted in a favorable prognosis.

Although MTA was selected in this clinical case due to its favorable properties for apical sealing, hydraulic condensation with bioceramic sealers has demonstrated excellent potential for reducing voids and improving obturation homogeneity. These sealers, when used with hydraulic techniques, promote deeper penetration into dentinal tubules and minimize "dead spaces," which are known sites for bacterial infiltration and treatment failure. Studies using micro-CT and dye penetration methods support their superior sealing performance in complex canal anatomie

CLINICAL RELEVANCE

This case highlights the advantages of MTA in endodontic retreatments and the importance of proper diagnostic imaging for optimal treatment planning. The use of ProRoot MTA, the gold standard material, contributes to a favorable result due to its superior sealing ability, biocompatibility, and regenerative properties, reinforcing its effectiveness in managing complex cases like external root resorption.

REFERENCES

CP040

EFFECT OF BIOCERAMIC SEALER EXTRUSION: CASE REPORT OF A MAXILLARY CENTRAL INCISOR

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Micronova Microscope Enhanced Dentistry, Budapest (HU)

AIM

To present a retreatment case in the esthetic zone, and highlight the relevance of sealer extrusion using bioceramic materials.

INTRODUCTION

Bioceramic sealers have gained significant attention in endodontics due to their excellent biocompatibility, bioactivity, and sealing ability. However, one of the main concerns associated with their use is ***sealer extrusion****, which occurs when the material extends beyond the apical foramen or into periapical tissues during root canal obturation. This phenomenon can lead to complications such as post-operative pain, inflammatory reactions, and, in rare cases, neurotoxicity. Several factors influence bioceramic sealer extrusion, including root canal anatomy, preparation techniques, application methods, and the flowability of the sealer itself.*

CASE PRESENTATION

A 31-year-old male patient was referred to our office. The previous dentist diagnosed a periapical lesion on tooth 11 (Fig.4.). ***Chief complaint****:The tooth was asymptomatic (not tender to percussion, no sign of any acute process). Unsatisfactory esthetic appearance.*
Radiological examination*: periapical x-ray showed a short, incomplete root canal filling and a metal post and core.*
Clinical examination*: Esthetically questionable metal-ceramic crown with open margins. (Fig.1.)*
Diagnosis*: chronic apical periodontitis*

Treatment*: In the first visit after local anaesthesia the crown has been removed. Rubberdam isolation was placed. Under high magnification (Zeiss Extaro 300), using an ultrasonic tip, the metal post was removed. The D1, and D2 retreatment files (Dentsply Sirona, USA) were used to remove the root canal filling. The working length was measured using an apex locator (COXO) and confirmed with a periapical radiograph. ProTaper Next X1-X5 (Dentsply Sirona, USA) rotary files were used to instrument the canal. 5.25% sodium hypochlorite (NaOCl) solution irrigation was carried out with a constant activation (EndoActivator, Dentsply Sirona, USA). The cold lateral compaction method was used to fill the root canal with an X5 master cone and AH Plus Bioceramic Sealer (Dentsply Sirona, USA). Root canal filling was confirmed with a periapical radiograph. Unintentional sealer extrusion into periapical space was shown on x-ray. Patient has been informed. The root canal treatment was completed in a single-visit appointment.*
According to Fráter et al a Bioblock (direct short-fiber reinforced flowable composite post) builup was performed in 1mm increments using Clearfil SE bond (Kuraray Noritake Dental, Japan), as a bonding agent and EverX flow Bulk and EverX flow Dentin shade composites (GC International AG, Switzerland). An E-max ceramic crown was made after scanning the prepared tooth. The crown was luted with heated composite material.

Fig. 1.: Metal-ceramic crown on tooth 11

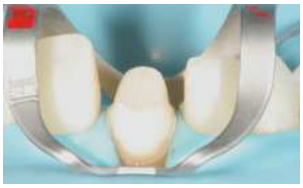


Fig.2.: Bioblock post-endodontic buildup

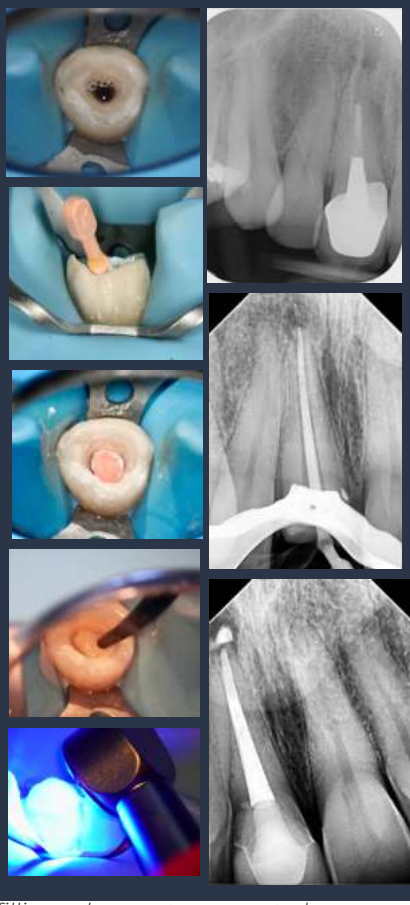
Fig.3.: E-max crown after cementation

DISCUSSION

Certain authors indicate that in the absence of apical periodontitis, the apical extent of root canal fillings does not appear to have a direct connection to treatment results. Conversely, when preoperative apical periodontitis is present, the evidence theoretically contradicts this, as histological studies have shown that periapical tissues exhibit inflammation signs after contact with root canal sealers, even after the material has set. Many clinical studies discuss the outcomes of root canal treatment, suggesting that while it may not directly affect results, it can slow down the healing process.

CONCLUSION

Bioceramic sealer extrusion is a common occurence in endodontics, particularly with hydraulic sealers. While minor extrusion is often well-tolerated due to the material's biocompatibility, excessive extrusion can lead to complications.
Proper technique, accurate working length determination, well-defined apical stop, and controlled application help minimize risks.



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The Effect of Unintentional AH-Plus Sealer Extrusion on Resolution of Apical Periodontitis After Root Canal Treatment and Retreatment—A Retrospective Case-control Study
J.F. Brochado Martins DDS, MSc, B. Scheeren DDS, MSc, S.V. van der Waal DDS, MSc, PhD

Mechanical Performance of Extensive Restorations Made with Short Fiber-Reinforced Composites without Coverage: A Systematic Review of In Vitro Studies
Jakab András Gábor; Palkovics Dániel; T. Szabó Veronika; Szabó Balázs; Vincze-Bandi Eszter; Braunitzer Gábor; Lassila Lippo; Vallittu Pekka; Garoushi Sufyan; Fráter Márk Tibor:Mechanical Performance of Extensive Restorations Made with Short Fiber-Reinforced Composites without Coverage: A Systematic Review of In Vitro Studies. POLYMERS, 16 (5). ISSN 2073-4360 (2024)

Management of a Large Periapical Lesion Performing Biodentine Plug and Root Canal Treatment: A Case Report

CP041

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** Van Yüzüncü Yıl University, Dentistry Faculty, Department of Endodontics*

Aim: To heal an extensive periapical lesion using calcium hydroxide disinfection and Biodentine plug through a non-surgical endodontic approach.

Introduction: Periapical lesions result from pulp necrosis caused by trauma, caries, or tooth wear, allowing microbial invasion into the root canal system. The lack of blood supply once the root canal is infected makes host defenses and systemic antibiotics ineffective. In such cases, non-surgical endodontic treatment is the primary approach for eliminating bacteria and promoting healing. However, bacterial biofilms and dentinal tubule invasion often complicate disinfection. Since periapical pathology is majorly infection-driven, the prognosis relies on proper treatment strategies such as disinfection and hermetic seal of the root canal apico-coronally.

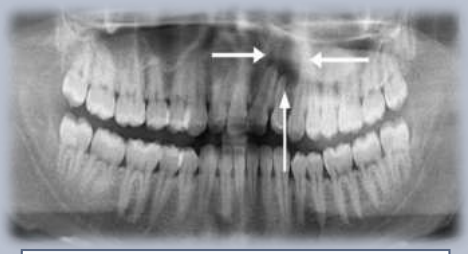

Fig.1. The Panoramic radiograph of the case

Fig.2. Diagnostic periapical radiograph

Case Presentation: A 26-year-old female patient underwent a routine dental examination, during which a large periapical radiolucency was detected around teeth #21 and #22 on a panoramic radiograph (Fig.1). The diagnostic periapical radiograph approved the pathology. (Fig.2) She had no significant pain but reported intermittent swelling in the anterior maxilla. Clinical examination revealed an open apex with purulent, slight drainage in tooth #21, while tooth #22 was non-vital without active drainage. In the same session, tooth #21 was circumferentially instrumented with stainless steel hand files, and passive drainage was allowed. A micro aspiration over the apical foramen was performed, and thorough irrigation was performed. In that session, the root canal remained empty, leaving a cotton pellet on the root canal opening, and the coronal part was sealed temporarily. In the session after two days, no drainage was detected. The root canal was irrigated, and a calcium hydroxide paste was placed for two weeks to provide disinfection and promote healing. The calcium hydroxide was removed at the visit scheduled, and a 4 mm Biodentine plug was placed to create an apical barrier. The remaining canal space was then obturated using a warm vertical obturation technique. The coronal restoration was done using a nano-hybrid composite material (Filtek Z550, 3M ESPE, US). Meanwhile, tooth #22 was treated conventionally with root canal therapy and cold gutta-percha obturation (Fig.3). Access cavity was restored with the nano-hybrid composite mentioned above.

Follow-Up & Outcome: At 6 months (Fig.4), the patient was asymptomatic, and radiographic evaluation showed initial signs of periapical healing. By the 12-month follow-up (Fig.5), significant bone regeneration was evident, with a marked reduction in lesion size. The patient remained asymptomatic, with no recurrence of drainage or discomfort.

Fig.3. After treatments

Fig.4. Six months follow-up

Fig.5. 1 year follow-up

Discussion: Periapical lesions often respond well to non-surgical endodontic treatment, which should be prioritized over surgery due to lower patient anxiety and reduced risks. Techniques like decompression and calcium hydroxide therapy aid in lesion resolution by reducing internal pressure, dissolving necrotic tissue, and eliminating bacteria. With its high alkalinity and bactericidal properties, calcium hydroxide promotes periapical healing and bone regeneration, making it an effective intracanal medicament. In this case, the combination of calcium hydroxide disinfection and a Biodentine apical plug successfully managed a large periapical lesion with an open apex, preventing surgical intervention. Significant bone formation was observed over time, reinforcing the effectiveness of this approach. Careful monitoring is essential to ensure continued healing before considering surgical options.

Clinical Relevance - Non-surgical endodontic treatment, including calcium hydroxide disinfection and Biodentine apexification, can effectively manage large periapical lesions and open apices. This approach promotes periapical healing, reduces the need for surgery, and enhances patient outcomes.

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CP042

APICAL RESECTION WITH MTA RETROGRADE FILLING: A CASE REPORT ON TRAUMA-INDUCED PERIAPICAL LESION

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AIM - This study aims to present the endodontic management of a traumatized tooth with a periapical lesion that required apical resection. The effectiveness of retrograde MTA filling and warm gutta-percha obturation in achieving a hermetic seal and periapical healing is evaluated.

INTRODUCTION - Dental trauma, especially in anterior teeth, can have significant effects on the pulp and periapical tissues. In teeth exposed to trauma, pulp necrosis may occur, leading to the formation of a periapical lesion over time. In such cases, conventional root canal treatment is usually the first choice of treatment. However, in some cases, surgical intervention may be necessary due to the failure of periapical lesion healing, unsuccessful root canal treatment, or inadequate sealing.

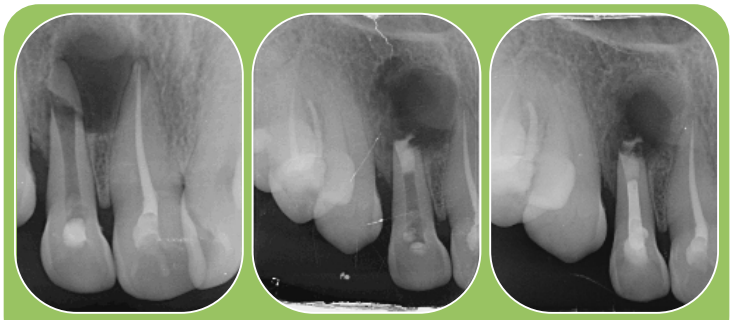
Apical resection is a surgical procedure performed when conventional endodontic treatment is insufficient, particularly in the presence of a periapical lesion. This procedure involves the removal of the infected root tip and the placement of a biocompatible material as a retrograde filling to create a hermetic apical seal. Nowadays, mineral trioxide aggregate (MTA) is widely preferred as a retrograde filling material due to its biocompatibility, low microleakage rate, and ability to promote tissue healing. This case report presents the treatment of a tooth with a periapical lesion caused by trauma, including apical resection, retrograde filling with MTA, and subsequent root canal filling using the warm gutta-percha technique.

CASE PRESENTATION - A 28-year-old female patient with no systemic diseases presented with a complaint of persistent purulent exudate. The patient reported a history of childhood trauma. Periapical radiographic examination revealed a fracture in the apical region of tooth #22. Clinical examination showed pain on percussion and swelling in the surrounding tissues. During the initial stages of root canal treatment, continuous purulent drainage from the root apex prevented the completion of the procedure, leading to the decision for apical resection.

During the apical resection procedure, the apical tip of tooth #22 was removed and sealed retrogradely with mineral trioxide aggregate (MTA). Subsequently, root canal obturation was completed using the warm gutta-percha technique. Careful preparation of the root apex was performed during the apical resection and retrograde filling process to ensure hermetic sealing, and biocompatible materials were used to promote healing.

At the six-month follow-up, the patient was asymptomatic, and radiographic,examination revealed healing of the apical region and a reduction in the periapical lesion. These results demonstrate the efficacy and long-term success of apical resection and retrograde filling with MTA.

Upon comparing this case with similar reports in the literature, it is evident that apical resection and MTA usage lead to favorable outcomes. The biocompatibility of MTA and its low microleakage rate are key reasons for its preference in such cases. Additionally, the warm gutta-percha technique contributed to faster healing and ensured an adequate seal.



Preoperative, Postoperative, 6- Month Control Radiograph

DISCUSSION - In the treatment of trauma-induced periapical lesions, apical resection combined with retrograde MTA filling has been shown to provide a favorable environment for periapical healing [2]. MTA was chosen for its superior sealing ability and biocompatibility, which are critical for the prevention of persistent infection. However, it is important to acknowledge that the six-month follow-up may not be sufficient to conclude long-term success, as complete tissue regeneration and stable periapical health typically require at least one year of monitoring [1]. In this case, persistent purulent drainage from the root canal system prevented adequate drying and obturation through conventional orthograde techniques. Therefore, apical surgery with immediate retrograde filling was performed to eliminate the source of infection and create a sealed environment, enabling successful orthograde root canal obturation afterward. This treatment sequence was a strategic choice to manage persistent periapical infection effectively and to improve the prognosis.

CLINICAL RELEVANCE - Early and comprehensive intervention is crucial in teeth with trauma-induced periapical lesions. This case demonstrates that combining surgical and orthograde approaches can be a viable strategy when conventional root canal therapy alone is insufficient. Clinicians should carefully select biocompatible materials like MTA and plan for long-term follow-up beyond six months to ensure complete healing and prevent recurrence.

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Université Paris Cité

Advanced Biomaterial Strategy for Restoring Damaged Endodontically Treated Teeth : focus on post placement

CP043

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AIM

This study aims to present the biomaterial advancements of the past decade and their applications, offering alternative approaches to treating damaged endodontically treated teeth (ETT) with the goal of prolonging their retention on the dental arch and serving as a valuable resource for dental practitioners who face this issue daily. Here, focus will be on post placement.

Fig 1 : Bundled glass fiber post (BP) placement to reinforce a traumatized immature incisor

INTRODUCTION

ETT show few but significant differences in mechanical properties compared to vital teeth, which makes them significantly more susceptible to fracture. Therefore, the use of a post which necessitate a canal preparation and thus an additionnal removal of sound tissue should be avoided as much as possible. This study suggest a decisionnal tree for restoring ETT, relying on clinical features based on a comprehensive litterature review; and discusses the issues surrounding current post options, presenting an interesting alternative: the bundled glass fiber post (BP).

METHODOLOGY

A thorough investigation was conducted by reviewing the available literature on the subject, focusing on English-language articles accessible through major search engines and published in prominent indexed journals within the Materials and Dental sector, both with and without impact factors. Priority was given to articles presenting the highest level of evidence available in the literature. The results presented in this article were extrapolated from this literature search, with reference to the authors' clinical experience.

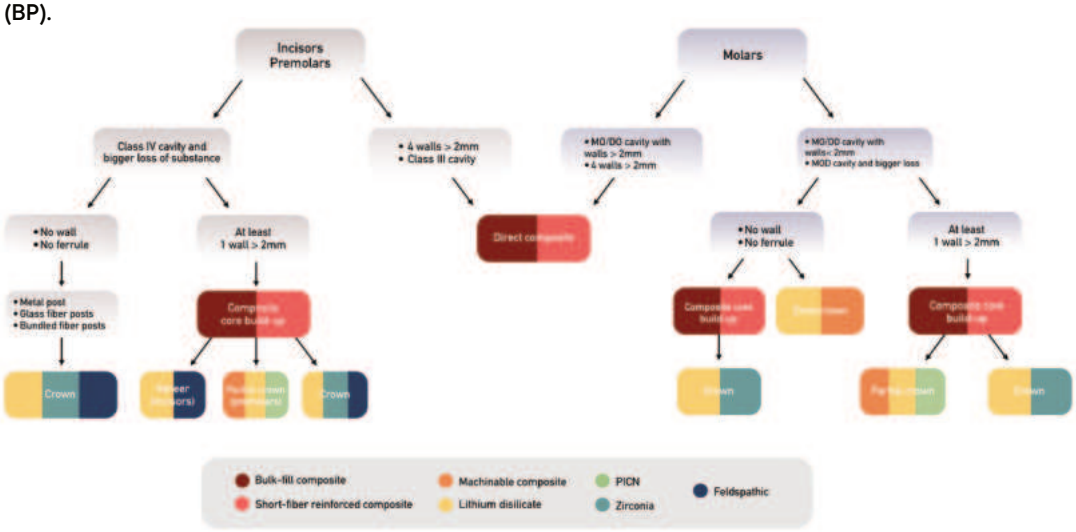

Fig 2 : decisionnal tree for restoring ETT

DISCUSSION

In the presence of a ferrule, both in vitro and in vivo studies strongly suggest that posts are unnecessary for restoring ETT. When no ferrule can be obtained, the placement of a post still seems beneficial on anterior teeth and premolars due to the higher risk of mechanical failure in this region. Regarding molars, which have a larger bonding surface due to the size of their pulpal floor, the placement of a post is not justified, even in the absence of coronal walls. Regarding choice of post type, in vitro studies suggest that fiber glass post, with an elastic modulus close to the dentin's may decrease the risk of root fracture, and provide higher fracture resistance. Yet, recent clinical studies failed to demonstrate a difference in the failure rate between cast-post and glass-fiber posts; therefore, the most recent meta-analysis concluded that both were equivalent and recommended following the preference of the professional or individual characteristics of the patient. Whether cast or glass-fiber posts are used, the insertion of a post necessarily involves the removal of healthy tooth substance, mechanically weakening the tooth. In this context, the recent development of bundled glass-fiber-reinforced posts or bundled posts (BPs), is promising. The use of BPs in the root canal space does not necessitate post space preparation as it is based on a bundle of fibers that are bonded directly to the root canal. It has been reported that BPs improve the resistance and stress distribution compared to single fiber posts in incisors in vitro. Most of the studies reported that the utilization of multiple posts in the weakened root canal provided better fracture resistance and stress distribution in both anterior and posterior regions. Some studies even found that teeth restored with BP showed higher fracture resistance than those restored without posts, suggesting a reinforcement of ETT which could extend their indication from teeth without ferrule to all damaged teeth, with the aim of pure strenghtening as an alternative to fiber-reinforced composite.

CLINICAL RELEVANCE

Currently, post placement should be limited to anterior teeth without a ferrule. BP can be used as a post or to reinforce damaged teeth withouth further damaging the tooth and seems promising as a post-endodontic restoration.

Read Full Article

Sturm, R.; Prates Soares, A.; Sterzenbach, G.; Bitter, K. Interface analysis after fatigue loading of adhesively luted bundled fiber posts to human root canal dentin. J. Mech. Behav. Biomed. Mater. 2021, 119, 104385

Pulpotomy with MTA in a Mature Tooth Diagnosed with Symptomatic Irreversible Pulpitis – A Case Report

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CP044

Aim

To present a clinical case demonstrating the effectiveness of vital pulp therapy (VPT) as a conservative treatment option for a mature permanent tooth diagnosed with symptomatic irreversible pulpitis.

Introduction

Irreversible pulpitis is a progressive inflammatory condition of the dental pulp, often resulting from deep caries, trauma, or extensive restorative procedures[1]. VPT includes procedures such as partial pulpotomy, and full pulpotomy, all of which aim to preserve the vitality of the remaining pulp tissue[2,3]. Histological studies have shown that despite clinical signs of irreversible pulpitis, inflammation is often confined to the coronal pulp, while the radicular pulp remains histologically normal or only mildly inflamed[4,5] . Clinical research supports the efficacy of full pulpotomy using hydraulic calcium silicate-based materials such as Biodentine and mineral trioxide aggregate (MTA). Several studies have demonstrated a success rates of 97.4% clinical success and 95.4% radiographic success at 12 months [2,6] .

Case Presentation

- 11 Y.O Patient came with her parents, With a chief complaint in her father's words **" my daughter has pain in her tooth since last night"** pointing on **tooth #26**. The patient denies any significant past medical history, classified as ASA I. Intra-oral examination, soft tissues appeared normal , Tooth#26 presented with occlusal–buccal caries.
- Endodontic assessment Summarized in Table 1

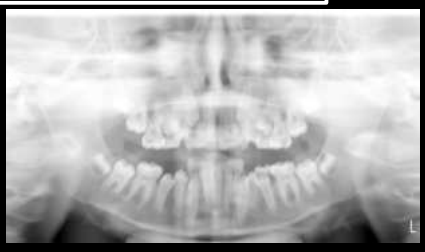
Pre-Op PA Parallel

Tooth	#26			#16			#36		
Cold test	+++			Normal response			Normal response		
Palpation	Normal response			Normal response			Normal response		
Percussion	Normal response			Normal response			Normal response		
Mobility	Physiological			Physiological			Physiological		
Probing depth	DB	B	MB	DB	B	MB	DB	B	MB
	2	3	3	2	3	3	2	3	3

Table 1: Summary of the endodontic assessment., +++ = Sever pain

Pre-operative records

Extra-Oral presentation



Radiographic Examination (Panoramic)

Pre-Op BW

Pre-Op PA D. Shift

Pre-Op Clinical presentation

Discussion

The endodontic diagnosis in this case for tooth #14 was Symptomatic irreversible pulpitis with normal apical tissues. The selected treatment approach was Partial MTA pulpotomy followed by a direct composite resin restoration. Traditionally, root canal treatment (RCT) has been the stander of care for managing such cases. However, increasing clinical and histological evidence supports the use of VPT, even in symptomatic mature permanent teeth, as a conservative and biologically favorable alternative[1,3]. Calcium silicate capping materials such as MTA and Biodentine have shown similar favorable outcomes in terms of pulp healing [7]. The combination of conservative pulp removal, proper hemorrhage control , bioactive material placement, and immediate placement of the final restoration has been shown to significantly enhance the prognosis of VPT [1].

After RD Isolation

Initial Excavation

Caries Detector Application

Pulp Exposure

Hemostasis

MTA

Final Restoration

Immediate Post-op D. Shift

Immediate Post-op BW

5 months Recall

5 months recall

After 5 months patient presented asymptomatic Tooth is in function, Tooth was non responsive to cold test. Radiographically all were within normal limit

Clinical relevance

VPT can be considered as a reliable treatment option in mature permanent teeth with symptomatic irreversible pulpitis, provided accurate diagnosis, proper case selection, and strict adherence to clinical protocols are followed.

References

The Endodontic Management of a Dilated Odontoma: A Case Report

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Barts Health NHS Trust

CP045

Aim

To outline the endodontic management of a dilated odontoma, with an orthograde and retrograde approach, utilising CBCT imaging and 3D-printed models to enhance the treatment planning process.

Figure 1a. Intra-oral photograph highlighting the buccal swelling associated with the maxillary right lateral incisor (UR2).
Figure 1b. Peri-apical radiograph taken at pre-operative assessment

Introduction

This case describes the management of a 15-year-old female patient that was referred to tertiary services regarding an ectopic canine.

On initial examination, the patient presented with a dilated odontoma of the maxillary right lateral incisor (UR2) with a large apical radiolucency and associated sinus tract (Fig 1).

She was found to have a Class II Division II incisal relationship on a skeletal II base with reduced vertical proportions complicated by a multitude of factors including a dilated odontoma which appeared anatomically complex to negotiate, a palatally ectopic maxillary right canine, and an increased overbite in addition to her expectations of an aesthetic outcome.

Case Presentation

Due to the presence of a sinus tract, orthograde endodontic treatment was initiated with chemo-mechanical preparation alongside sonically activated irrigation (EndoActivator®) of 5.25% sodium hypochlorite and 17% EDTA (Fig 2). The main canal was coronally flared with Gates Glidden and Hedstrom files followed by mechanical preparation with TePe® brushes due to the irregularly large shape. The procedure was carried out over several appointments with inter-appointment dressings of calcium hydroxide initially prior to ledermix.

Figure 2. Photograph of access cavity of maxillary right lateral incisor.

Upon re-assessment, there was no resolution of the sinus tract, therefore a CBCT was taken confirming a complex root canal system. The findings showed the invagination did not communicate with the main canal (Fig 3 & 4). Thus, a decision was made to obturate the main canal with calcium silicate (biodentine) followed by a glass ionomer cement and finally composite to seal the access cavity.

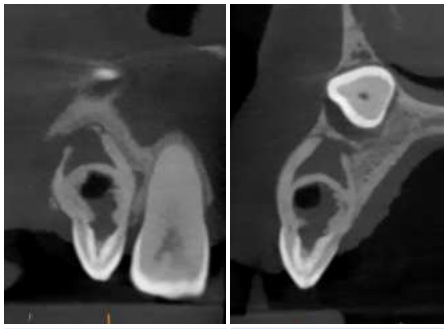

Figure 3. Sagittal slice of CBCT radiograph depicting a periapical radiolucency causing dehiscence of the buccal cortex.

Figure 4. Coronal slice of CBCT radiograph displaying the dilated odontoma and ectopic maxillary canine.

CBCT imaging in conjunction with the fabrication of 3D-printed plastic models (Fig 5) were used as key planning tools in establishing the continued treatment approach.

A multi-disciplinary team (MDT) was formulated leading to a decision to carry out retrograde endodontic treatment since the sinus tract had not resolved. Given the patient's age and complexity of treatment, the apical surgery was completed under general anaesthesia alongside the extraction of the ectopic canine (Fig 6). Finally, the tooth was definitively restored with composite to improve the aesthetic proportion of the lateral incisor and make it symmetrical with the contralateral tooth.

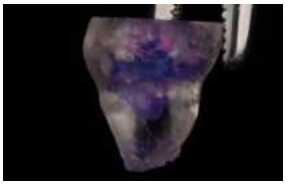

Figure 5. 3D printed model with dye to visualise complex anatomy.

Figure 6a. Pre-operative photograph showing buccal swelling and diminutive crown.

Figure 6b. Mucoperiosteal flap raised to expose apex and associated peri-radicular tissues.

Figure 6c. Intra-oral photograph after apicectomy and curettage.

Figure 6d. Biodentine placed at apex and allowed to set prior to flap closure and suturing.

The patient was clinically and radiographically reviewed at 1-month and 3-month intervals which showed positive signs of healing through resolution of the sinus tract, reduction in the size of the apical lesion and osseus infiltration (Fig 7).

Following successful endodontic treatment, the patient has now proceeded with her orthodontic treatment plan aiming to correct her malocclusion. This will be followed by composite build-ups of the maxillary right incisors and restorative camouflage of the premolar into a canine to improve the aesthetics profile.

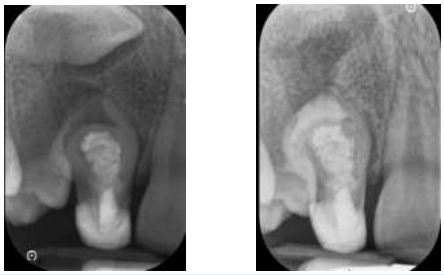

Figure 7. Peri-apical radiographs: 7a) Following orthograde endodontics. 7b) 3 months following apical surgery and extraction of the ectopic maxillary canine.

Discussion

The management of this case highlights the importance of a multi-disciplinary approach to treatment planning alongside thorough clinical and radiographic investigations.

The use of CBCT imaging and study models in the treatment planning process shows how a combination of traditional and modern approaches can achieve reliable results whilst maintaining tooth structure and achieving positive treatment outcomes.

A consideration for the long-term prognosis of the endodontic treatment was required given the patient's age, nevertheless, it was agreed that this approach would allow for subsequent treatment options in the future.

Clinical Relevance

- Clinicians should understand the importance of how anatomy can influence the use of orthograde or retrograde approaches to endodontic treatment.
- Consider the use of CBCT and 3D-printed plastic models as a key diagnostic tool and treatment planning.
- Appreciating the challenges in treating a dilated odontoma with complex root canal systems.
- Understanding the value of working within a multi-disciplinary team when managing these cases including restorative, paediatric and orthodontic departments.

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Preservation of C-shaped mandibular second molars using Intentional Replantation

CP046

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I. AIM

To report the challenges of non-surgical root canal treatment in mandibular second molars exhibiting the features of C-shaped root canal system and the efficacy of intentional replantation through cases.

II. INTRODUCTION

A high prevalence of C-shaped canals in mandibular second molars in Asian population has been reported and success rates of non-surgical endodontic treatment of them were about 70%. Because of the complexity of C-shaped canals, it is difficult to clean, shape, and obturate effectively during root canal treatment. So, when conventional root canal treatment has failed, intentional replantation might be an alternative treatment option.

III. CASE PRESENTATION

CASE 1

< Patient Information & Clinical Examinations >

1. Sex/Age	Male/47
2. Chief Complaint (C.C)	I experienced severe pain during the weekend. My gold crown was also fallen out.
3. Present Illness (P.I)	#47 w/ per(++), mob(-), bite(+), PPD(distal 5mm), nonsurgical root canal treatment done, gold crown exfoliated.
4. Impression	#47 previously treated tooth /w symptomatic apical periodontitis
5. Treatment plan	Intentional replantation on #47

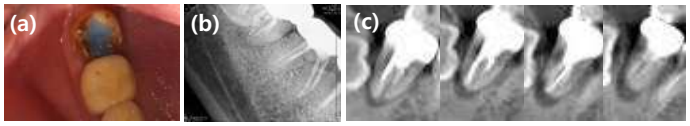

Fig 1. (a) initial intra-oral photograph (b) initial periapical radiograph before the gold crown was exfoliated (c) initial cone-beam computed tomography

< Surgical Procedure >

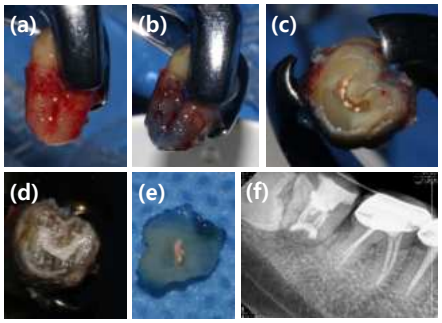

Fig 2. Intentional replantation procedure (a) #47 was carefully extracted using an extraction forcep (b) Root surface was dyed with methylene blue and rinsed to make sure there was no crack line (c) Root-end resection was done using tapered diamond bur. Retro-preparation using 330 tapered bur was made following original C-shaped canal and resin-wire splint delivered between #46,47 (d) Retrograde filling was done using putty-type MTA(One-Fil®Putty, MEDICLUS, Korea) (e) Other section of resected root-end segment (f) Periapical radiograph was taken after tooth replantation and resin-wire splint between #46,47

< Follow-up >

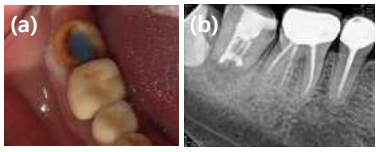

Fig 3.
(a) Postoperative intra-oral photograph. Resin-wire splint was removed after 2 weeks.
(b) 1 month follow-up periapical radiograph

CASE 2

< Patient Information & Clinical Examinations >

1. Sex/Age	Male/81
2. Chief Complaint (C.C)	I'm feeling discomfort when biting something on left side.
3. Present Illness (P.I)	#37 w/ per(+), mob(+), bite(-), PPD(n.s), nonsurgical root canal re-treatment done(1 year ago)
4. Impression	#37 previously treated tooth /w symptomatic apical periodontitis
5. Treatment plan	Intentional replantation on #37

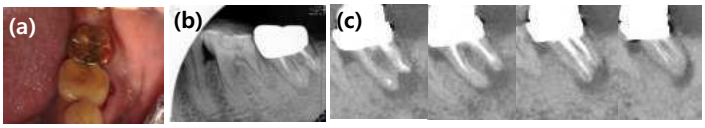

Fig 4. (a) initial intra-oral photograph (b) initial periapical radiograph (c) initial cone-beam computed tomography

< Surgical Procedure >

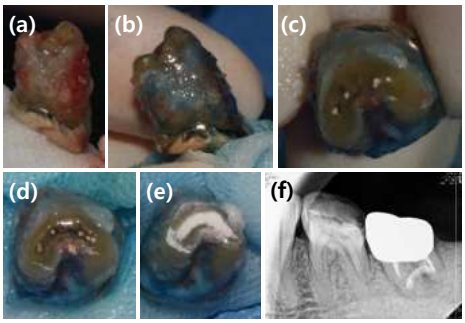

Fig 5. Intentional replantation procedure
(a) #37 was carefully extracted using an extraction forcep
(b) Root surface was dyed with methylene blue and rinsed to make sure there was no crack line
(c) Root-end resection was done using tapered diamond bur
(d) Retro-preparation using 330 tapered bur was made following original C-shaped canal.
(e) Retrograde filling was done using putty-type MTA(One-Fil®Putty, MEDICLUS, Korea)
(f) Periapical radiograph was taken after tooth replantation

< Follow-up >

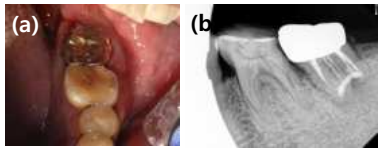

Fig 6.
(a) 2 weeks intra-oral photograph
(b) 2 weeks follow-up periapical radiograph

IV. DISCUSSION

According to several articles, splinting is necessary only if mobility of +2 or greater exists. Resin-wire splint was only used in the first case. After treatment of the #47 was completed, it was repositioned to its original position manually, yet the patient had difficulties in clenching his jaw. This resulted in #47 locating in supra-position, a risk of trauma. To minimize all variables that could have an undesirable effect on the outcome, occlusal reduction and a resin-wire splint for 2 weeks was applied. On the other hand, the second patient had mobility of 1, and since the #37 gold crown was excluded from occlusion, no additional splint was necessary.

V. CLINICAL RELEVANCE

Residual inflamed pulp tissue and debris left in untreated isthmuses can lead to endodontic failure. The isthmus and apical delta of fused roots are commonly found within the apical 3mm. Surgical endodontic procedures, such as intentional replantation, allow clinicians to thoroughly examine the root canal system and achieve effective obturation.

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CP047

MANAGEMENT OF COMPLICATED TOOTH FRACTURE TRAUMA: CVEK AMPUTATION and RE-ATTACHMENT PROCEDURE

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AIM: The aim of this study is to demonstrate the treatment completed with the reattachment procedure after Cvek amputation in a case with complicated crown fracture as a result of trauma and to present the clinical results.

INTRODUCTION: Traumas that affect the enamel, dentin and pulp tissue are classified as complicated crown fractures. Complicated crown fractures are dental traumas that occur due to falls and impacts. In complicated crown fractures, there are treatment options such as direct capping, amputation and root canal treatment.[1] When deciding on treatment, the time elapsed after the trauma, the developmental stage of the relevant tooth and its suitability for restoration are evaluated clinically and radiographically. Cvek amputation (partial amputation) is the process of removing infected pulp tissue at a depth of 2 mm. It is a method used in patients presenting within 24-48 hours after trauma and therefore was preferred in our case.


Fig.1.Clinical preoperative and postoperative


Figure 2


Figure 3

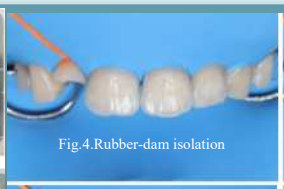
Fig.4.Rubber-dam isolation


Fig.5.Orthophosphoric acid application


Fig.6.Bonding procedure


Fig.7.Completion of restoration


Fig.8a.6-month follow-up


Fig. 8b. 6-month follow-up


Fig 9. 6 month follow-up radiograpy

CASE PRESENTATION

A systemically healthy 16-year-old patient applied to our clinic on 30.09.2024 with a complaint of a fracture in tooth number 12. According to the anamnesis, it was determined that the patient had fallen from the stairs. The patient applied to our clinic 48 hours after the trauma, with the broken piece that he kept in a dry environment. The patient complained of mild pain and tenderness. In the clinical examination, palpation and percussion were found negative. The pulp sensitivity test indicated that the tooth was vital (Fig.1). Radiographic examination revealed that the tooth was mature (Fig.2). Given the appropriate time since the trauma and the vitality of the tooth, it was decided to perform a Cvek amputation (partial amputation) on the tooth.

After providing anesthesia without vasoconstrictors to the traumatized tooth, the coronal 2 mm portion of the exposed infected pulp tissue was removed under rubber dam isolation. After hemostasis was achieved using moist cotton pellets, BIO-C®REPAIR MTA was placed into the cavity (Fig.3). The MTA material was covered with resin modified glass ionomer liner. Two weeks after the amputation procedure, restoration was carried out with reattachment of the fractured fragment. The fractured fragment was stored in a saline solution.

For tooth restoration, shade selection was performed using the button technique, which involves placing a small amount of composite material directly onto the tooth surface, while rubber-dam isolation (Nictone, Mexico) was employed to prevent contamination (Fig.4). Opposing tooth surfaces were etched with 35% orthophosphoric acid (Ultradent, USA) for 30 seconds (Fig.5).Universal adhesive agent (G-Premio Bond, GC, Japan) was applied to both surfaces according to the manufacturer's instructions (Fig.6). The high-filling fluid composite (A2; G-eanial Injectable, GC, Japan) was then placed on both surfaces. To conceal the fracture junction line, bevelling was carried out on the vestibular surface of the tooth using a yellow-banded lobut bur. Following this, the acid etching and adhesive agent application procedures were repeated. After treatment, the occlusion was carefully checked. The restoration was then finished with polishing discs (OptiDisc, Kerr, Switzerland) (Fig.7) and tungsten carbide burs (Horico, Germany).Polishing was completed with polishing paste (Dia Polisher Paste, GC, Japan).

DISCUSSION

Complicated crown fractures are a commonly encountered type of dental trauma. One of the methods used for the treatment of this trauma is Cvek amputation. In Cvek amputation, when the time elapsed after the trauma is short, the goal is to remove the infected coronal pulp and preserve the vitality of the remaining pulp tissue. Success in treatment has been demonstrated in young patients in the literature.[2] Reattachment treatment, on the other hand, is a biomimetic treatment approach recommended both for aesthetics and cost. It is known that repairing the tooth with its own fragment provides more satisfying aesthetic results.[3] In this case, following Cvek amputation, the reattachment procedure was applied, and during the patient's 6-month clinical (Fig. 8a-8b) and radiographic follow-up (Fig.9) visit, the tooth was found to be vital, asymptomatic, and functional.

CLINICAL RELEVANCE

In our case, it has been demonstrated that the vitality of the tooth was preserved and the periapical tissues remained healthy with Cvek amputation and BIO-C®Repair MTA application in a patient presenting with a complicated crown fracture. With the reattachment treatment of the fractured fragment, the tooth remained functional and provided aesthetically satisfactory results.

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CP048

REATTACHMENT OF A COMPLICATED CROWN-ROOT FRACTURE WITH FIBER POST: A CASE REPORT

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- **Introduction**

- Crown fractures in maxillary incisors are among the most frequently encountered dental traumatic injuries. The reattachment of fractured tooth fragments using fiber posts and dentin bonding systems has been a widely practiced method for years. This technique, known as the reattachment technique, offers numerous advantages. With the advancements in adhesive systems and composite resins, reattachment restorations have become easier to apply in terms of both aesthetics and function.

- **Objective**

- This case report describes the treatment procedure of a maxillary incisor with a horizontal complicated crown-root fracture at the cervical one-third of the root due to trauma. The treatment involved fiber post-core construction and the adaptation of the fractured fragment using a modified reattachment technique.

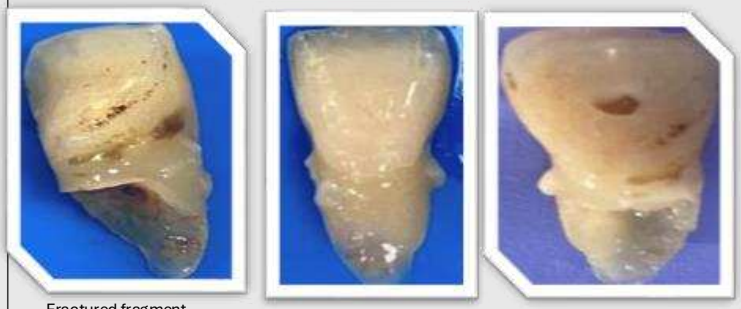
- **Case Report**

- A 21-year-old systemically healthy female patient presented to the Department of Endodontics at Atatürk University Faculty of Dentistry with a complaint of a horizontal complicated crown-root fracture in the upper left central incisor following trauma. Clinical and radiographic examinations revealed Miller Class III mobility and a fracture line at the cervical one-third of the root.

- Infiltrative anesthesia was administered (Ultracaine, D-S Forte).
- The fractured fragment was removed without elevation.
- Rubber dam isolation was achieved.
- The working length was measured using a #15 K-file and an apex locator (Propex, Dentsply, Germany).
- Root canal preparation was performed using R#25.06 and R#40.06 files (NIC, Guangoong, P.R.C., China).
- Root canal treatment was completed with gutta-percha (Raito 40.06, Shenzhen Rogin Medical) and a calcium hydroxide-based root canal sealer (Kerr, Sealapex, Via Passanti, Italy) using the lateral condensation technique.
- During these procedures, the fractured fragment was preserved in saline solution.
- A fiber post space was prepared on both the inner surface of the fractured fragment and the remaining root structure (DOCHEM, MedNet EC-Rep GmbH, Muenster, Germany).
- The fractured fragment and the remaining root within the alveolar crest were adapted, and the fiber post was cemented using adhesive cement (Rebilda DC, Cuxhaven, Germany).
- The treated tooth was then splinted using a fiber splint applied between the canine teeth (Ribbond, Handewitt, Germany).
- After 8 weeks of splinting, a reduction in tooth mobility was observed. The patient remains under observation.

Pre-op

Extraction socket



Fractured fragment

Post-op radiography,splinted teeth and post-op 8th week

Clinical Relevance
In cases of complicated crown-root fractures, treatment with the reattachment technique can provide favorable outcomes for the prognosis of the affected tooth.

Discussion
Although the reattachment technique in cases of complicated crown-root fractures provides aesthetic and functional advantages, further clinical studies are needed to better understand its impact on periodontal ligament healing.

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CP049

Preservation of maxillary anterior teeth by surgical extrusion after crown-root fracture: A case series

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Aim

The aim of this case series is to present surgical extrusion as a safe and predictable treatment procedure that can be used to preserve substantially damaged anterior teeth with a crown-root fracture.

Introduction

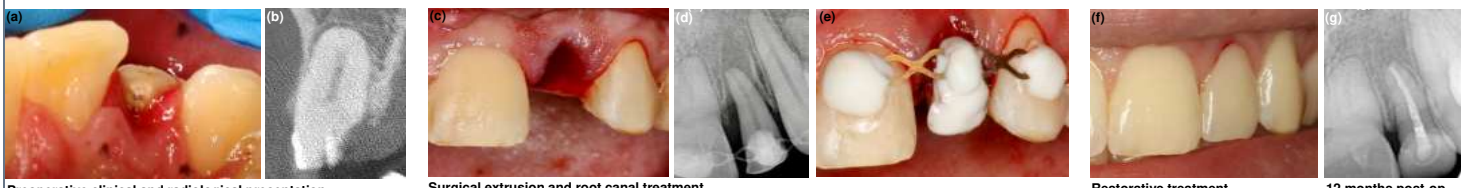
Most dental injuries involve anterior teeth, especially the maxillary incisors [3]. Crown-root fractures have a reported prevalence of 5% in permanent teeth [3] and exhibit a characteristic fracture pattern. On the buccal side the fracture is mostly localized supragingivally, whereas on the palatal side the defect often extends subcrestally [4]. Therefore, the treatment of a crown-root fracture is challenging as it requires the consideration of periodontal, endodontic and restorative aspects. Surgical extrusion is a reliable treatment option for the management of these fractures in permanent anterior teeth [4]. This case series shows three successfully treated teeth that were restored by surgical extrusion combined with 180° rotation.

Case reports

An atraumatic extraction system (Benex®-Control, Meisinger, Neuss, Germany), was used for extrusion. The periodontal fibers were initially severed using a periotome. Root canals were enlarged with Gates-Glidden for insertion of a self-tapping anchor screw. A drawstring was attached to the anchor screw, and the teeth gradually extruded by increasing the traction force by turning the knob at the end of the extractor clockwise. The complete extrusion was performed using only pulling forces applied by the Benex®-Control. The extracted teeth were gently replanted into the socket with 180° rotation. The root was immobilized by adhesive splinting to the adjacent teeth for 8 weeks. Meanwhile, root canal treatment was carried out. After splint removal, restorative treatment was performed with ceramic crowns 4 weeks later.

Case 1

A healthy 19-year-old male patient with no relevant medical history presented to the department five hours after a falling accident with a complicated crown-root fracture of tooth 22.

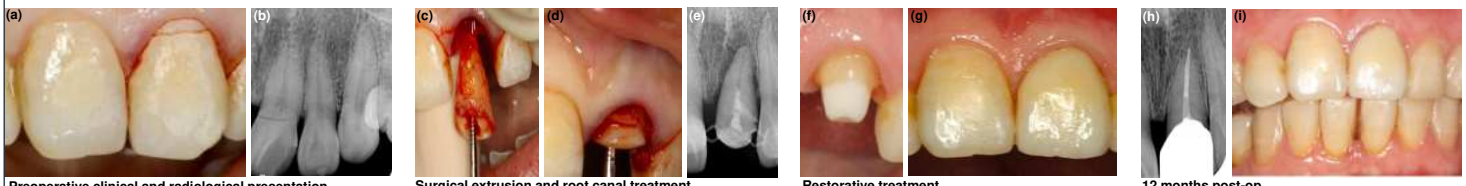


Preoperative clinical and radiological presentation | Surgical extrusion and root canal treatment | Restorative treatment | 12 months post-op

(a) Fractured tooth 22 **(b)** Sagittal view of the preoperative CBCT **(c)** Alveolar socket post extraction **(d)** Periapical radiograph after surgical extrusion and splinting **(e)** Splinting **(f)** Final restoration of the extruded tooth **(g)** Follow-up periapical radiograph after 12 months with normal periapical conditions

Case 2

A healthy 51-year-old female patient with no relevant medical history presented to the department one hour after a bicycle accident with a complicated crown-root fracture of tooth 21.

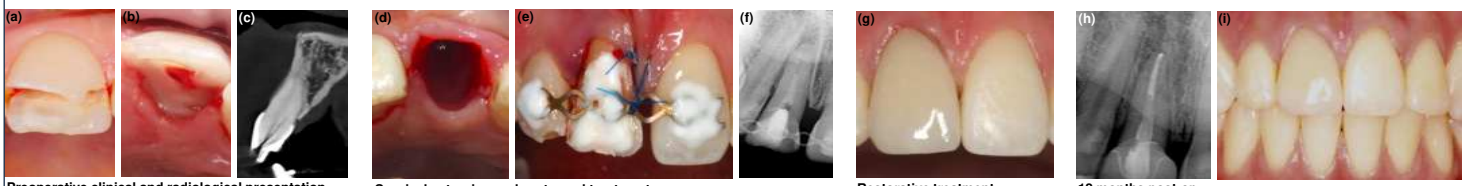


Preoperative clinical and radiological presentation | Surgical extrusion and root canal treatment | Restorative treatment | 12 months post-op

(a) Fractured tooth 21 **(b)** Preoperative radiograph **(c)** Benex extraction system in place during extraction of tooth 21 **(d)** Reposition with 180° rotation **(e)** Radiograph after surgical extrusion **(f)** Clinical situation after buildup with fiber post and composite **(g)** Final restoration of tooth 21 **(h)** Follow-up periapical radiograph after 12 months with normal periapical conditions **(i)** At 12-month follow-up, clinical situation with satisfactory aesthetic appearance and periodontal maintenance

Case 3

A healthy 28-year-old female patient with no relevant medical history presented to the department one hour after an e-scooter accident with a complicated crown-root fracture of tooth 11.



Preoperative clinical and radiological presentation | Surgical extrusion and root canal treatment | Restorative treatment | 12 months post-op

(a) Fractured tooth 11. View of the fracture margin from buccal direction **(b)** View from palatal perspective. Note the deep fracture margin which extends into the subcrestal region **(c)** Sagittal view of the preoperative CBCT **(d)** Tooth socket following extraction **(e)** Splinting and stitching **(f)** Radiographic control after surgical extrusion **(g)** Final restoration of tooth 11 **(h)** Follow-up periapical radiograph after 12 months with normal periapical conditions **(i)** Follow-up after 12 months

Discussion

Due to the deep subcrestal location of the fracture margin in all three cases, adhesive fragment reattachment or restorative treatment of the accessible region was not indicated. Adhesive reattachment is a technique-sensitive procedure that requires a dry environment for effective adhesive bonding [1,4]. Furthermore, there is a significant risk of adhesive residues and undetected additional root fractures, which can adversely affect periodontal health [1,4]. A long-term observational study by *Soliman et al.* (2020) demonstrated that teeth with crown-root fractures and reattachment of the coronal fragment were more likely to experience complications and failures, with treatment success without the need for reintervention achieved in only 22% of the cases [1]. In all three cases, the Benex®-Control system was used for surgical extrusion. This system was primarily developed to minimize traumatic forces to the alveolar socket during tooth extraction, thereby facilitating subsequent implant placement [2]. Two clinical studies on surgical extrusion utilizing the Benex®-Control system highlighted its minimally invasive nature while protecting hard and soft tissues [2,5]. *Krug et al.* (2018) demonstrated a success rate exceeding 90% in 61 patients, with a mean follow-up of 3.1 years [2]. Furthermore, *Elkhadem et al.* (2014) confirmed the reliability and safety of this procedure in a systematic review based on 11 case reports and 8 case series [3].

Crown-root fractures typically extend into the subcrestal region of the palatal side [4]. A rotation of the teeth by 180° was performed to expose the defect margin while simultaneously minimizing the extrusion distance, as the bone margin surrounding the maxillary anterior teeth is typically located more coronally on the palatal side compared to the labial side [4].

In conclusion, tooth preservation was successful following a severe dental injury. All three teeth have been restored to a satisfactory functional and aesthetic level. Further clinical and radiographic follow-ups are recommended.

Clinical relevance

The management of crown-root fractures represents a technically challenging procedure within the field of dental traumatology, necessitating careful consideration of periodontal, endodontic, and restorative factors. Treatment modalities such as adhesive fragment reattachment pose a significant risk of compromising the periodontal health of the affected teeth. In contrast, surgical extrusion utilizing the Benex®-Control appears to be a more reliable and predictable approach for preserving injured teeth, regardless of the patient's age.

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A case of horizontal root fracture after root canal treatment of a tooth with a history of dental trauma

CP050

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Aim

The purpose of this report is to present a case of horizontal root fracture that occurred after root canal treatment of a maxillary central incisor with a previous history of dental trauma.

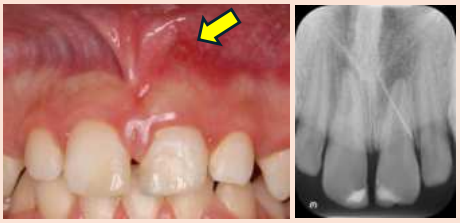
Introduction

Horizontal root fracture (HRF) is reported to occur in 1.2~7.0% of all dental injuries in the permanent dentition. The treatment plan for HRF is determined based on the location of the fracture line and the vitality of the pulp. The probability of pulp survival is higher in teeth with HRF than those with luxation injury, and thus it is recommended that the patient be observed without removing the pulp as a preventive measure. For this reason, many case reports of HRF involve fractures that were identified prior to root canal treatment, with few reports where the HRF was detected after the treatment.

Case Presentation

A 15-year-old male patient presented with a labial sinus tract at the apex of his maxillary left central incisor.
Chief complaint : About six months ago, the tooth began to hurt and become sensitive, but now there is no pain at all.
History of present illness : The tooth crown fractured due to trauma at the age 8, and a composite resin restoration was done by a nearby dentist.

First visit



Sinus tract was present (arrow).

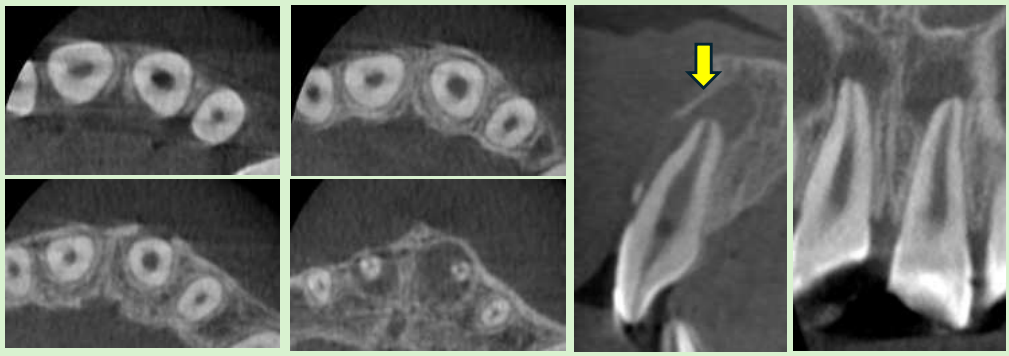
Present illness	# 1 1	# 2 1
Spontaneous pain	−	−
Percussion pain	−	−
tenderness	−	−
PPD	≦3mm	≦3mm
Cold test	+	+
EPT	3/80	65/80
Sinus tract	−	+

Diagnosis

Pulpal; asymptomatic irreversible pulpitis
Periapical; chronic apical abscess
Notes: immature teeth
(Cvek's classification; stage 4)

Treatment

Non-surgical root canal treatment for #21



CBCT images

Radiolucency was seen around the periapical area of #11 and #21, with #21 showing an open apex (arrow). Tooth #21 exhibited a labial cortical bone defect at the mid-root level. No obvious fracture line was visible.

Microscopic findings & treatment

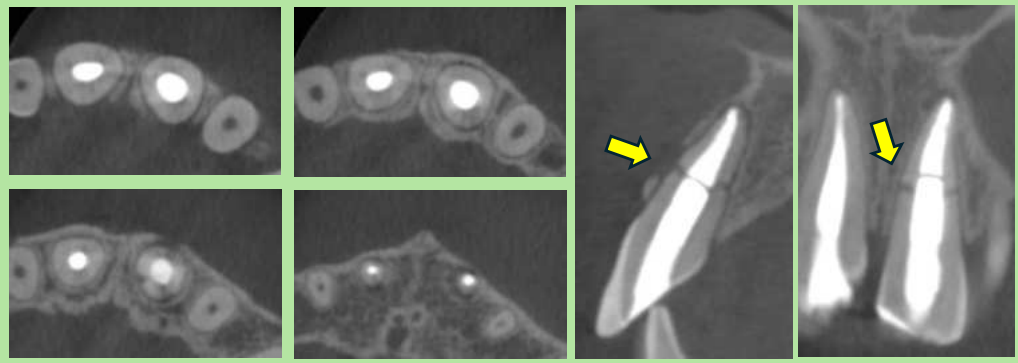
The apical foramen (arrow) can be seen under the microscope. Since the size of the apical foramen was greater than #80, it was filled with MTA.

RCF 6 months

After six months, a faint radiolucency (arrow) was observed in the mesial region of the root.

1 year follow-up

The sinus tract had disappeared. However, an HRF (arrow) was detected in the periapical radiograph (PA), though the patient had no memory of experiencing additional dental trauma.



CBCT images

The periapical radiolucency was almost completely resolved. However, an HRF (arrow) was detected close to the interface between GP and MTA.

Discussion

In this case, HRF became evident one year after root canal treatment on both the PA and CBCT images. Due to factors such as the mid-root location of the bone defect and the difference in the elastic modulus between MTA and GP, stress may have concentrated near the interface of MTA and GP, leading to mid-root HRF near the interface. A crack that could not be detected with CBCT might have have already existed at the time of root canal treatment, although CBCT is reported to be more sensitive than PA in detecting fracture lines.
HRF are classified into cervical, middle, and apical third fractures, with the prognosis reported to vary depending on the location. Among these, cervical third fractures, which are most exposed to the oral cavity, are reported to have the poorest prognosis. It should be noted that the fracture line in the sagittal plane may be oblique, leading to potential misdiagnosis of its exact location on the PA. In this case, CBCT images actually revealed that the fracture line appeared oblique in the sagittal plane, while it was located at the middle third on both the PA and CBCT images. The prognosis of this case is considered favorable because of the presence of bone in the cervical region of the tooth and the lack of the communication with the periodontal pocket; however, continued follow-up is required.

Clinical relevance

This report describes a rare case in which an HRF occurred after root canal treatment of a previously traumatized tooth. In cases of traumatized teeth, careful follow-up after root canal treatment is crucial, taking into account the potential for such an outcome.

CP051

Treatment of Mandibular Premolars with Different Root Canal Anatomy: Two Case Reports

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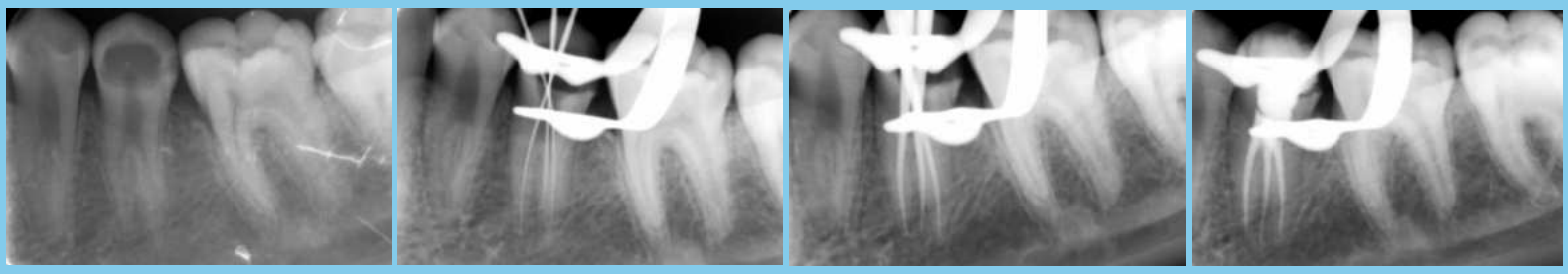
Aim: This report presents the root canal treatment of mandibular premolars with varied root canal anatomy.

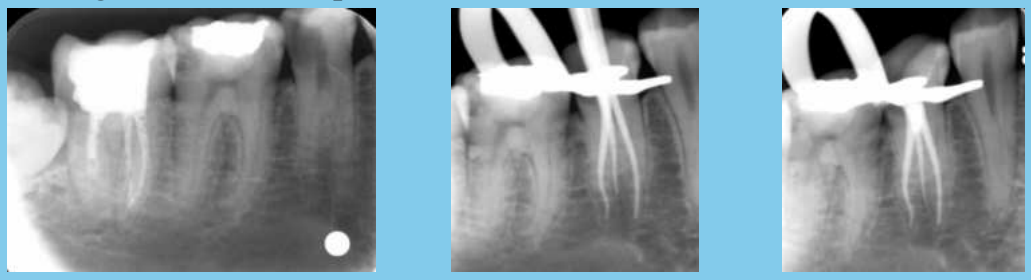
Introduction: Mandibular premolars typically exhibit a single root and a single canal. Variations in root canal anatomy are uncommon in these teeth.

Case presentation:

Case 1: A 14-year-old female patient presented with spontaneous pain in the left mandibular second premolar and was referred to Hacettepe University, Department of Endodontics. After isolating the tooth with a rubber dam, the access cavity was performed and the working lengths of the root canals were determined. All canals were instrumented using the Protaper Gold system. Following the preparation, the canals were irrigated with 5 mL of 17% EDTA, followed by 5 mL of 2.5% sodium hypochlorite, and finally, 2.5 mL of distilled water. After drying the canals with paper points, the canals were obturated with gutta-percha and AH Plus sealer using the single-cone technique.



Case 2: A 26-year-old female patient presented with spontaneous pain in the right mandibular second premolar and was referred to Hacettepe University, Department of Endodontics. The tooth was isolated, the access cavity was performed and the working lengths were determined. All canals were instrumented using the Protaper Gold system. Similar to the first case, the canals were irrigated with 5 mL of 17% EDTA, followed by 5 mL of 2.5% sodium hypochlorite and 2.5 mL of distilled water. After drying the canals with paper points, the canals were obturated with gutta-percha and AH Plus sealer using the single-cone technique.



Conclusion:All clinical procedures were performed and the root canal treatment of premolars with atypical root canal anatomy was successfully completed.

Discussion: Mandibular second premolars exhibit diverse root canal anatomy, requiring thorough clinical and radiographic assessments ,performing under magnification (Dental loupe) to identify hidden canals and anatomical variations of root canal system.

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Atypical Root Anatomy - A Case Report Demonstrating Variant Anatomy of the Posterior Superior Alveolar Canal Impacting Endodontic Treatment of a Maxillary First Molar.

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AIM - This case highlights the value of CBCT in assessing anatomical variations in root apices and the surrounding areas. An unusual occurrence of an intraradicular anastomosis is described. The benefits in avoiding an adverse endodontic treatment outcome are demonstrated.

INTRODUCTION - Lateral canals and ramifications are not an uncommon finding in the root apices of molar teeth (1). This case report describes an aberrant positioning of the posterior superior alveolar neurovascular bundle that traverses through the buccal aspect of the apical part of a mesiobuccal root, where it appears to anastomose with the pulp canal. Preoperative CBCT assessment identified this anatomical variation, and appropriate measures were undertaken during the endodontic treatment procedure to avoid complications.

CASE PRESENTATION - A 60-year-old male patient presented for specialist endodontic treatment with symptoms of irreversible pulpitis from the recently crowned LHS maxillary first molar tooth. Pretreatment CBCT imaging identified normal and intact apical ligament spaces. A well-defined, thin, linear radiolucency extended obliquely through the apical third of the mesiobuccal root (Fig.1 and Fig. 2). A consulting Oral Radiologist identified the unusual appearance of the apex as the bony canal of the left superior posterior alveolar neurovascular bundle passing through the mesiobuccal root of tooth 26.

Endodontic treatment was performed over two appointments. It was decided that root canal instrumentation and obturation should terminate slightly short of the level of the intraradicular anastomosis in the mesiobuccal root. An electronic apex locator accurately recorded this position, and treatment was completed uneventfully. The 12-month review CBCT image confirmed a normal intact apical ligament space (Fig. 3 and 4).

Fig. 1. Sagittal CBCT view.

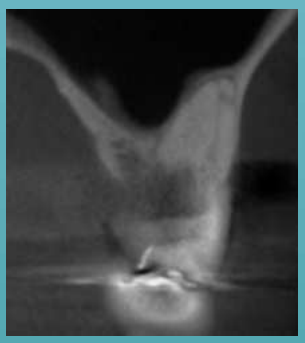

Fig. 2. Coronal CBCT view.

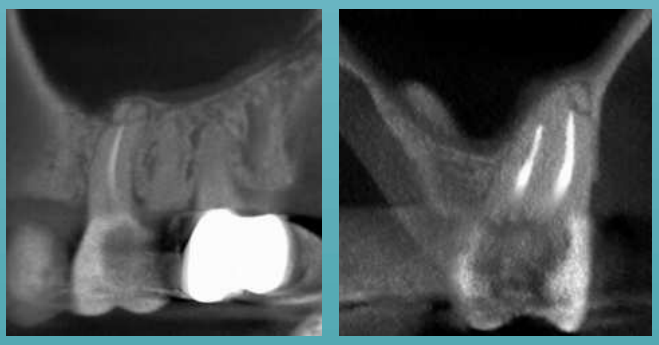

Fig. 3 and 4. 1 year follow up CBCT views.

DISCUSSION - Lateral and apical ramifications occur with fragmentation of the developing epithelial root sheath, resulting in interruption of dentinogenesis (1). In the case presented, this likely occurred as the developing root encountered the posterior superior alveolar neurovascular bundle. During CBCT investigation, the atypical appearance was detected.

A previously documented case of an ectopic branch of the mandibular canal traversing the mesiolingual canal of a lower second molar reported profuse bleeding following rotary instrumentation beyond the intraradicular anastomoses in the apical 2-3mm (2). The endodontic treatment procedure in the case presented here was modified to avoid disrupting or injuring the neurovascular tissue in the canal traversing the root.

CLINICAL RELEVANCE - CBCT is an indispensable aid in assessing anatomy of the tooth and surrounding structures prior to undertaking endodontic treatment. In this case, the detection of atypical anatomy, and judicious use of the electronic apex locator, contributed to a successful endodontic outcome without disruption of the aberrant neurovasculature.

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CP053

Selective Treatment of Dens Invaginatus Type III A. Case Report.

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AIM: The primary goal of endodontic treatment should be to preserve healthy pulp tissue whenever possible to mantain patient oral health.

INTRODUCTION: Dens Invaginatus (DI) is an abnormal malformation of enamel folding into dentine. Early diagnosis is of major importance to prevent degeneration and pulp necrosis.

CASE PRESENTATION:

Fig. 1. Preoperative.

Fig. 2. Postoperative.

A 12-year-old female was referred to the Endodontic Department because of a swelling localized in the upper right lateral incisor. The tooth showed normal results for thermal stimulus. At interrogation, no relevant medical or family history disorders were reported. An abnormal coronal anatomy was found in both maxillary lateral incisors. Deep caries was found in the palatal pit of the tooth. Tomographic and radiographic examinations showed periapical radiolucency as well as an invagination consistent with a DI Type III A (Fig.1). So, the diagnosis obtained was a normal pulp with Chronic Apical Abscess associated with the presence of DI. It was decided to treat only the canal of the invagination, and the treatment was performed in multiple visits (Fig.2). The 1-year follow-up appointment showed considerable healing of the periapical radiolucency and normal pulp results were obtained at recall exam. (Fig.3).

Fig. 3. Control.

DISCUSSION: Structural defects in enamel due to DI are predisposing factors of caries because of deep depressions. This could exacerbate infection and ultimately result in pulp necrosis. Some treatment approaches may be preferred, including root canal treatment, replantation, periapical microsurgery, and/or extraction.

CLINICAL RELEVANCE: This procedure allows treatment of only the infected part of the tooth, preserving structural integrity and more important, healthy pulp tissue. It helps maintain functionality, minimizes complications, and ensures overall health and quality of life.

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Double Trouble: Chronic Apical Abscess with Dual Sinus Tracts

CP054

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AIM

This case report aims to describe the root canal treatment of a maxillary first molar diagnosed with chronic apical abscess, accompanied by two sinus tracts — one on the labial and one on the palatal aspect.

INTRODUCTION

Chronic apical abscesses are a common manifestation of persistent endodontic infections and are often associated with sinus tract formation. Typically, such infections are relieved by a single intraoral sinus tract adjacent to the affected tooth(1). The concurrent presence of two intraoral sinus tracts draining from both the labial and palatal aspects of a single tooth is a rare occurrence; however their presence indicates an underlying pathological process requiring definitive endodontic intervention.

CASE PRESENTATION

A 47-year-old male patient with no systemic diseases presented to our clinic with two sinus tract openings: one in the vestibular sulcus and the other on the palatal aspect of the maxillary left first molar, patient was asymptomtic. Periapical radiographs were taken (Figure 1) and vitality testing ((Endo-Frost cold spray (Roeko; Coltene Whaledent, Langenau, Germany)) was performed on adjacent teeth. The second premolar and second molar were vital, whereas the first molar which had an old composite restoration, was non-vital. Cold pulp test has generally high diagnostic accuracy and can be considered the primary pulp testing method in clinical practice. Despite the high diagnostic accuracy of the cold pulp test, false-positive vitality test results may occur. Therefore, a #15 gutta-percha point of 2% taper (Pearl Endopia, Pear Dent Co., Ltd. Korea) was inserted into the labial sinus tract and a #25 gutta-percha point of 2% taper (Pearl Endopia) into the palatal sinus tract before taking periapical radiographs (Figure 2), (Figure 3). The gutta-percha points traced to the mesiobuccal and distobuccal apices, confirming the need for root canal treatment. Following rubber dam isolation, an access cavity was prepared, revealing mesiobuccal, distobuccal, and palatal canals. Shaping was performed using Revo-S Shaper Universal rotary NiTi files (Micro-Mega, Besancon, France) up to 30/0.04 for the mesiobuccal and distobuccal canals and 35/0.04 for the palatal canal, 2,5 mL of 5% NaOCl (Wizard, RehberKimya, Istanbul, Turkey) was used per root canal during each file change. Calcium hydroxide ((Multi-Cal (Pulpdent Corporation, Watertown, MA, USA)) was placed as an intracanal medicament. At the two-week follow-up, the sinus tracts had healed. Final shaping was completed with Revo-S Shaper Universal rotary NiTi files (Micro-Mega) (MB & DB: 35/0.04, P: 40/0.04), followed by final irrigation with 5% EDTA (Microvem, Istanbul, Turkey) and 5% NaOCl (Wizard). The root canals were obturated using lateral condensation technique with 0,2 taper gutta-percha points (Pearl Endopia) and AH Plus root canal sealer (Dentsply Sirona, Switzerland) (Figure 4), (Figure 5). At the six-month radiographic follow-up, significant reduction in the radiolucent lesion at the mesiobuccal and distobuccal apices was noted (Figure 6).


Figure 1

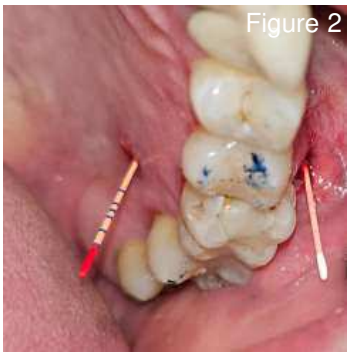
Figure 2

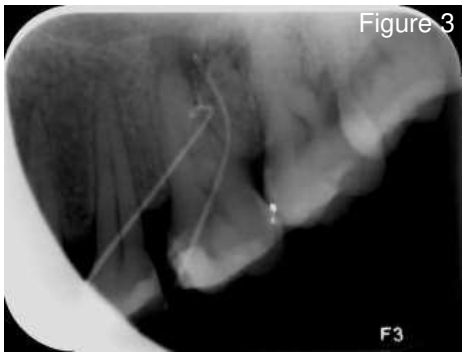

Figure 3

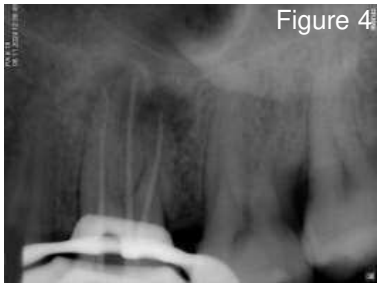
Figure 4


Figure 5


Figure 6

DISCUSSION

The majority of chronic apical abscesses of endodontic origin do not require systemic antibiotic therapy for satisfactory resolution and healing(2). Although various techniques have been used in the past for sinus tract healing, modern endodontic treatment, incorporating thorough shaping, irrigation, and intracanal medicaments, has proven to be sufficient for complete resolution of odontogenic sinus tracts.

CLINICAL RELEVANCE

The presence of multiple intraoral sinus tracts in endodontic infections is uncommon and often raises suspicion of an underlying vertical root fracture(3). While two sinus tracts draining from a single tooth may indicate a root fracture, they are not always pathognomonic for such a condition. This case highlights an exception, demonstrating that dual sinus tracts can also occur in the absence of a vertical root fracture, emphasizing the need for thorough diagnostic assessment before determining the etiology.

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CP055

C-shaped Canal Configuration with an Independent Distolingual Root in a Mandibular Second Molar: Challenges in Endodontic Therapy

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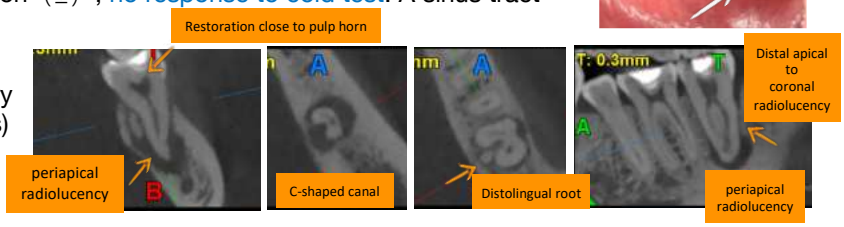
AIM To demonstrate the identification and management of distolingual (DL) root canal in an independent DL root in combination with a C-shaped root of a mandibular second molar.

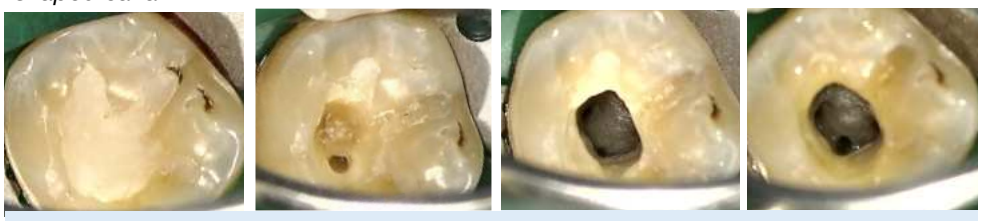
INTRODUCTION C-shaped canals, characterized by a continuous or semi-continuous "C" morphology in cross-section, are predominantly found in mandibular second molars. Cases involving concurrent DL canals in independent DL roots further exacerbate treatment difficulty due to increased risks of missed canals, inadequate disinfection, and procedural errors.

CASE PRESENTATION

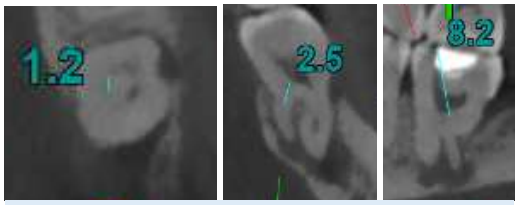
- 21y, male
- C.C: localized swelling of left mandibular area for six months
- Composite resin restoration for 7 years. Sensitivity to cold and heat stimulation for 2 years.
- Examination: 37O composite resin restoration, percussion （±）, no response to cold test. A sinus tract was found on the buccal mucosa. PD: distal 5-7mm.
- 36: normal to pulp tests.
- **Diagnosis**: 37 Endodontic/ periodontic lesion (primary pulpal lesions with extension to the periradicular tissues)
- **Treatment plan** : 37 root canal treatment



- **Treatment process:**
- 1. *Open access and Instrumentation of C-shaped canal.*
- 2. *Identification and management of DL*
  - **CBCT measurement** steps:
    (1) DL root was identified on the axial image of the tooth;
    (2) The sagittal image was adjusted to the orientation of DL; the coronal image was then adjusted to the orientation of DL; the axial image was adjusted to the level of the pulpal floor.



(3) This very spot of the intersection of three panels was identified as the location of DL orifice. The distance from this point to the ML orifice, calcification depth, and the distance to the coronal point were measured.



  - **Identification of DL orifice:**
  - ✓ Microscope: magnification and illumination; Ultrasonic tip ET20: was used to remove the calcification; An 8# C file: negotiation and finding the glide path of DL.
  - ***Preparation of DL:***
  - ✓ *Ni-Ti CM files + 5.25%NaOCl ; Ultrasonic irrigation*

- *3. Obturation and restoration*
- *4. Six-month recall:* symptom free

DISCUSSION C shaped canal system+ DL: 0.68% among 1920 madibular second molars (Kim, 2015); 0.83% among 1200 mandibular second molars (Yang, 2022).

CLINICAL RELEVANCE

1. Preoperative evaluation with CBCT is critical for assessing anatomic variation and accurately identify additional root canals.
2. Magnification and illumination of microscope facilitate the detection of calcifications and localization of root canal orifices.
3. Ultrasonic tips enable the removal of calcified tissues with minimal invasiveness and high precision.
4. Good clinical outcome requires thorough debridement of the whole root canal system.

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CP056

Non-Surgical Endodontic Treatment of Mandibular First Molars with Three Mesial Canals: A Case Report

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I. Aim

This case report highlights the clinical management of mandibular first molars with a middle mesial (MM) canal, emphasizing the importance of thorough canal exploration and identification to improve endodontic outcomes.

II. Introduction

Mandibular first molars generally have two mesial canals; however, variations such as an additional MM canal are not uncommon. Bhatti et al. (2022) reported an MM canal in 7.7% of mandibular first molars, noting a significant association with adjacent C-shaped second molars (OR = 3.11, P = 0.048). Additionally, Al-Maswary et al. (2023) found a pooled prevalence of 4.4% for MM canals in first molars. These findings underscore the necessity of thorough access preparation and enhanced visualization during endodontic treatment.

III. Case Presentation

Case 1: A 78-year-old male presented with chewing discomfort. Examination revealed a perforated splinted crown, percussion tenderness, and a distal periapical lesion. The tooth was diagnosed as pulp necrosis with symptomatic apical periodontitis. Under local anesthesia (2% lidocaine with 1:100,000 epinephrine), the prosthesis was removed and an access cavity prepared. The MB and DB canals were treated initially, followed by instrumentation of the ML and DL canals on a subsequent visit. An additional MM canal was detected and managed during the third session with copious NaOCl irrigation. At the final visit, after symptom resolution, the canals were obturated using gutta-percha and AH Plus sealer (Dentsply, Germany) with the continuous wave technique, and restored with composite resin core (Luxacore Z, DMG, Germany).

Fig 1-1. Pre-operative radiograph

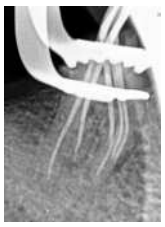

Fig 1-2. Cone-fit radiograph

Fig 1-3. Immediate Postobturation radiograph

Fig 1-4. 1-month follow-up CBCT view

Case 2: A 67-year-old male was referred following tooth preparation for a full-coverage restoration on the mandibular right first molar. He experienced intense pain upon cold exposure and while chewing. Clinical and radiographic findings confirmed a diagnosis of irreversible pulpitis. Under local anesthesia (2% lidocaine with 1:100,000 epinephrine), an access cavity was prepared, and the MB, ML, DB, and DL canals were identified, negotiated, and instrumented using a rotary NiTi system(ProTaper Gold, Dentsply Sirona, Germany). During the second visit, an MM canal was discovered and treated. Copious NaOCl irrigation was performed at each stage. At the final visit, after complete symptom resolution, the canals were obturated using gutta-percha and AH Plus sealer (Dentsply, Konstanz, Germany) with the continuous wave technique, and restored with composite resin core (Luxacore Z, DMG, Germany)

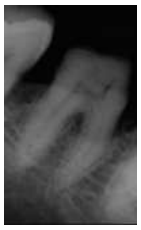

Fig 2-1. Pre-operative radiograph

Fig 2-2. Initial Apical File Radiograph

Fig 2-3. Finding of MM canal radiograph

Fig 2-4. Finding of MM canal clinical photo

Fig 2-5. Immediate Postobturation radiograph

IV. Clinical Relevance

A systematic, repeated approach to canal exploration is essential for detecting anatomical variations such as the MM canal. Missing an extra canal can lead to persistent infection and subsequent treatment failure. These two cases illustrate that careful inspection—together with proper access cavity design and thorough irrigation—can help clinicians detect hidden canals that might otherwise be overlooked.

V. Conclusion

Recognizing the potential presence of an MM canal in mandibular first molars is crucial for clinical success. A comprehensive, methodical approach that includes enhanced visualization and meticulous exploration ensures complete debridement and obturation, thereby improving treatment outcomes.

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Root Canal Treatment of a Mandibular Premolar with Three Canals
A Case Report

CP057

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Aim: To present the endodontic treatment of a three-canalled mandibular second premolar with a periapical lesion, emphasizing the importance of accurate diagnosis and thorough canal exploration.

Introduction: The success of root canal therapy heavily relies on a comprehensive understanding of the tooth's internal anatomy. Mandibular premolars often present with complex and variable root canal morphologies, posing challenges during endodontic treatment.

Case Presentation: A 20-year-old male patient with no systemic disease was admitted with a complaint of pain in the right lower back region. Local anesthesia was administered, and the tooth was isolated using a rubber dam. The temporary filling and carious tissue were removed. The access cavity was modified using ultrasonic tips to locate canal orifices. Two buccal and one lingual canal were detected. Thereafter, the working lengths were determined using an apex locator and periapical radiographs. The canals were chemomechanically prepared using rotary files (EndoArt, Inci Dental, Istanbul, Turkey) and copious irrigation using 3% sodium hypochlorite (Mikrovem AF, İstanbul, Türkiye). A calcium hydroxide paste was used for intracanal medication. In the second session, calcium hydroxide in the root canals was removed by irrigation with 3% sodium hypochlorite. 3% NaOCl, 17% EDTA, and distilled water were used for final irrigations. The root canals were dried with paper points and filled with gutta-percha and a resin-based root canal sealer using the lateral condensation technique. The coronal cavity was restored with a composite resin filling.

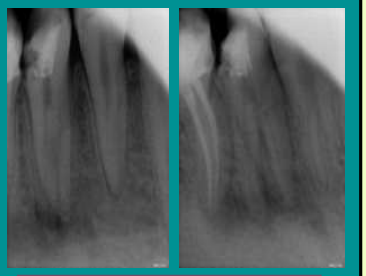

Fig.1 and Fig.2
pre-operative radiographs

Discussion:
Three canals in mandibular premolars are an uncommon anatomical variation, with studies reporting an incidence as low as 0.5%. Clinicians should maintain a high index of suspicion when treating mandibular premolars, especially if initial treatment attempts are unsuccessful or if symptoms persist. Modifying the access cavity design and employing magnification tools can aid in the identification of extra canals. In this case, using ultrasonic tips facilitated the detection of two buccal and one lingual canal. Applying calcium hydroxide as an intracanal medicament significantly improves disinfection in periapical lesions. Consequently, intracanal treatment with calcium hydroxide was implemented in this case. It should also be noted that cone-beam computed tomography (CBCT) is valuable for accurately diagnosing teeth with complex anatomies; however, it was not performed in this case due to the patient's refusal.

Fig.3. Working length determination

Clinical Relevance: Recognizing anatomical variations in mandibular premolars is crucial for treatment success. This case highlights the role of advanced techniques in detecting and managing complex root canal systems and underscores the importance of recognizing anatomical variations in mandibular premolars to achieve successful endodontic outcomes. A meticulous approach, incorporating detailed radiographic evaluation and modification of clinical techniques, is essential for identifying and treating additional canals.

Fig.4 Radiograph with master cones

Fig.5 Final obturation radiograph

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MANAGEMENT OF ENDODONTIC FILE SEPARATED IN SEVERE APICAL CURVATURE OF ROOT CANAL

CP058

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AIM - To report a clinically favorable treatment outcome following the separation of an endodontic file within a severely curved apical region of a maxillary premolar.

INTRODUCTION - An unfortunate complication during root canal therapy is the breakage of an endodontic file. This can impede proper cleaning of the root canal system and potentially reduce the likelihood of successful treatment. Managing a separated file presents a considerable challenge for clinicians, who may consider options such as leaving the fragment, bypassing it, attempting its removal, or resorting to surgical procedures.

CASE PRESENTATION - A 59-year-old female patient was referred to our department for the retreatment of her maxillary left second premolar. On a panoramic radiograph, a previous root canal filling, appearing relatively satisfactory, was observed along with a severe apical curvature and a periapical lesion around the canal's apex (Fig. 1). The root canal filling was removed down to the curvature through the use of Gates-Glidden burs and a reciprocating file system. Due to the inability of reciprocating files to reach beyond the curvature, this portion was instrumented using pre-curved hand files. During the final shaping of the pre-curved apical section, a size 30 file separated right at the curvature. Given that no straight-line access to the coronal aspect of the separated file was present, it was determined that attempting fragment removal, even with the assistance of a dental operating microscope, would be useless. At this stage, the canal was irrigated with a 1% sodium hypochlorite solution, and the smear layer was removed using a 10% citric acid solution. Subsequently, a calcium hydroxide paste was placed as an intracanal medicament (Fig. 2). During the following appointment, attempts were made to bypass the fractured file using hand files; however, the fragment was displaced further apically into the periapical tissues. A decision was made to obturate the canal, observe the area, and surgically remove the fragment later if deemed necessary. Following the obturation of only the apical segment of the canal, the patient was referred to the prosthodontic department for the final restoration. A radiograph was taken to evaluate the new position of the fragment and the canal obturation (Fig. 3). A clinical examination conducted five years and eight months later demonstrated a satisfactory outcome, and a follow-up radiograph showed healing of the periapical lesion (Fig. 4).

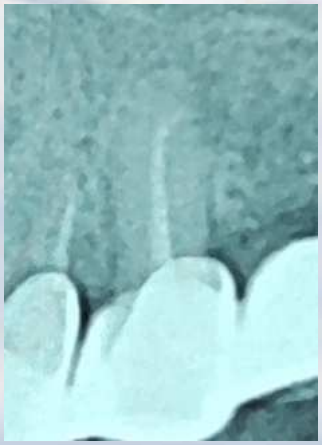

Fig. 1. Pre-operative radiogram

Fig. 2. Radiogram after file separation and medication placement

Fig. 3. Post-obturation radiogram

Fig. 4 Control radiogram after five years and eight months

DISCUSSION - Conservative removal of separated endodontic instrument performed with minimal damage to root dentin is the most preferred option for this complication. However, in our case the constraints of the root canal anatomy prevented this approach. Considering that a separated instrument, whether inside or outside the canal, does not necessarily lead to treatment failure, and given that the fracture occurred late in the instrumentation process after the canal had been thoroughly cleaned, we determined that only periodic radiographic and clinical evaluations would be required. Moreover, a previous case-control study demonstrated that the prognosis is not substantially diminished when a fractured instrument remains within the root canal (Spili et al., 2005).

CLINICAL RELEVANCE - A well-considered decision regarding the management of a separated instrument should take into account various elements, including the canal morphology, the point at which the instrument fractured, the dentist's skill, the available armamentarium, and possible complications, tailoring the approach to each specific situation. In our case, by pushing the fractured fragment into the periapical area, it was positioned where the body's natural defenses are more effective against any remaining bacteria. It's worth noting that in certain instances, relatively straightforward, conservative, and inexpensive methods can address this complication..

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REMOVAL OF BROKEN INSTRUMENTS FROM ROOT CANAL: TWO CASE REPORTS

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CP059

Aim: The purpose of this case report is to present the removal of broken root canal instruments using different techniques.

Introduction: Root canal instrument fracture is an undesirable problem that can occur due to overuse of instruments, complex root canal anatomy, or procedural errors in instrument use. The effect of instrument fractures on prognosis depends on many factors such as the pretreatment condition of the pulp and periradicular tissues and the stage at which the fracture occurs during shaping.

Case Reports/ Case 1: A 58-year-old female patient without any systemic disease was referred to our clinic for preprosthetic root canal treatment on tooth number 43. After opening the access cavity, an extra canal was detected in the canine tooth. After reaching the apex with a 15 K-file in the extra canal, a file fracture occurred in the canal (Fig1). In the same session, the coronal part of the broken instrument was released using an ultrasonic device (VDW ultra; VDW GmbH, Munich, Germany), and the cannula of the prepared microtube (Fig2) was placed on this released part, and a 30 H-file was passed through it to remove the broken file (Fig3). Then, the working length of the root canals was determined with an electronic apex locator (Woodpecker DTE, Guangxi, China) and periapical radiographs, and root canal preparation was performed using Endoart (İnci Dental, Turkey) rotary file system at 200 rpm and 2.5 Ncm torque. After each file, irrigation was performed with 2.5% NaOCl. After the preparation was completed, final irrigation was performed with 5 mL of 2.5% NaOCl, 5 mL of 17% EDTA, and 10 mL of distilled water, then the canals were dried using sterile paper points. The root canals were filled with gutta-percha and resin-based root canal sealer (Adseal, META Biomed, Korea) using the lateral condensation technique (Fig5). The tooth was restored using composite resin (Estelite Sigma Tokuyama, Tokyo, Japan). Clinical and radiographic follow-up visits were carried out up to 1 year. No signs or symptoms were observed (Fig6).

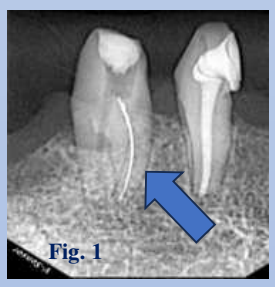
Fig. 1

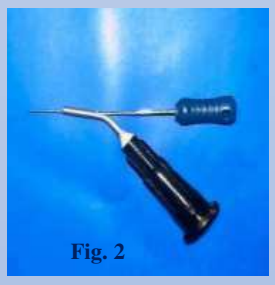
Fig. 2

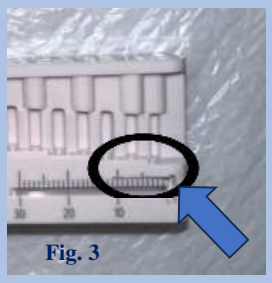
Fig. 3


Fig. 4


Fig. 5


Fig.6.Follow-up 1 year

Case Reports/ Case 2: A 16-year-old female patient without any systemic disease applied to our clinic with a complaint of pain in her tooth number 36. Radiographic examination revealed that the tooth had previously undergone root canal treatment and that there was a broken instrument in the mesiolingual canal (Fig7). An indication for renewal of root canal treatment was given to the tooth. After making the broken instrument visible with an operating microscope (25×) magnification, the ultrasonic tip (ET25, Satelec, Merignac, France) used to remove the broken instrument was connected to the ultrasonic device (VDW Ultra; VDW GmbH, Munich, Germany) (Fig8) and the broken instrument was removed by operating it counterclockwise under water cooling (Fig9). Old root canal fillings in the distal and mesiobuccal canals were removed using the ProTaper Universal Retreatment Niti system (Dentsply Sirona, Ballaigues, Switzerland) at 500 rpm and 2 Ncm torque (Fig10). The root canals were filled with calcium hydroxide and sealed with a temporary filling. After determining that the tooth was asymptomatic at the second visit, the working length of the root canals was determined with an electronic apex locator (Woodpecker DTE, Guangxi, China) and periapical radiographs. Root canal shaping was performed using Endoart (İnci Dental, Turkey) rotary file system at 200 rpm and 2.5 Ncm torque. Irrigation was performed with 2.5% NaOCl after each file. After the preparation was completed, final irrigation was performed with 5 mL of 2.5% NaOCl, 5 mL of 17% EDTA and 10 mL of distilled water, then the canals were dried using sterile paper points. The canals were filled with gutta-percha and resin-based root canal sealer (Adseal, META Biomed, Korea) using the lateral condensation technique (Fig11). The tooth was restored using composite resin (Estelite Sigma Tokuyama, Tokyo, Japan). Clinical and radiographic follow-up visits were performed for up to 6 months, and no signs or symptoms were observed (Fig12).


Fig. 7


Fig. 8

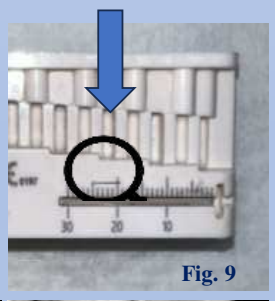
Fig. 9


Fig. 10


Fig. 11


Fig.12.Follow-up 6 month

Discussion: Removal or bypassing of broken instruments appears to be more successful in the coronal (100%) and middle (45.4%) thirds of the canals compared to the apical third (37.5%) (1). Success has been achieved in removing broken instruments from curved root canals using ultrasonic tips and an operating microscope when part of the broken instrument segment is located in the straight portion of the canal. When freeing the broken instrument in the canal with ultrasonic tips, it should be worked by abrading from the inner slope of the canal. Otherwise, perforation may occur in the canal (2). It is advantageous to use the microtube technique when the broken fragment in the canal is long, but to use this technique, the broken instrument must be close to the coronale and the canal must be relatively straight (3).

Conclusion and Clinical Relevance: By removing the broken instrument from the root canals and providing special equipment such as an operating microscope or ultrasonic device, successful results are achieved by eliminating the patient's symptoms with minimal loss of material in the tooth structure.

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CP061

Non-Surgical Retreatment of a Mandibular Molar with Fractured Instruments: A Case Report

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Aim

Aim of this case report is to show the successful treatment of a mandibular second molar tooth with a fractured instrument in distal root canal and to emphasize using modern endodontic techniques such as using ultrasonic devices, benefits of bioseramic filling materials and restoring the tooth with a resilient filling material to acchieve a complete successful retreatment for positive clinical and radiographic results.

Introduction

The incidence of instrument fracture varies widely, ranging from 0.4% to 23%. Fractured endodontic instruments within the root canal system negatively impact the prognosis of orthograde endodontic treatment by obstructing proper cleaning and shaping of the apical canal. Molar teeth, particularly mandibular molars, are more prone to instrument fractures than anterior teeth due to factors such as limited canal accessibility, smaller root canal diameter, and greater curvature.

Case presentations

A 48-year-old male patient presented to the Department of Endodontics at Akdeniz University with a complaint of pain in the right mandibular region. A review of his medical history revealed that tooth #47 had undergone root canal treatment seven years prior.

Clinical examination demonstrated mild percussion and palpation sensitivity in the affected tooth, along with an inadequate amalgam restoration. Radiographic evaluation revealed the presence of a fractured lentulo within the distal canal and incomplete obturation of the mesial canals extending to the apex.

The patient was informed in detail about the planned retreatment procedure and the protocol for removal of the fractured instrument. Under rubber dam isolation, an access cavity was prepared, and no fractures or crack lines were detected. A minimally invasive preparation around the fractured lentulo in the distal canal was performed using ED27 and ED89 ultrasonic tips (Woodpecker, Guilin, China). During the procedure, an H-type file—presumably used in a previous attempt to retrieve the fractured lentulo—was removed from the canal. Once the lentulo exhibited a “dancing” movement, it was immersed in EDTA solution and ultrasonically activated, facilitating its retrieval.

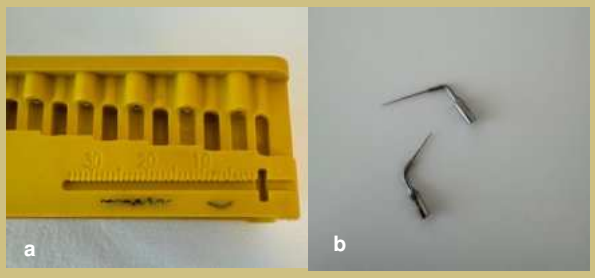

Figure 1. *Fractured instruments(a), ultrasonic tips ED27 at the bottom and ED89 at the top (b).*

The gutta-percha in the mesial canals was removed using SuperSystem Retreat One files (Perfect Medical, Turkey) in conjunction with 10.06-10.04 files, followed by chemomechanical preparation of all canals utilizing ProTaper Next rotary files (Dentsply Sirona, Ballaigues, Switzerland).

The canals were then dried with sterile paper points, and calcium hydroxide was placed as an intracanal medicament to remain for three weeks. The canal orifices were sealed with sterile Teflon, and a temporary restoration was performed using light-cured glass ionomer cement. The patient was scheduled for a follow-up appointment in three weeks.

At the second appointment, the tooth was completely asymptomatic. Given the presence of an extensive periapical lesion and the suspected loss of apical constriction, the canals were obturated using the single-cone technique with gutta-percha and a bioceramic sealer. The final restoration was completed using a nanohybrid composite (BRILLIANT Dentin, COLTENE, Altstätten, Switzerland) and fiber-reinforced composite (everX Posterior, GC Europe N.V., Leuven, Belgium).

Due to the significant loss of coronal structure, full-coverage restoration was deemed necessary, and the patient was subsequently referred to the Department of Prosthodontics for further treatment.

Figure 2. *Periapical radiograph of the patient taken before treatment (c), after removal of broken instruments (d), after treatment (e) and six months follow-up radiograph (f)*

Discussion

This case highlights the challenges of endodontic retreatment in the presence of a fractured instrument and inadequate obturation. Successful retrieval, thorough disinfection, and the use of bioceramic sealer and fiber-reinforced composites contributed to favorable outcomes. Given the extensive coronal tissue loss, full-coverage restoration was essential for long-term success. The patient’s follow-up appointments are ongoing.

Clinical Relevence

This case emphasizes the importance of meticulous retreatment strategies in managing failed root canal treatments. The successful removal of a fractured instrument, effective disinfection, and the use of bioceramic and fiber-reinforced composite materials contributed to tooth preservation. Proper case selection and restorative planning are crucial for ensuring long-term clinical success.

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Clinical Management of Fiber Post Removal Using Diamond Ultrasonic Tips – A Case Report

CP062

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Aim

To present a conservative and effective technique for the removal of a fiber post using diamond-coated ultrasonic tips, highlighting the clinical approach, advantages, and outcomes.

Introduction

Fiber posts are frequently used in restorative dentistry due to their favorable esthetic properties, dentin-like elasticity, and ease of placement. However, their removal becomes necessary in certain retreatment cases, posing a significant challenge for clinicians.

Traditional mechanical removal techniques risk unnecessary dentin loss or root perforation, particularly in curved canals.

Diamond-coated ultrasonic tips may be considered a minimally invasive, efficient alternative. When used with copious irrigation, it helps dissipate heat effectively, preserving the integrity of periodontal tissues and reducing the potential for thermal injury [1]. Moreover, Their diverse shapes and sizes also allow for adaptability in different clinical scenarios, further enhancing their clinical utility in post removal procedures [2].

Discussion

The use of diamond-coated ultrasonic tips for fiber post removal offers enhanced precision and conservative dentin preservation. Their vibration-based mechanism disrupts the cement interface while minimizing the removal of radicular dentin.

Nevertheless, heat generation remains a critical concern. Dominici et al. recorded temperatures on the root surface approaching thresholds for bone necrosis within 60 seconds of ultrasonic activation without coolant [1]. Therefore, clinicians should limit continuous activation to ≤15 seconds and apply copious irrigation.

Additionally, microcrack formation is a significant risk during post removal. Haupt et al. demonstrated that all techniques induce microcracks, but ultrasonic instrumentation caused significantly fewer new cracks compared to burs and post removal kits [3]. This suggests that ultrasonics may exert lower stress on root dentin.

In terms of performance, Lindemann et al. found that while removal kits were faster, diamond burs and ultrasonics provided superior effectiveness in removing post material, making them especially valuable in difficult or unknown post systems [2].

Case Presentation

- 36 Y.O Patient came With a chief complaint of **"My crown fell down; I want to place a restoration"**
- pointing on **tooth #11**. The patient denied any significant past medical history, classified as ASA I. Extra-oral examination WNL. Intra-oral examination, soft tissues are WNL, Tooth #11 presented with fracture crown coronal to gingival level
- Endodontic assessment Summarized in Table 1

Pre-Op PA Parallel

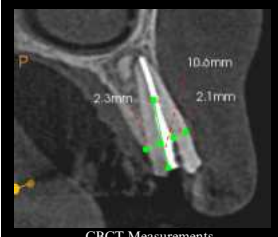
Tooth	#11	8	9
Cold test	NR	WNL	WNL
Palpation	WNL	WNL	WNL
Percussion	WNL	WNL	WNL
Mobility	Physiological	Physiological	Physiological
Probing depth	3mm	3mm	3mm

Table 1: Summary of the endodontic assessment. WNL:Within Normal Limit.

Pre-operative records

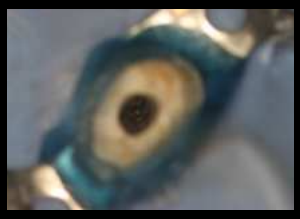
Pre-Op PA Shifted

Occlusal Clinical Photograph



CBCT Measurements

RD Isolation



Post Removal

Post Removal

Obturation

Fiber Post Cementation

Post-op. Occlusal Photograph.

Immediate Post-op PA

9 months follow-up

Clinical relevance

The use of diamond-coated ultrasonic tips represents a safe and conservative approach that preserves tooth structure, reduces clinical time, and improves outcomes when performed under magnification. This case illustrates a successful application of this technique in a challenging clinical scenario.

References

FRACTURED ENDODONTIC FILE REMOVAL FROM MAXILLARY PREMOLAR

CP063

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AIM

To present a clinical case of a successful removal of endodontic file fragment fractured in maxillary premolar.

INTRODUCTION

Removal of separated endodontic instrument is a challenging procedure that is necessary for appropriate cleaning and disinfection of root canal. If endodontic infection is present in the canal adequate access to whole endodontic space is the most important factor for healing of periapical lesion.

CASE PRESENTATION

Patient was referred to our department for endodontic retreatment of maxillary first premolar with periapical lesion observed as an incidental finding on panoramic radiograph (Fig 1). Dental radiograph showed short root canal filling with about 4 mm long more radiopaque region in apical portion in one of root canals (Fig 2). Based on the x-ray appearance, we suspected that there was a broken endodontic instrument. Clinically, patient was without symptoms or sensitivity to percussion or palpation. After previous canal filling removal, it was evident that buccal canal was blocked approximately at the length of the beginning of more radiopaque region seen on periapical radiograph. Due to the curvature of the canal and the length on which the blockage was located, it was not possible to achieve adequate visibility even with the help of additional magnification of the dental microscope. We concluded that achieving a straight-line access to the fractured fragment would imply too much sacrifice of the buccal wall of the canal, bearing in mind its curvature in the palatal direction. Therefore, we achieved adequate access by moderately removing the buccal aspects of the coronal third and the palatal aspects of the middle third of the canal. The latter has been achieved with an aid of a specialized ultrasonic endodontic tip. Magnification of endodontic microscope was used during preparation of adequate space around coronal aspect of the fragment and transmission of vibrations from endodontic ultrasonic tip. Broken file was successfully loosened up, retrieved and canal patency confirmed (Fig 3). Root canals were cleaned and shaped using reciprocating file system and irrigated with 1% sodium hypochlorite and 10% citric acid solutions for smear layer removal. Following chemical-mechanical instrumentation, calcium hydroxide paste was placed for a week. In the next visit canals were obturated with epoxy-based sealer and gutta-percha using single cone technique. Post-obturation radiograph showed changed morphology of buccal canal due to fragment removal and unintentional overfilling of the palatal canal (Fig 4). The tooth was conservatively restored using glass-ionomer and resin-based materials. Control radiographic and clinical examination, three years later, showed favorable outcome (Fig 5).

Fig. 1 Pre-operative panoramic radiograph

Fig. 2 Pre-operative periapical radiograph

Fig. 3 Retrieved file fragment

Fig. 4 Post-obturation radiograph

Fig. 5 Control radiograph after twelve months

DISCUSSION

Broken endodontic file retrieval is considered a conservative therapeutic approach that enables retention of the tooth while minimizes the loss of root structure. In our case, due to canal curvature, considerable removal of the canal dentin around the fractured instrument was required. This led to the formation of the ledge on the canal wall which required special attention during the subsequent instrumentation and obturation of the canal.

CLINICAL RELEVANCE

Conservative removal of fractured endodontic file is not always predictable therapeutic procedure but is a prerequisite for periapical healing as it enables elimination of microorganisms from infected endodontic space. Careful planning and considerable clinical experience are necessary for the safe removal of fragments fractured in the apical third of the root canal where, in addition to difficult access, the space for manipulation is also reduced.

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Removal of two separated endodontic instruments with subsequent apical healing and development of a new pathosis: A case report

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CP064

RĪGA STRADIŅŠ UNIVERSITY

AIM

This case report aims to demonstrate a successful retrieval of two broken instruments using a combination of ultrasonics, loop device and rotary instruments with subsequent apical healing and a new pathosis development.

INTRODUCTION

Every clinician comes across cases with separated instruments in the previously treated patients during a routine endodontic practice. According to the literature, the incidence of endodontic instrument separation has been reported from 0.39% to 5%. [1,2] The presence of an endodontic instrument in the root canal may block access to the apical third of the root preventing effective disinfection procedures and jeopardizing the outcome of the endodontic treatment.[3] This case report describes management of previously endodontically treated upper second premolar with an apical periodontitis and two separated endodontic instruments with subsequent apical healing and new pathosis development.

CASE PRESENTATION

A 38-year-old male was referred to endodontic department for a root canal retreatment of an upper left second premolar (tooth 25) before prosthodontic treatment. Patient was asymptomatic. The probing depth was within the normal level. Radiographic examination revealed inadequate endodontic treatment, separated instruments and two radiolucent lesions in the apical area - periapical and mesially to the root apex.

The retreatment was performed in two visits under Zeiss Extaro 300 dental microscope (Zeiss, Germany). A gutta percha filling was removed from the buccal canal using ProTaper Retreatment instrument D2 (Dentsply De Trey, Konstanz, Switzerland). Ultrasonic unit (NSK, Varios 970) with an ultrasonic U-file #25 (NSK Europe GmbH, Eschborn, Germany) and Broken Tool Removal System - Btr Pen 0,4 mm (PPH Cerkamed, Stalowa Wola, Poland) were used to remove the first separated instrument from the middle third of the root canal. Second instrument in apical portion of the canal was bypassed with a K-file #10 (Mani, INC. Tochigi, Japan) and sequential instrumentation with HyFlex OGSG files (Coltene/Whaledent AG, Altstätten, Switzerland) was performed. The instrument was removed with a HyFlex OGSF 30/.04 instrument. Both retrieved instruments were fragments of lentulo spirals. Calcium hydroxide was placed.

During the subsequent visit the tooth was asymptomatic. Root canals were rinsed with a NaOCl 3%, EDTA 17% with ultrasonic activation, sterile water and CHX 2%. After that root canals were rinsed with sterile water again. Root canals were filled with gutta percha and bioceramic sealer (Totalfill BC, FKG Dentaire Sàrl, Le Crêt-du-Locle, Switzerland) in a continuous wave technique (Gutta-Smart KIT Dentsply) afterwards . At a 15 months follow –up visit the patient had no complaints but previously for 12 months after the root canal obturation tooth was sensitive to mastication. Tooth was a bit sensitive to percussion. The tooth was not in occlusion. Probing depth was 3-4 mm. Periapical and mesial lesions were healed but periodontal ligament was widened in the middle third of the root mesially.

(A) Preoperative radiograph d25. (B) Retrieval of separated instruments. (C) Postoperative radiograph. (D) a 15 month follow -up

DISCUSSION

Retrieval of a separated instrument is a complex procedure which may cause excessive root dentin removal and risk the long term outcome of the tooth predisposing it to root fracture. The risk-benefit balance must be assessed.[4] In this case we suspect a crack in the middle/ apical third of the root which could be present both before the endodontic threatment or appeared during/after the treatment. The patient is scheduled for follow up in 6 months or earlier if the symptoms will reoccur. It is advisable to make a CBCT and perhaps a surgical revision could be considered.

CLINICAL RELEVANCE

Successful instrument fragment removal is not always defined as endodontic treatment success. Potential root canal treatment failure after initial apical healing is not very common. This case hightlights the importance of the long term follow up.

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RĪGAS STRADIŅA UNIVERSITĀTES STOMATOLOĢIJAS INSTITŪTS

Four-year journey of replacement resorption and its management– a case report

CP066

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AIM

To present the progressive nature of replacement resorption and its management, emphasizing the role of conservative monitoring, age considerations, and bone dynamics in achieving successful implant placement without grafting.

INTRODUCTION

Dental avulsion is a serious traumatic injury which may lead to replacement resorption (RR), where the root is replaced by bone, resulting in ankylosis of the tooth. Teeth with RR are usually replaced later with dental implants with bone grafting. However, in some instances, spontaneous bone replacement during resorption eliminates the need for grafting.

CASE PRESENTATION

This case discusses a 14-year-old patient with avulsed tooth #21, managed with repositioning, splinting, and endodontic treatment. At the one-year follow-up, mild discoloration and mobility were observed, with early signs of RR (Fig 1). Over four years (18 years of age), the tooth showed increased mobility and complete root resorption. The tooth was extracted, and an immediate dental implant was placed, avoiding bone grafting due to spontaneous bone replacement. Esthetics was restored via cement-retained implant crown (Fig 2, Fig 3 and Fig 4). The case highlights timely intervention's role in managing RR for aesthetic and functional outcomes in young patients.

DISCUSSION

RR leads to progressive root loss and ankylosis post-avulsion. This case highlights the role of conservative monitoring, allowing strategic extraction and immediate implant placement without grafting, leveraging natural bone replacement for optimal aesthetics and function.

CLINICAL RELEVANCE

Spontaneous bone replacement can simplify treatment by eliminating the need for grafting. However, RR at a very young age may result in bone deficiency over time. Both RR progression and implant placement should be carefully assessed, considering the patient's age and the extent of bone discrepancy to ensure optimal long-term outcomes.

PRE-OPERATIVE IMAGES

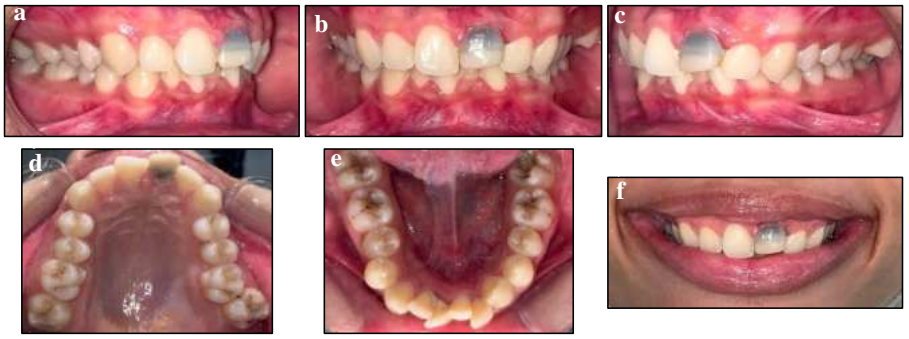

Figure 1. Preoperative photographs of a patient at 18-years-age showing different dental views. (a) Right buccal view (b) Frontal view (c) Left buccal view (d) Maxillary occlusal view (e) Mandibular occlusal view (f) Full smile view.

PRE-OPERATIVE AND POST-OPERATIVE RADIOGRAPHS

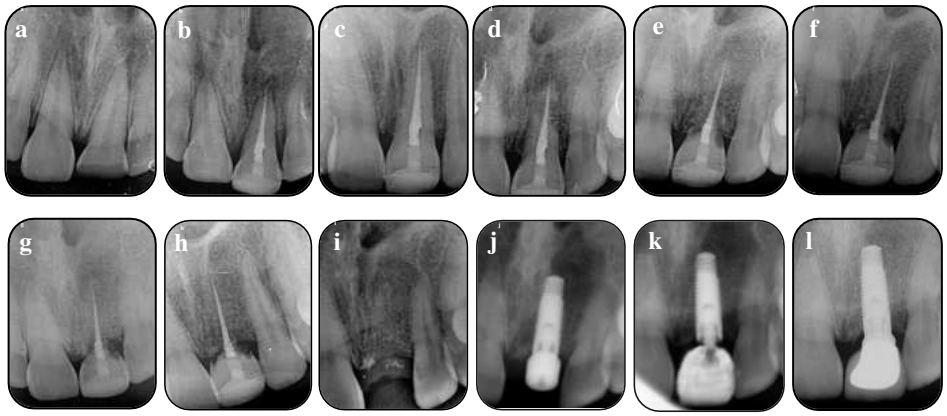

Figure 2. Periapical radiographs illustrating the progression of replacement resorption and substitution of tooth #21 by an immediate dental implant. (a) Immediate post-repositioning of avulsed tooth #21 in its socket; (b) Non-surgical endodontic treatment (10 days post-trauma); (c) 3 months follow-up; (d) 6 months follow-up; (e) 1 year follow-up; (f) 2 years follow-up; (g) 3 years follow-up; (h) 4 years follow-up; (i) Immediate post-extraction of tooth #21; (j) Immediate dental implant placement; (k) Temporary crown #21; (l) Final prosthesis of implant #21.

EXTRACTED TOOTH #21

Figure 3. Extracted tooth #21 with remnant gutta percha.

POST-OPERATIVE IMAGES

Figure 4 (a, b, c). Final prosthesis of implant #21.

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Endodontic Management of Internal Resorption in the Distal Root of Mandibular First Molar: A Case Report

European Society Of Endodontology Congress, 3-6 September 2025, Paris, France

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CP067

Aim:

The aim of this case report is to present the successful endodontic management of internal root resorption (IRR) in the distal root of a mandibular first molar using modern imaging techniques and advanced obturation methods.

Introduction:

Internal root resorption (IRR) is a pathological condition characterized by the progressive loss of intraradicular dentin due to clastic cell activity[1]. It is typically asymptomatic and detected incidentally during routine radiographic examinations[2]. If left untreated, IRR can lead to root perforation and tooth loss[3]. This case report presents the successful endodontic management of IRR in the distal root of a mandibular first molar.

Case Report:

A 42-year-old female patient was referred to our clinic for retreatment of previous root canal therapy in teeth #46 and #45. Both teeth exhibited periapical lesions but were asymptomatic. The patient had no systemic diseases.
Periapical radiographs revealed inadequate root canal fillings in both teeth and suspected internal resorption in the distal root of tooth #46. A CBCT scan was performed after removing the previous root filling, confirming the diagnosis of IRR in the distal root. The previous root canal treatment of tooth #45 was renewed, and a fiber post was placed. Tooth #46 was isolated with a rubber dam, and the treatment protocol was initiated. Irrigation was performed using 2.5% sodium hypochlorite, saline, 17% EDTA, and 2% chlorhexidine. Root canal shaping was completed using the ProTaper Next system at working length. Mesial canals were obturated using the cold lateral condensation technique. The apical part of the distal canal was filled with a gutta-percha cone, while the resorption defect was sealed with thermoplastic gutta-percha. Due to extensive coronal damage, the tooth was restored using EverX fiber-reinforced composite and referred to the Prosthetic Dentistry department for final prosthetic restoration.

Results

The patient failed to attend initial follow-up appointments but returned one year later for evaluation. Periapical radiography revealed complete healing with no signs of periapical pathology. The tooth remained asymptomatic and periodontally stable.

Discussion

IRR is a rare but clinically significant condition that requires an accurate diagnosis and a well-planned treatment strategy. CBCT imaging is invaluable in confirming IRR and assessing the extent of resorption[4]. Thermoplastic obturation techniques have been reported to be effective in managing IRR cases, ensuring complete sealing of the resorption defect[5].

Conclusion

The successful management of IRR depends on early detection, effective irrigation, and appropriate obturation techniques. CBCT imaging and thermoplastic filling materials play a crucial role in achieving predictable clinical outcomes. Regular follow-ups are necessary to confirm long-term treatment success.

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Figure 1. Preopreative OPG. Inadequate root canal fillings and periapical lesions can be seen on tooth number #45 and #46.

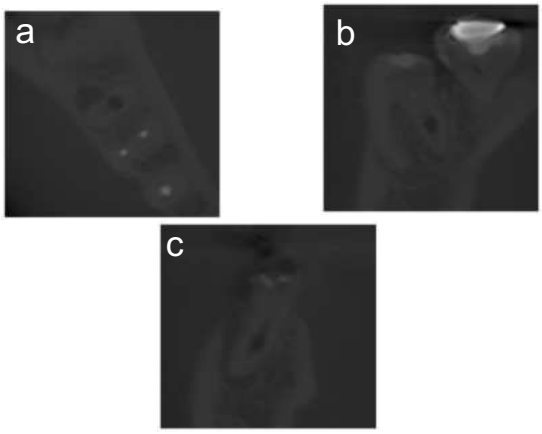

Figure 2. CBCT images axial section (a), sagittal section (b), coronal section (c)

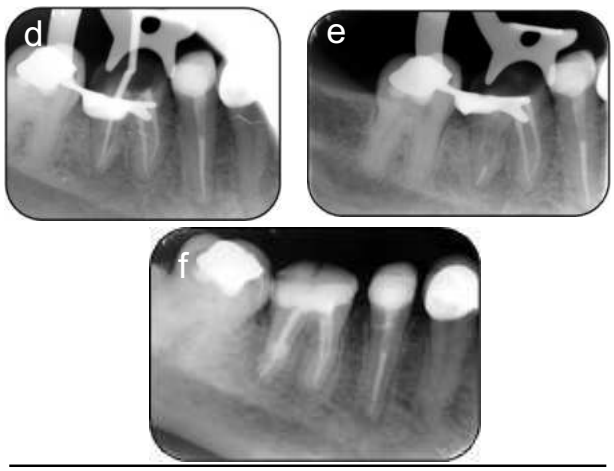

Figure 3. Determination of working length and obturation of mesial canals (d), apical sealing of the distal canal with gutta-percha (e), completion of the treatment (f).

Figure 4. One-year follow-up radiograph (g)

CP068

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MANAGEMENT OF A PRE-ERUPTIVE INTRACORONAL RESORPTION (PEIR) NEAR THE PULP IN A PERMANENT LOWER PREMOLAR : A CASE REPORT

Introduction

Pre-eruptive intra-coronal radiolucency/resorption (PEIR) is used to describe an abnormal, well-circumscribed, radiolucent area, in the coronal dentinal tissues close to the amelo-dentinal junction of unerupted teeth (1). The tooth prevalence has been reported to be 0.2-3.5% in population of Australia, Asia and Turkey, usually affecting one or two permanent teeth (1). The etiology is not fully understood but apical inflammation of primary teeth, dental caries, localized developmental defects, and internal or external resorption have been proposed in the literature (1).

Aim

Describe the management pre-eruptive intracoronal resorption near the pulp in a permanent lower premolar (#45) in a young patient.

Case Presentation

A 14-year-old girl was referred to the endodontology department with a chief complaint of cold sensitivity in the fourth quadrant and a presumptive diagnosis of dens invaginatus.

ANAMENSIS:

- Neurogenic bladder disease, hypertension and renal dysfunction
- No history of trauma or orthodontics

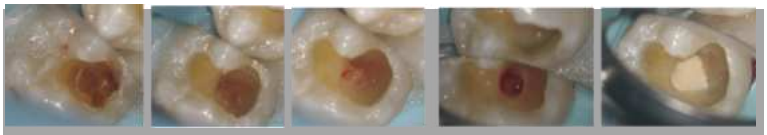
RADIOGRAHIC EXAMINATION AND CLINIC EXAMINATION

Clinically, no visible cavity was detected on tooth 45. However, radiographic examination revealed a coronal radiolucency that resembles a carious lesion and a not fully formed apex. However, at a prior OPT the same coronal radiolucency was observed prior to eruption of this tooth. Moreover, multiple of such coronal radiolucency's were detected, affecting teeth 34, 36, 37, 47, 46, 26, 25, 14, 15, and 16 which indicates that it probably concerns PEIR instead of caries.

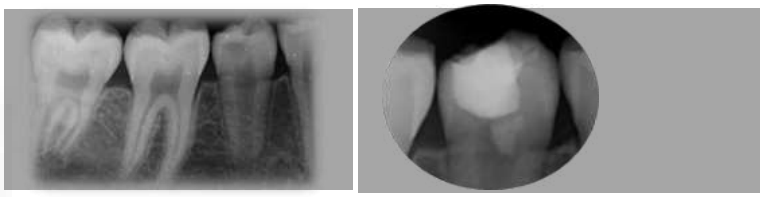
DIAGNOSTICS # 45

- ***Pre-eruptive intracoronal resorption***
- ***Reversible pulpitis with normal periapical tissues***

TREATMENT:



The lesion presented as decomposed, soft dentin. While it was removed gently and radiographically there seemed to be a layer of minerilized dentin between the PEIR and the pulp chamber, a pulp exposure occurred. Bleeding was controlled within five minutes using sterile cotton soaked in 3.5% sodium hypochlorite. A calcium silicate cement (Biodentine) was the material selected to conduct the partial pulpotomy. The tooth was restored with composite.



Three months post-treatment, the patient showed a normal sensitivity response with no symptoms on palpation or percussion. A follow-up was scheduled for six months for further clinical and radiographic evaluation.

Discussion

The management of PEIR depends on the eruption status, lesion progression, lesion size, and the degree of pulp involvement (2). In erupted teeth, the primary treatment focuses on restoring defects to prevent further enlargement due to potential bacterial colonization, increased resorptive dentin thickness, and possible tooth fracture (2).The clinical presentation may not always align with radiographic findings. Hard tissues (enamel and dentin) may be affected (1), creating an entry path for oral microorganisms. This can lead to a “caries-like” lesion, potentially resulting in pulpitis. In this case, the soft dentin tissue was removed, leading to pulp exposure and control of the bleeding was controlled after the partial removal of the pulp indicating probably that there was presence of microorganisms due to enamel damage.

Clinical relevance

Although PEIR usually is located at the amelodentinal junction, it could have consequences for the pulp as well. It is considered important to keep this in mind while treating PEIR. A partial pulpotomy is a viable treatment option for managing large coronal resorptive defects that result in pulp exposure in immature teeth.

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Scaffold-Based Approaches in Regenerative Endodontics: A Case Series

CP069

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Aim

This case series aims to show the radiographic healing of periapical lesions following regenerative endodontic procedures in necrotic, mature permanent teeth using three different scaffolds: blood clot, leukocyte-and platelet-rich fibrin (L-PRF), and injectable platelet-rich fibrin (I-PRF).

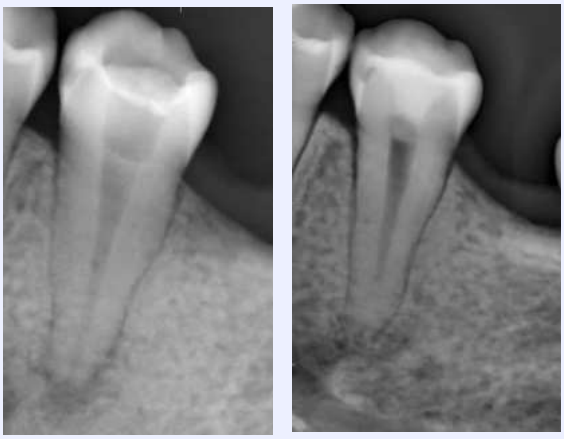
Introduction

Traditional endodontic therapy treats necrotic teeth but does not restore pulp vitality, leading to structural weakening and aesthetic concerns (Ng Mann et al. 2007). Regenerative endodontic therapy (RET) aims to restore the pulp-dentin complex using stem cells, growth factors, and scaffolds in a microorganism-free environment (Murray 2018). Initially applied to immature teeth, RET has also shown success in mature teeth, promoting periapical healing and tissue regeneration (Digka Sakka et al. 2020). Periapical bleeding induction provides a cost-effective scaffold with limitations such as unpredictability and technical sensitivity (Nosrat Homayounfar et al. 2012). Platelet-rich fibrin (PRF), a second-generation platelet concentrate, has emerged as a promising alternative (Dohan Choukroun et al. 2006). PRF is a biological scaffold, supporting dentinogenesis and tissue repair (Ghanaati Booms et al. 2014). Various PRF types, including L-PRF and I-PRF, offer enhanced regenerative potential and clinical convenience (Lyris Millen et al. 2021).

Case Presentation

Three cases of necrotic, mature permanent teeth with apical lesions were treated using different regenerative endodontic scaffolds. All cases followed a standardized protocol, beginning with local anaesthesia with epinephrine (Ultracaine), rubber dam isolation, and removal of caries and old restorations to ensure proper access to cavity preparation. Working length was determined using an electronic apex locator and confirmed radiographically before canal shaping with Reciproc Blue (VDW, Munich, Germany) #R50 files, followed by irrigation with 20 mL 2% sodium hypochlorite (NaOCl) (Cerkamed, Warsaw, Poland) and saline. The canals were then dried with paper points, and calcium hydroxide was applied as an intracanal medicament, sealed with a temporary restoration, and left for three weeks. At the second visit, beginning with local anaesthesia without epinephrine (Lidocaine) and then the medicament was removed with %17 ethylene diaminetetraaceticacid (EDTA) (Cerkamed) and ultrasonic activation, the canal was dried, and a bonding agent was applied to minimize coronal discoloration before scaffold placement.

Case 1: In this case, a sterile #25 K-file (Dentac; Oncu Dental, Istanbul, Turkey) was introduced into the canal to induce periapical bleeding, allowing blood to fill the canal space up to a controlled level to facilitate clot formation, while ensuring it did not overflow coronally.



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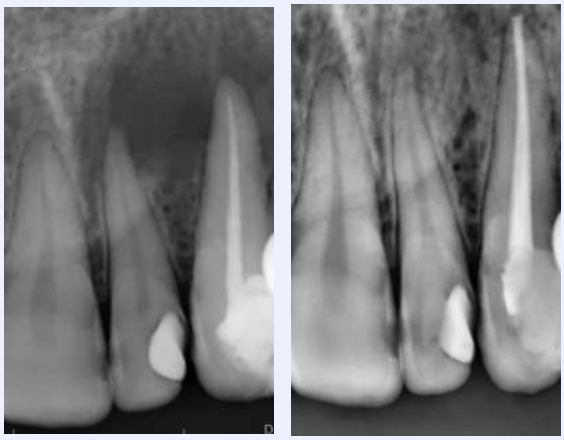
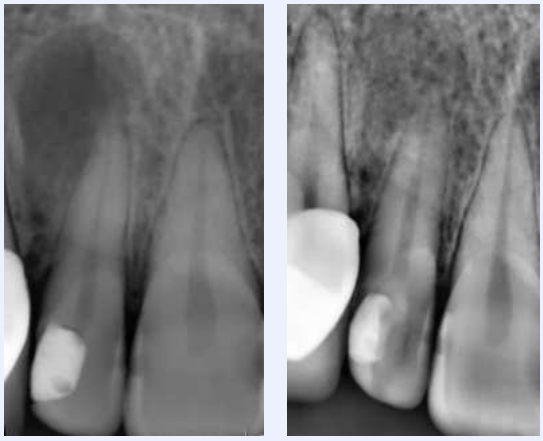
Case 2: In this case, venous blood was collected into a glass tube without anticoagulants and centrifuged at 3000 rpm for 10 minutes. The middle layer (L-PRF) was separated, shaped into a conical form, and carefully placed within the root canal to act as a scaffold for tissue regeneration.



Case 3: In this case, venous blood was centrifuged at 700 rpm for 3 minutes, and the middle layer (I-PRF) was aspirated into a syringe. The I-PRF was then injected into the root canal, ensuring uniform distribution to facilitate regeneration.



A coronal barrier of Biodentine (Septodont, Saint-Maur-des-Fosses, France) was applied in all cases, followed by composite (Palfique Estelite Paste; Tokuyama Dental Corp, Tokyo, Japan) restoration.

Discussion

All three cases showed successful periapical lesion healing. REPs in mature teeth provide promising clinical outcomes, as evidenced by the resolution of periapical radiolucencies. However, scaffold selection plays a crucial role in procedural success. PRF-based scaffolds may offer advantages over periapical bleeding induction, including better control over scaffold volume and reduced risk of post-treatment discoloration. Further studies are needed to compare the long-term outcomes of different PRF types and bleeding induction methods concerning lesion healing, postoperative pain, and aesthetic considerations.

Clinical Relevance

Regenerative endodontic procedures represent a promising alternative to traditional root canal treatment for necrotic, mature, permanent teeth with apical lesions. PRF-based scaffolds may enhance tissue regeneration while mitigating the disadvantages of periapical bleeding induction.

KU LEUVEN CP070 ese PARIS ENDO KU LEUVEN

Effectiveness of Vital Pulp Therapy vs Root Canal Treatment in the management of pain in cases of irreversible pulpitis: A case series

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AIM & INTRODUCTION

To compare in healthy patients the effectiveness of Root Canal Treatment (RCT) with Vital Pulp Therapy (VPT) regarding pain management in cases of mature permanent teeth presenting signs and symptoms of irreversible pulpitis. VPT has emerged as a minimally invasive approach aiming to preserve the vitality and functionality of the remaining healthy pulp after a carious exposure or trauma.

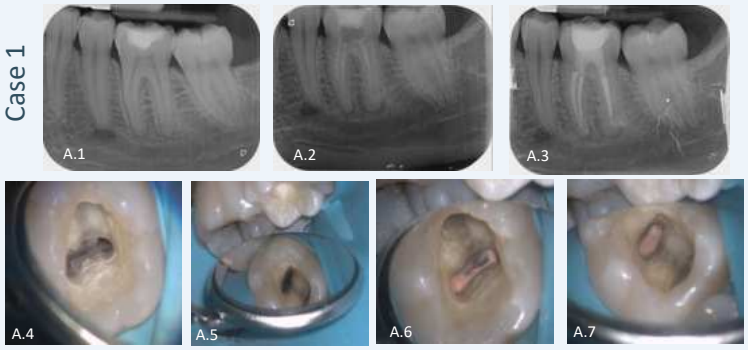
METHODOLOGY

Pain Assesment&Control

All patients appeared in the emergency department of the Student Dental Clinic (UZ Leuven) with signs and symptoms of irreversible pulpitis. After the correct diagnosis was made with clinical and radiologic tests, the patients were asked to describe their pain and assess it using a Visual Analogue Scale (VAS). The patients were contacted 2 days post-operatively to give a pain score again, using the same VAS as in the clinic.

Root Canal Treatment

Case 1



The endodontic treatment was carried out in two appointments (Fig. A1-A7). During the first appointment the complete removal of caries and the preparation (WaveOneGold, Dentsply Sirona) and disinfection (NaOCl 3%, EDTA 17%) of the canal system took place under rubber dam isolation. The teeth were temporarily filled with $Ca(OH)_2$ paste (Ultracal XS, Ultradent) and glass ionomer (Fuji Triage, GC). During the second appointment the endodontic therapy was completed using tapered gutta-percha points and sealer (AH Plus, Dentsply Sirona) with warm vertical compaction and a definitive restoration of the crown.

Vital Pulp Therapy

Case 2

The VPT and the restoration were carried out in one appointment (Fig. B1-7). Following rubber dam placement and disinfection, all carious dentin was carefully removed. The inflamed pulp was excised until complete hemostasis was achieved using a cotton ball soaked in 3% sodium hypochlorite (NaOCl). A layer of a pulpotomy agent (Biodentine, Septodont), was then applied to the remaining pulp tissue, followed by a light-cured glass ionomer liner (Ionoseal, VOCO). The definitive composite restoration was completed in the same appointment.

RESULTS

Statistical analysis of 18 clinical cases was conducted to compare pain reduction following RCT (n=8) and VPT treatments (n=10). The Mann-Whitney U test revealed no statistically significant difference between both groups (p = 0.857). However, less post-operative pain was noticed in the VPT group (Fig. 1-3)

Figure 1

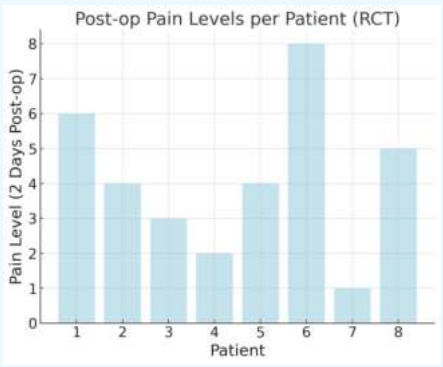


Figure 2

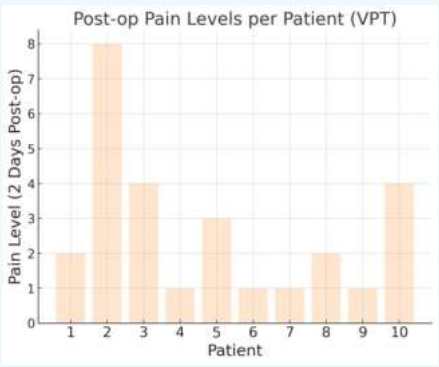
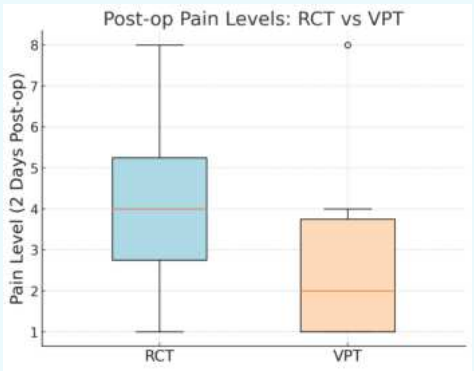


Figure 3



DISCUSSION

Correct diagnosis, the use of magnification and rubber dam, complete hemostasis and an adequate coronal restoration are factors that may influence the success of the treatment. VPT, as an alternative to RCT, can have many advantages: quicker, less technically complex treatments, reduced cost for both patient and clinician, retention of pulpal repair and regeneration capacity, and lower risk of fracture due to better structural integrity. A sufficient follow-up examination is required to document a favorable outcome.

CONCLUSION - CLINICAL RELEVANCE

VPT establishes a biologically acceptable environment for the pulp tissue and prevents future bacterial contamination by using the appropriate pulp capping material and an adequate restoration. VPT is a viable treatment modality even in cases of irreversible pulpitis.

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The authors have no conflict of interest.

References:

CP071

Revascularisation of an immature upper premolar in the apical part

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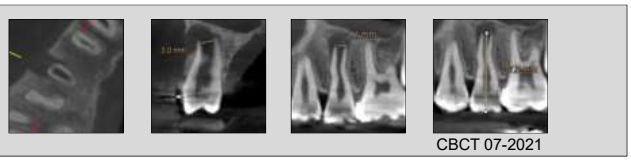
AIM

The aim of regenerative endodontic procedures (REP) is to achive further root development and make teeth more resistant to fracture[2,4].

Introduction

A young male patient, aged 11 years and 10 months, was referred by his general dentist for root canal treatment on the upper right premolar with an immature apex. Necrosis had occurred during orthodontic treatment. The root development showed a stage 3 using Cone beam Computed Tomography (CBCT)[1].



CBCT 07-2021

Case presentation

The patient presented without symptoms. Initial treatment consisting of trepanation, a rinse and a medication containing calcium hydroxide (CH) had already been done.

All treatments were performed using a dental microscope and rubberdam isolation. Length determination is challenging in immature teeth due to the absence of an apical constriction[2,3,4]. Vital tissue was identified by endometric measurement with a level of 16.5 mm, corresponding with the findings at the CBCT.

No mechanical instrumentation was performed. An activated sodium hypochlorite irrigation (1.5%, Eddy®,a) was applied, followed by EDTA 17% and CH medication in advance for REP. The diameter of the apical foramen was 1.1 to 3.0 mm, according to stage 3[1,2,4].

Four weeks later, calcifications were identified at the working length, consequently a MTA[b] plug was placed at this level and subsequent X-rays revealed apical continuous root development since primary treatment. A fibre post (D.T. Lightpost®,a #3) was adhesively fixed using RelyX™,c Unicem to strengthen the root[2,4]. Finally the tooth was restored by an adhesive restoration (Clearfil™,d Repair, Filtek™,c Supreme XTE). Clinical re-evaluation took place after six month, the radiological re-evaluation after 1.5, 2.5 and 3.5 years[2,4].

Material:

a: Eddy® / D.T. Light Post #3 / VDW GmbH München/Dentsply Sirona/ Germany; **b:** Cerkamed Bio MTA / Stalowa Wola/ Poland; **c:** RelyX™ Unicem / Filtek™ Supreme XTE / 3M Seefeld/Germany; **d:** Clearfil™ Repair/Kuraray Europe GmbH/ Hattersheim am Main/Germany;

Discussion

Healing of the periapical leasion and further root development are the desired outcomes for treating pulp necrosis in immature teeth[2,3,4].

Depending on the stage of root development either revacularisation or apexification using sodium hydroxide or MTA is an option[2,4].

Due to the corona pandemic restrictions, a long time passed between initial and systematic treatment. Disinfection by meticulous irrigation and medication provided an environment to enable continued root formation. An apical barrier of hard tissue formed, thus the MTA-plug was located in the lower part. The reaction of tissue led to an increase in root length and revascularisation of the apical third[2,4,5].

Re-evaluation showed a continuous root development, an increased length (up to 21.5 mm) and thickness of the root and decreased apical diameter, while radiological evidence revealed a normal periodontal ligament space. Thus this provides evidence for the high regenerative potential of stem cells in the apical papilla in young patients[2,4,5].

07-2021 09-2021 10-2023 03-2024 02-2025

Clinical relevance

The treatment outcome can be considered favourable as the primary objectives were achieved. A normal crown to root ratio was obtained and the root was restabilised intraradicularly by the adhesive fixation of a fibre post. The long term prognosis of the tooth appeares uncompromised and orthodontic treatment was continued as planned.

02-2025

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CP072

Laser-Assisted Pulp Regeneration in an Immature Permanent Tooth with Periapical Periodontitis: A Case Report

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AIM- To evaluate the impact of pulp regeneration therapy on an immature permanent tooth affected by periapical periodontitis, integrated with laser technology for root canal and periapical lesion sterilization.

INTRODUCTION-Laser-assisted pulp regeneration addresses apical periodontitis in permanent teeth with incomplete root development. It utilizes laser technology for root canal disinfection, bioactive materials for pulp regeneration, and blood supply reconstruction, thereby promoting root development.

CASE PRESENTATION-A 24-year-old female patient experienced discomfort in the lower left posterior tooth when biting for over a month. The tooth had undergone pulp therapy at a local hospital a year ago and had experienced occasional biting discomfort since then. There was no history of pain from cold or hot stimuli or gum swelling.

Fig 1 Clinical examination

Clinical examination revealed that the second lower left premolar (#35) had a white temporary filling material. The tooth showed no response to a cold test, no discomfort upon percussion, no significant mobility, and no apical swelling or sinus tract. The periapical radiograph showed discontinuous high-density shadows in the root canal, an open apical foramen with a parallel pattern, and low-density shadows around the root apex. Diagnosis: chronic periapical periodontitis of tooth #35 (undeveloped root).

visit 1 Laser (Er: YAG, 20mJ, 10Hz, Fotona) Cleaning of Root Canal Infection

visit 2 Pulp Revascularization Procedure

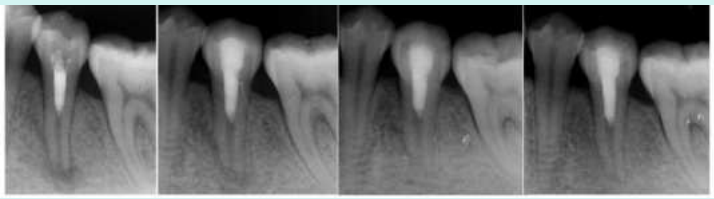

Fig 2 Postoperative 3 months, 6 months, 12 months, 20 months

DISCUSION- This case utilized Laser-Assisted Pulp Revascularization (LAPR), an innovative treatment approach. Laser treatment effectively removes the smear layer on the root canal walls, thereby creating a more favorable microenvironment for revascularization. The antibacterial properties of lasers reduce the risk of postoperative infections, while their biostimulatory effects promote periapical tissue healing and further root development. Notably, despite the patient's age being beyond the typical scope for young permanent teeth, the combination of laser therapy and pulp revascularization surgery achieved satisfactory outcomes.

CLINICAL RELEVANCE- Laser-assisted pulp revascularization offers new insights and options for the treatment of periapical lesions, especially for patients who need to preserve their natural dentition and promote continued root development.

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CP074

LMU HOSPITAL

Department of Conservative Dentistry and Periodontology

Revitalization and Partial Pulpotomy of a Dens Invaginatus Type III with Apical Periodontitis

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Aim

To present a minimally invasive treatment approach for Dens invaginatus Oehlers type III with two separate pulp conditions and immature apex.

Introduction

Dens invaginatus is a developmental irregularity characterized by an enamel invagination into the crown or root before the mineralization phase with a prevalence of 0.3- 10%[1,2].
Since the invagination serves as a plaque retention area and the enamel at the base of the invagination is less mineralised or may even be absent, pulp necrosis can occur even before completion of root maturation.

Case presentation

An 8-year-old boy presented to the outpatient clinic of the Department of Conservative Dentistry & Periodontology at LMU Hospital. Previously, a submucosal abscess had been incised, and tooth 22 had been accessed.
Radiological examination revealed a dental anomaly—a Dens invaginatus Type III—with apical periodontitis (Fig. 1).

Findings	22
Pulp test	+
Percussion	+
Mobility	I
Probing depth	2mm
PAI Score	4

Fig. 1: Pre op diagnostic periapical radiograph revealing a Dens invaginatus (Oehlers Class III) on tooth 22

After clinical evaluation and orthodontic consultation, re-entry was performed under rubber dam isolation: Signs of bleeding from the main canal lumen were interpreted as indications of vital pulp tissue. After superficial irrigation with 3% NaOCl, a partial pulpotomy was performed using a calcium silicate cement (Fig. 2a + b). The invagination was disinfected with ultrasonically activated 3% NaOCl and treated with a long-term calcium hydroxide dressing.

Fig. 2a : Pulp status after partial pulpotomy

Fig. 2b : Application of the tricalcium silicate putty

Over a period of 6 months, radiological signs of remission of the periapical lesion were observed. Revitalization procedure was performed according to the ESE guidelines[3] using a calcium silicate cement (Totalfill BC Putty, FKG, La Chaux-de-Fonds, Switzerland) (Fig. 3—c).

Fig. 3a: Intracanal medicament in situ (12/2018)

Fig. 3b: Control X-ray (02/2019)

Fig. 3c: Control X-ray after revitalization (07/2019)

Over a follow-up period of five years, the healing process was uneventful, with complete root maturation and healthy periapical conditions (Fig. 4a + b).

Fig. 4a and b: Five year recall (05/2024) without visible signs of discoloration of the crown

Discussion

The endodontic treatment of a Dens invaginatus often presents a significant challenge, not only because of the complexity of the root canal system but also different pulp conditions can be present within a single tooth: While the pulp in the infection-prone invagination may already be inflamed or necrotic, the pulp in the main canal can sometimes remain vital. Therefore, the sensitivity test is of particular importance, even if radiological signs of apical periodontitis are present.

Clinical Relevance

A tooth with an invagination (e.g. Oehler class III) that still shows signs of a vital pulp in the main canal despite radiographic signs of apical periodontitis can be treated minimally invasive by limiting the endodontic therapy to the infected invagination.

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Regenerative Endodontic Treatment of a Necrotic Mature Tooth and a Previously Treated Tooth with Periapical Lesions: Report of Two Cases

CP075

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AIM: To present the success of regenerative endodontic treatment using different materials in previously treated teeth and in teeth with pulp necrosis and periapical lesions.

INTRODUCTION: Regenerative endodontic procedures (REPs) have emerged as a promising treatment modality for managing necrotic teeth with periapical pathology, offering an alternative to traditional apexification and non-surgical retreatment techniques. Unlike conventional endodontic therapy, REPs aim to promote continued root development and periapical healing by stimulating tissue regeneration within the root canal.

Case Presentation

Case 1. A 17-year-old female patient presented to our clinic with pain on chewing and discoloration of the maxillary left central incisor. Her history revealed a traumatic injury at age 10, followed by root canal treatment seven years ago. Clinical examination showed discoloration and a sinus tract associated with tooth #21. Radiographic evaluation revealed an overextended, non-hermetic root canal filling and a periapical lesion. Based on these findings, nonsurgical endodontic retreatment followed by a REP was planned. After removing the coronal restoration and preparing an access cavity, the overextended gutta-percha was retrieved, and the working length was determined using an electronic apex locator. Canal preparation was performed with Ni-Ti rotary instruments, and final irrigation was completed using alternating rinses of 1.5% NaOCl and 17% EDTA, activated with passive ultrasonic irrigation (PUI). Calcium hydroxide (Ultracal XS, Ultradent Products Inc., South Jordan, UT, USA) was applied as an intracanal medicament for three weeks.

At the second visit, under rubber dam isolation, the root canals were irrigated with EDTA and saline solution. Apical bleeding was induced using a size 30 stainless steel K-file, allowing blood to fill the canal space and form a stable clot. MTA (ProRoot MTA, Dentsply, Tulsa, OK) was placed 2 mm below the cementoenamel junction, and the coronal portion was sealed with glass ionomer cement. After two weeks, the cavity was permanently restored with composite resin.

Fig.1. Preoperative intraoral photograph

Fig.2. Preoperative periapical radiography

Fig. 3. Postoperative periapical radiography

Fig.4. Intraoral photograph at 6 months follow-up

Fig.5. Periapical radiograph at 6 months follow-up

Fig.6. Periapical radiograph at 9 months follow-up

Case 2. A 16-year-old female patient presented to our clinic with complaints of pain during chewing. Intraoral examination revealed a sinus tract associated with the maxillary right central incisor. Radiographic assessment demonstrated a periapical lesion related to the same tooth. Under rubber dam isolation, an access cavity was prepared, and root canal instrumentation was performed using nickel-titanium rotary instruments with 1.5% sodium hypochlorite irrigation. After completing the shaping procedure final enhanced irrigation protocol was performed of 1.5% NaOCl and 17% EDTA, activated with PUI. Calcium hydroxide was then placed as an intracanal medicament, and the patient was scheduled for a second appointment three weeks later.

At the second visit, ten millimetres of whole blood was drawn by venipuncture from the patient's antecubital vein for preparation of platelet-rich plasma (PRP) . After the removal of the calcium hydroxide medicament, the root canal was irrigated with 20 ml 17% EDTA and 5 ml sterile saline solution. PRP was placed into the canal space up to the cementoenamel junction. Subsequently, a 3 mm Biodentine (Septodont, France) barrier was placed over the PRP clot and was verified radiographically. After waiting 12 min for the Biodentine to set, the final restoration was performed.

Fig.1. Preoperative intraoral photographs

Fig.2. Preoperative periapical radiography

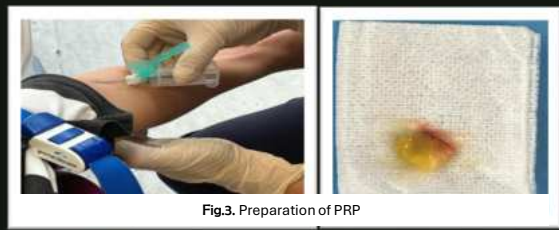

Fig.3. Preparation of PRP

Fig. 4. Postoperative periapical radiography

Fig.5. Intraoral photograph at 6 months follow-up

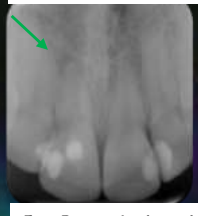

Fig.6. Periapical radiograph at 6 months follow-up

Follow Up: Both patients will be monitored every three months for one year to assess clinical and radiographic outcomes. At each recall visit, the patients remained asymptomatic, and no signs of infection or sinus tract recurrence were observed. Radiographic evaluations demonstrated progressive periapical healing, reduction in lesion size, and increased radiodensity. At the 6-month follow-up, the patient who underwent PRP-assisted regenerative treatment did not exhibit a response to electric pulp testing. However, at the 9-month follow-up, the retreatment patient showed a delayed positive response, suggesting partial neural regeneration.

DISCUSSION: Regenerative endodontic treatment demonstrated promising clinical outcomes in both previously treated mature teeth and necrotic teeth, supporting its potential as a viable alternative to conventional approaches. In the retreatment case, the removal of non-hermetic root canal filling followed by regenerative therapy facilitated periapical healing, despite the challenges associated with previously treated teeth. In the necrotic case, the use of PRP played a crucial role in stimulating tissue regeneration and promoting healing. The application of biocompatible materials such as Biodentine and MTA provided an effective seal and contributed to periapical repair. These findings highlight the significance of biomaterial selection and regenerative techniques in optimizing clinical success.

CLINICAL RELEVANCE: The successful application of regenerative endodontic treatment in both previously treated mature teeth and necrotic teeth highlights its potential as a biological alternative to conventional retreatment. The use of apical bleeding and PRP facilitated tissue regeneration, while Biodentine and MTA provided effective sealing, contributing to favorable clinical and radiographic outcomes.

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REVASCULARIZATION PROCEDURE IN TOOTH WITH NECROTIC PULP

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CP076

Aim: To present a regenerative treatment protocol and to assess clinically and radiographically the impact of mineral trioxide aggregate (MTA) material as a coronal plug following the revascularization of a mature, non-vital permanent central maxillary incisor with necrotic pulp.

Introduction: Regenerative endodontics uses tissue engineering principles. Revascularization restores blood flow, providing oxygen, nutrients, and immune cells in young permanent teeth with incomplete root growth, facilitating new pulp-like tissue formation. Because of the encouraging results of regenerative procedures in young immature permanent teeth, regenerative endodontic procedures have been tried for use in adult teeth with necrotic pulp.

Case presentation: A 17-year-old female was referred for discoloration of the maxillary left central incisor following the removal of orthodontic appliance (Fig 1). The clinical examination showed a change in the tooth color and no response to pulp sensibility tests, percussion and palpation. The preoperative radiograph showed external inflammatory root resorption (Fig 2). The revascularization procedure was completed in two visits:

First visit:

-Isolation and disinfection of the operative field (rubberr dam).

- Access cavity preparation with minimal canal instrumentation.

- Irrigation with 20 ml of 1.5% NaOCl and 17% EDTA (Fig 3).

-Applying a mix of two intracanal antibiotics (amoxicillin 400mg and clindamycin 600mg) for 7-14 days. A mixture of one capsule of each antibiotic and saline solution was prepared into a paste and inserted into the canal using a lentulo spiral (Fig 4,5).

Second visit:

-Administration of local anesthesia (without vasoconstrictor).

- Irrigation with copious amounts of EDTA (17%) and subsequent drying.

- Induced bleeding from the periapical tissue (2 mm beyond the foramen) with a K- file ISO 10 to create a coagulum.

- Placing an MTA dressing, maintaining a thickness of 3 mm, up to 1 mm below the CEJ (Fig 6).

- Definitive restoration with glass ionomer cement (GJC) followed by a composite filling (Fig 7).


Figure 1


Figure 2


Figure 3


Figure 4


Figure 5

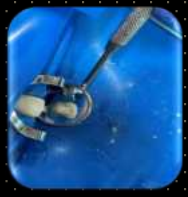
Figure 6


Figure 7


Figure 8


Figure 9


Figure 10

This case report shows successful and apexification of mature necrotic permanent tooth confirmed by clinical controls at 3, 6, 9, and 12 months and X-ray at 12 months (Fig 8). After 12 months, blood flow measured by a pulse oximeter was identical to the right maxillary central incisor. (Fig 9,10).

Discussion: To prevent tooth discoloration, which frequently occurs due to the presence of minocycline in triantibiotic paste and metal oxides in MTA, DAP (dual antibiotic paste), MTA Biorep (Itena, France) was used. MTA Biorep is a biocompatible bioceramic reparative cement with a quick setting time of 15 minutes, which doesn't pose a risk of tooth discoloration as it has calcium tungstate as a radiopacifier. Bioceramic cement (MTA Biorep) serves as a biological barrier due to its bacteriostatic properties and sealing ability.

Conclusion & Clinical Relevance This case showed that revascularization therapy may be effective in arresting external root resorption. This endodontic technique revitalizes permanent teeth with necrotic pulp and open apices. Bioceramic cement (MTA Biorep) has shown clinical and radiographic success in revascularization.

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Management of Maxillary Central Incisor fracture using Orthodontic extrusion

CP077

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I. AIM

To demonstrate the clinical management of a maxillary anterior tooth with crown root fracture and subgingival margin through orthodontic extrusion for functional and esthetic restoration.

II. INTRODUCTION

Complicated crown-root fractures occur in 5% of all dental injuries, with the majority occurring in permanent maxillary incisors. These fractures can result in esthetic, functional, and psychological problems. Therefore, the treatment of complicated crown-root fractures is important but often challenging, especially when the biologic width compromised. In this case study, to re-establish the biologic width, orthodontic extrusion using a fixed appliance were performed, followed by a retention period. After the retention period, fiber post and core were built up and zirconia crown was finally placed.

III. CASE PRESENTATION

<Patient Information & Clinical Examinations>

1. **Sex/Age :** Male/69
2. **Chief Complaint (C.C)** : I broke my upper anterior tooth while eating hard ice-cream yesterday.
3. **Present Illness (P.I) :**

	mob	Per	Pal	PPD
#11	–	–	–	n/s
#21	+++	+	+	353/333
#22	–	–	–	n/s

4. **Impression :** #21 complicated crown-root fracture
5. **Treatment plan :** #21 root canal treatment, post, core and zirconia crown final restoration after orthodontic extrusion

<1st visit>

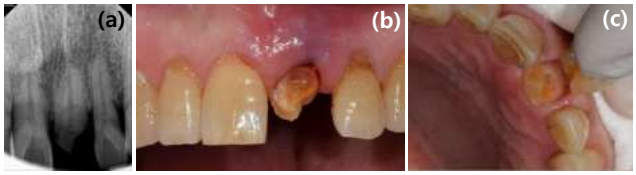

Fig 1. (a) initial periapical radiograph on #21
(b, c) initial intra-oral clinical photograph, fracture margin is located 2mm subgingival on the labial surface

<Root Canal Treatment>

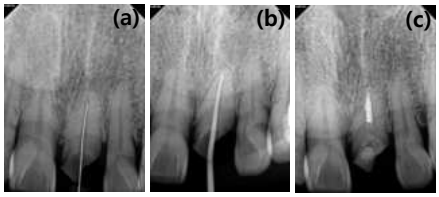

Fig 2. Root canal treatment procedure
periapical radiograph on #21
(a) Initial apical file (#20, K-file)
(b) Master cone fit (#60/04 taper) after canal enlargement and shaping with handfiling using step-back technique
(c) Canal filling using continuous wave technique with AH-Plus sealer

<Orthodontic Extrusion Appliance>

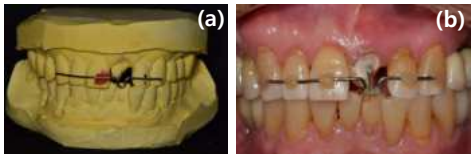

Fig 3. (a) Plaster model for fixed appliance
fixed appliance was designed considering tooth axis, overjet.
(b) Appliance delivery for orthodontic extrusion. (0.5 mm SS australian wire & super thread)
Fiberotomy done with #12 blade.

<4 weeks after Orthodontic Extrusion>

Fig 4. (a) Power thread was replaced and fiberotomy performed weekly for 3 weeks. The amount of extrusion was checked at every visit.
(b) After 4 weeks of orthodontic extrusion. Total 2mm of extrusion was achieved. labial margin is located equigingival.
(c) Fixed wire and resin removal using low speed carbide round bur.

<Post, Core & Stabilization Resin Wire Splint>

Fig 5. (a) Periapical radiograph after post & core (Snowlight #12, Abrasive tech, USA/ Luxacore A3, DMG, USA) using Etching (Uni-Etch, Bisco, USA) & self-priming adhesive (Onestep, Bisco, USA)
(b) A stabilization resin splinting wire was delivered (0.5mm SS australian wire) and maintained for 2 months to prevent relapse..

<Crown preparation>

<Final restoration>

Fig 6. (a) Crown preparation for zirconia crown after confirming the maintenance of extrusion amount.
(b) Zirconia crown delivery and occlusal adjustment.

<4month follow up>

Fig 7. (a) 4 months follow-up periapical radiograph.
(b) 4 months follow-up intra-oral clinical photograph.

IV. DISCUSSION

Preservation of the gingival biologic width is critical for the long-term success of the treatment. For optimal periodontal health, 3-4mm distance from the alveolar crest to the coronal extension of the remaining tooth structure is recommended. The orthodontic procedure allows the movement of the fracture line above the gingiva, which optimizes marginal sealing. After extrusion, appropriate stabilization period is necessary for reorganization of PDL fibers. The typical stabilization time ranges from 6 to 12 weeks, generally requiring about 1month for every 1mm of extrusion. If maintenance is too short, relapse may occur. In this case, fracture margin is located 2mm subgingival and 1mm upper to crest, considering biological width, the total extrusion amount was aimed at 2mm, with a stabilization period set to 2 months.

V. CLINICAL RELEVANCE

Orthodontic extrusion is the least invasive treatment option for crown-root fractures that invade the biologic width. This procedure enables more favorable prosthodontic coronal restoration without causing loss of bone or periodontal support. However, the treatment duration is relatively long and esthetically unpleasing during the process. Therefore, Clinicians should consider the advantages and disadvantages of each treatment option and select appropriate restoration methods for crown-root fracture based on the specific clinical situation.

VI. REFERENCE

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TREATMENT OF LARGE PERIAPICAL LESIONS CAUSED BY TRAUMA: A CASE REPORT

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CP078

Aim

The aim of this case report is to describe the treatment of a large periapical lesion in the lower incisors in a patient with a history of trauma.

Introduction

Acute apical abscess is a spontaneously painful and pressure-sensitive periapical pathology that starts rapidly with an inflammatory reaction resulting from pulpal infection and necrosis (Chandra, 2014). Lesions may occur in the periapical region as a result of delayed treatment of pulp inflamed as a result of trauma. There are many case reports showing that teeth with extensive periapical lesions heal with non-surgical endodontic treatment (Öztan, 2002).

Figure 1: Rubberdam isolation

Case Presentation

A 14-year-old systemically healthy male patient was admitted to ZBEU Faculty of Dentistry, Department of Endodontics with complaints of pain, swelling and abscess in the lower incisors region (Fig. 8). Anamnesis revealed that the patient had a history of trauma 3 years ago. Radiologic images revealed a large periapical lesion involving teeth #31,32,41 (Fig. 2). Tooth #42 showed a positive response to the vitality test.

In the first session, access cavities were opened under rubber dam isolation (Fig. 1). Irrigation was performed using distilled water and 5.25% NaOCl with passive ultrasonic activation. Root canals were prapered with Ni-Ti rotary instruments to a size of 35/04 (Endoart, Incidental, Turkiye). There was no drainage in the root canals. Calcium hydroxide Ca(OH)2 was placed after the root canals were dried with sterile paper cones. The abscess in the buccal periapical region of teeth #31,41 was drained through a vertical incision (Fig. 9). After 10 days, it was determined that the symptoms had resolved. Before the final irrigation, the relevant teeth were reopened and Ca(OH)2 was removed with a number 15 H file and ultrasonic tip.Final irrigation of the root canal was performed as 5.25% NaOCl, distilled water, 17% EDTA with ultrasonic activation was applied at each stage. Root canal filling was performed with bioceramic paste (Dia-Root Bio Sealer) and gutta-percha (Diadent, Chongju, Korea) using the lateral condensation technique (Fig. 5). Clinical and radiographic examination after a one-year follow-up period showed that the affected teeth were asymptomatic and the large periapical lesion was healed (Fig. 6,7,10).

Figure 2: Preoperative radiograph

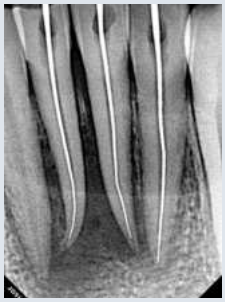

Figure 3: Working length radiograph

Figure 4: Master cone radiograph

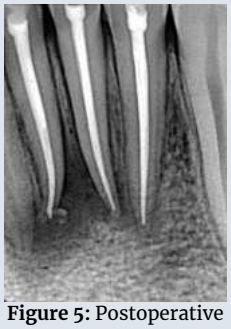

Figure 5: Postoperative radiograph

Figure 6: 3 months follow up

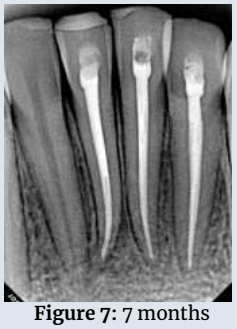

Figure 7: 7 months follow up

Figure 8: Apical abscess

Figure 9: Drainage after incision

Figure 10: 3 months follow up buccal region

Discussion

During root canal treatment, it is known that activated irrigation applications, removal of the biofilm layer and the use of intra-canal medication is an important step in reducing the number of bacteria in the root canal due to insufficient biomechanical preparation (Riccitiello *et al.*, 2011). Removal of the smear layer from the root canal dentin surface in both preparation and irrigation ultrasonic systems in order to remove can be utilized. Irrigation of these systems solutions have been reported to increase their efficacy (Van der Sluis *et al.*, 2006)

In this case, ultrasonic endodontic tips were preferred because of their ability to remove biofilm and increase the effectiveness of irrigation solutions.

Conclusion

In endodontic treatment, activation of irrigation with ultrasonic tips is an effective treatment option for the removal of medication and the removal of biofilm layers.

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Multidisciplinary Approach to a Dentoalveolar Trauma: A Case Report

CP079

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Aim:

Presentation of the endodontic and restorative treatment of a dental trauma case including an alveolar bone fracture.

Introduction:

The maxillary incisors are located in the region most affected by dental trauma. In this area, alveolar bone fractures may accompany dental injuries; however, the endodontic diagnosis of teeth in the fracture line does not differ from general trauma diagnoses. Early intervention and patient compliance are crucial for successful healing.

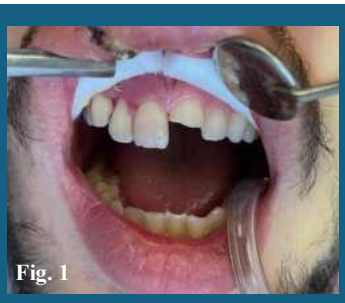
Fig. 1


Fig. 2

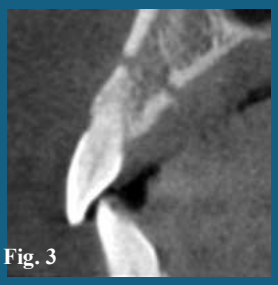
Fig. 3


Fig. 4

Case Presentation:

An 18-year-old healthy male patient presented to our clinic for the treatment of dental injuries following emergency intervention for soft tissue lacerations on the lips. (Fig. 1) The injuries occurred due to a blow to the maxilla during a physical altercation. Clinical examination revealed mobility in the region of teeth #11 and #12, which was confirmed by periapical radiography (Fig. 2) and cone-beam computed tomography (Fig. 3), leading to the diagnosis of an alveolar bone fracture. Additionally, a non-complicated crown fracture was detected in tooth #21. Pulp vitality tests, including cold and electric pulp testing, showed that tooth #21 responded positively and was considered healthy, while teeth #11 and #12 gave negative responses. On the same day, the fractured segment was repositioned, and a semi-rigid splint (0.25 mm monofilament nylon line) was applied (Fig. 4). The pulpal surface of tooth #21 was covered with glass ionomer cement (Imicryl, Nova Glass F) and referred to the Department of Restorative Dentistry. One week later, root canal treatment was initiated for the non-vital teeth, and calcium hydroxide was used as an intracanal medicament. Two weeks later, the treatment was completed with gutta-percha filling. After monitoring mobility, the splint was removed at the end of eight weeks. During this visit, sensitivity tests for tooth #21 were repeated, but it showed no response. Therefore, root canal treatment was completed in the same session.

The patient was referred to the Department of Restorative Dentistry at our faculty for the completion of all restorative and aesthetic procedures. In the filling procedures to be applied over the root canal treatment, conventional glass ionomer cement was preferred by our restorative department as a dentin replacement material. This material was chosen not only because it can prevent leakage and discoloration caused by trauma, but also because its modulus of elasticity is the closest to that of dentin. The procedure was completed by applying composite material. (Fig. 5,6) Despite all these advantages, the conventional glass ionomer cement used creates the appearance of a void between the root canal filling and the coronal restoration due to its radiolucency.

At the 3, 6, and 12 month follow-ups, no clinical symptoms were observed, and radiographic evaluation showed signs of healing. (Fig. 7,8,9)


Fig. 5


Fig. 6


Fig. 7

3 months


Fig. 8

6 months


Fig. 9

12 months

Discussion:

In trauma cases, including CBCT in imaging increases the accuracy of diagnosis and treatment. The patient's follow up during the recommended periods plays an important role in monitoring the response to tooth sensitivity tests and intervening at the right time. In cases with early intervention, recovery can be achieved with sufficient splint duration and patient follow-up according to the IADT trauma guidelines and the needs of the case. Along with endodontic treatment, referring the patient to other necessary treatments in the relevant departments and performing them simultaneously can also speed up the process.

Conclussion and Clinical Relevance:

Traumatized teeth can heal if diagnosed properly with early intervention and appropriate advanced imaging techniques. Maintaining the teeth in the mouth with the necessary aesthetics is also possible through a multidisciplinary approach.

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Unconventional yet Functional Treatment of Dental Trauma – a Case Report after 15 Years

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Aim

Presenting an unconventional solution after oblique root fracture to discuss the definition of a successful treatment after dental traumatic injuries.

Introduction

Horizontal root fractures caused by dental trauma do not necessarily require endodontic treatment, as long as no signs of infection occur radiologically or clinically.[1]

Case Presentation

A 29-year-old male patient presented with a dental traumatic injury after falling off his bike in 2009 [→1]. Tooth 21 was completely avulsed, tooth 11 suffered an oblique root fracture in the coronal third of the root [→4]. Despite inadequate storage, tooth 21 was replanted, splinted [→2] and root canal treatment was initiated on both central incisors [→3].

As the coronal fragment of tooth 11 was still remained mobile after several weeks of splinting, root canal treatment was performed through both fragments with a fractional apical root canal filling combined with a fiber post [→5,6]. Although the fracture line was still visible one year later on the X-ray picture [→10], stability increased and the patient showed no complaints except for aesthetics, which was addressed by insertion of a new metal-ceramic crown [→7,8,9].

Fifteen years after trauma, the patient presented with complaints and radiographically visible root resorptions on tooth 21 [→13], which had been adhesively fixed to the neighboring teeth by his general dentist [→11,12]. As tooth 11 was still stable and without complaints, only tooth 21 was extracted and replaced by an implant [→14-17].

Discussion

As hydraulic calcium silicate-based materials can present good healing outcomes, when used in the coronal fragment up to the fracture line after intra-alveolar root fractures[2], those materials might have the potential to improve healing processes in the prominent fracture area compared to the use of self-adhesive resin cements alone. As the patient was already an adult when the trauma occurred, extraction of tooth 11 and consecutive implantation would have been a valid treatment option.

Clinical Relevance

Although after intra-alveolar root fractures root canal treatment is not necessary in most cases or, if needed, limited to the coronal fragment[1], the case presented showed that dental traumatology cases often require individual treatment concepts. Clinical success cannot only be defined by radiographic findings but should always take patients' satisfaction and the absence of clinical symptoms into account[3].

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The authors thank the colleague Dr. Frederic Ziebarth (private practice, Erlangen, Germany) who placed the implant regio 21 and provided the pre-op X-ray picture.

Decoronation Procedure following Complications after Avulsion of a Central Incisor

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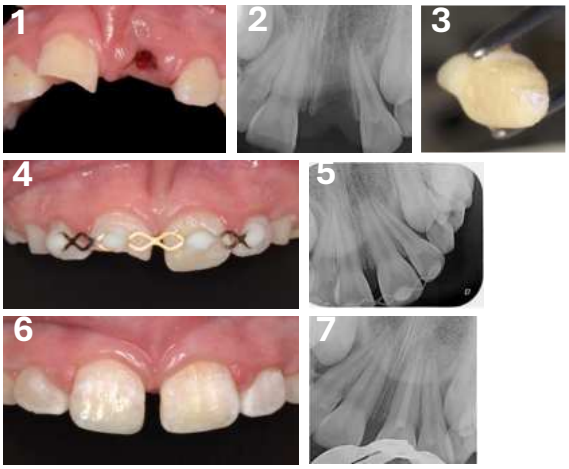
Aim

To present the treatment option of decoronation in pediatric patients suffering root resorption after avulsion with inadequate post-traumatic storage conditions before replantation.

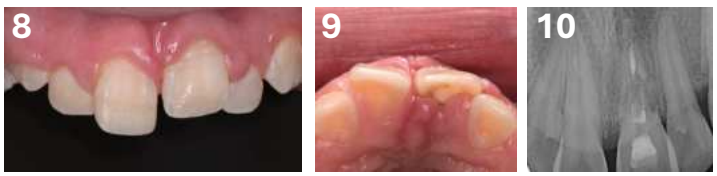
Introduction

Dental avulsion is a common traumatic dental injury in children that can result in resorptive processes on the root, when periodontal ligament cells suffered necrosis caused by the trauma and insufficient post-traumatic storage conditions of the avulsed tooth. In growing patients, treatment options have to focus on both dental function and aesthetics as well as bone and soft-tissue development.



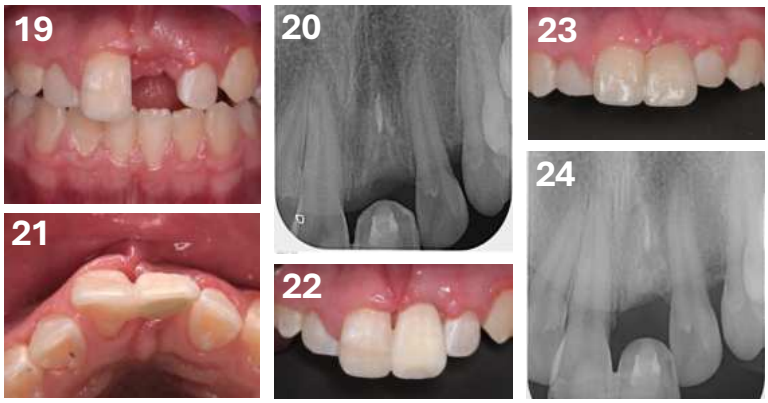
Case Presentation

A nine-year-old female patient presented with an avulsed central left incisor, which was stored dry in a pocket for 30 minutes, then in a tooth rescue box before replantation [→1,2,3]. A titanium trauma splint was applied, and root canal treatment was initiated the following day with a corticoid-antibiotic paste as an intracanal dressing [→4,5]. Three weeks later, the splint was removed, chemical and mechanical root canal preparation was performed, and calcium hydroxide was inserted [→6,7]. After 9 months, replacement resorption was detectable on radiographs and clinical infraposition confirmed the diagnosis [→8,9,10].



Following national guidelines, decoronation was chosen as therapy in accordance with patient and parents. A muco-periosteal flap was prepared for surgical access [→11]. Decoronation was performed at bone level using a surgical bur under saline cooling [→12]. The tooth crown was removed in toto, cleaned from residual tissue, sealed with flowable resin-based composite and adhesively fixed as a natural tooth replacement [→13-16]. The fit of the functional ortho device was checked and the patient could leave with a smile after surgery [→17,18].

Four weeks after surgery, clinical wound healing and X-ray picture showed no signs of inflammation [→19,20]. The crown of tooth 21 was re-attached adhesively supported by a glass fiber splint with improved aesthetics and stability [→21,22]. Eight months later the patient was recalled with neither clinical complaints nor radiographic pathologies [→23,24].



Discussion

Long-term success after avulsion depends on various factors, including appropriate storage solutions, timely replantation, and the use of trauma splints[1]. Root canal treatment with corticoid-antibiotic pastes and calcium hydroxide can help prevent pathologic changes, but resorptions might still occur[2].

Clinical Relevance

The presented case highlights that even initially promising therapies following guideline recommendations after dental trauma can result in complications like root resorption and ankylosis. Especially in children and adolescents it is of utmost importance to regularly schedule clinical and radiographic check-ups and to adjust treatment plans. Decoronation procedures using the natural tooth crown as an adhesively fixed replacement offers an aesthetic, affordable solution that can be adjusted when required by patients' development.

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Funding and Acknowledgement

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CP083

Conservative Management of Combined Crown-Root and Root Fractures in a 17-Year-Old Patient: A Fragment Bonding Strategy to Delay Tooth Replacement

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AIM - To describe the conservative management of combined crown-root and root fractures in a 17-year-old patient, emphasizing the possibility of subgingival fragment bonding and the selective endodontic management of a fragmented tooth

INTRODUCTION - Managing complex crown-root fractures presents significant challenges, requiring effective emergency intervention, pulp temporization, preservation of periodontal tissues and solutions for both short- and medium-term restoration. The primary objective is to preserve the therapeutic potential for future restoration once the situation has been stabilized.

This case involves a young patient who experienced multiple traumatic injuries. Preserving the natural tooth was essential, as alternative prosthetic options had to be delayed or were hindered due to trauma to the surrounding teeth

CASE PRESENTATION

A 17-year-old patient was referred to the dental emergency unit after a road traffic accident and spending the night in a coma in the general emergency department


Pre-operative facial view


Pre-operative occlusal view

Clinical and radiographic evaluation (intra and extra oral) revealed :

- Tooth 21: crown-root fracture extending subgingivally on the palatal aspect, with pulp exposure, and root fracture located in the apical third
- Tooth 11: complete avulsion


Sagittal section of tooth 21


Palatal, vestibular, and mesial view of the coronal fragment

Emergency Treatment :

- 11: was immediately replanted
- 21: a conservative strategy was adopted to preserve the natural tooth. A temporary IRM® filling was placed at the canal orifice of the middle fragment, followed by fragment bonding between the coronal and middle thirds using flowable composite
- A passive flexible splint was placed from 13 to 23, and follow-up radiographs were taken


Post-emergency clinical view


Post-emergency 21 radiograph

Endodontic treatment of 11 was completed following a calcium hydroxide dressing. For 21, an MTA® apical plug was placed in the middle fragment, and a fiber post was used to assure the bonding between the middle and coronal segments

Follow-up at 3, 6, and 12 months showed the stability of the situation with no clinical symptoms and no signs of deterioration, notably with no loss of periodontal support, especially bone. Clinical tests demonstrated stable tooth mobility and no increase in pocket depth


1 year post-treatment

Post-treatment periapical radiograph

DISCUSSION - For tooth 21, the initial crown-root fracture was treated by reattaching the fragments, and the root fracture was managed with an MTA® apical plug. At the one-year follow-up, no additional prosthetic solutions were needed at this stage. Although the IADT guidelines do not recommend reattachment, our particular situation, coupled with the young age of the patient, led us to compromise by preserving the natural tooth, as we had no guaranteed alternatives. Other reported cases have proposed orthodontic extrusion; however, due to the root fracture in this case, these options are not feasible. The reattachment of the fragments preserved periodontal support, allowing for future restorative options. This management was enabled by the patient's compliance, understanding of the treatment compromise, and lifestyle changes, including improved oral hygiene and modified masticatory habits

CLINICAL RELEVANCE - This case highlights the importance and feasibility of conservative management in complex crown-root fractures, particularly in young patients. The ability to preserve the natural tooth structure through fragment reattachment and selective endodontic treatment provides a viable and effective alternative to more invasive solutions. By preserving periodontal support and maintaining the therapeutic potential of the tooth, this approach offers valuable time for future restorative options while avoiding premature prosthetic interventions.

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Florid cemento-osseous dysplasia misdiagnosis with multiple root perforations on lower incisors-a case report

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AIM To present diagnosis of cemento-osseous dysplasia and prevent unnecesarry root canal treatment.

INTRODUCTION

Classification The cemento-osseous dysplasias (CODs) are fibro-osseous lesions occuring in tooth-bearing areas of the jaw, and can be divided into focal, periapical, and florid cemento-osseous dysplasia, based on the location and extend of jaw involvement (1).

Epidemiology Florid cemento-osseous dysplasia (FCOD) is a multifocal lesion, that can occur in all four quadrants, with a predilection for bilateral involvement of the mandible (2). It mostly affects middle-aged females, rarelly occuring before the age of 20 (3).

Clinical findings. The patients are commonly asymptomatic the affected teeth are usually intact or minimally restored, and they respond normally to pulp testing (4).

Radiographic findings They vary, based on the stage of the dissease in which the radiographs are taken. Early lesions are radiolucent, with time they change into mixed radiolucent radiopaque lesions, that are well circumscribed and have a well-defined radiolucent border. With aging, the lesions become more uniformly radiopaque, with a less defined appearance (5).

Diagnosis It is usually made based on the clinical presentation and radiographic findings, in cases of uncertainty a biopsy can be performed (4).

Treatment No treatment is needed, aside regular follow-ups (2).

CASE PRESENTATION A 46-year old female patient was referred to our department for endodontic treatment of teeth 32, 31 and 41. She has a medical history of hypertension, no known medications or allergies and no past dental trauma. Root canal treatment of all three teeth was initiated by the referring dentist. The teeth had lingual temporary restorations, they were tender to percussion and had increased mobility. Pulp testing with cold and electro tests was performed. Teeth 32, 31 and 41 gave negative results, while teeth 33, 42, 43 and 44 gave positive records. A sinus tract was present 3 mm from the buccal gingival margin of tooth 41. Previous CBCT radiograph (Figures 1a-e) was obtained and a periapical radiograph of teeth 32, 31 and 41 was acquired (Figure 2). In the first session rubber dam was placed on teeth 32, 31 and 41. The temporary restorative material was removed and access cavities were revised. Root perforations were clinically discerned with the help of a DOM. The perforation sites were irrigated with saline, hemostasis control was maitained with a cotton pellet. Perforations were repaired using a fast setting bioceramic material (Biodentine). When shaping and cleaning was perforemed, inflamed vital pulp tissue was present in the apical portion of the canal. Local anestethic was adimistered. Shaping was done using a rotary file (Reciproc blue), CaOH was placed and access cavities were temporarily sealed (Cavit). The patient is currently waiting for root canal obturation.

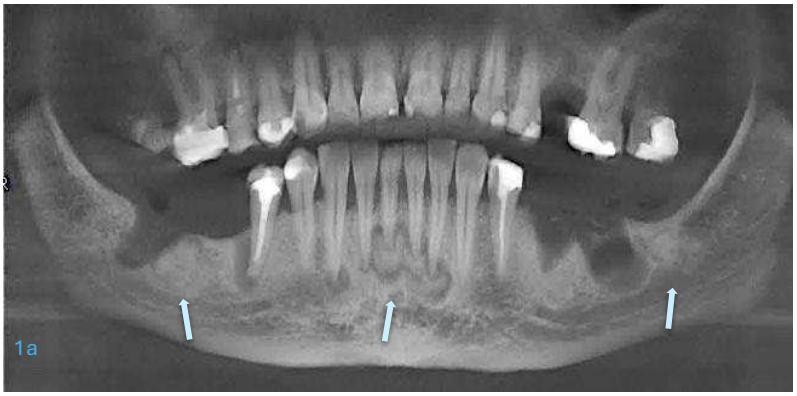

Figure 1a: A panoramic view of a CBCT radiograph, showing radiopaque-radiolucent lesions in the periapical region of teeth 32, 31, 41, 42 and 43 with a well circumscribed radiolucent border. Note radiopaque lesions with a radiolucent border near the area of the extracted teeth 36 and 47.

Figures 1b-1e: A sagittal view of teeth 43, 41, 31 and 32 respectively, showing periapical radiopaque lesions with a radiolucent border.

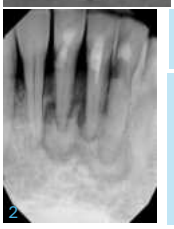

Figure 2: Preoperative periapical radiograph showing well circumscribed radiolucent-radiopaque lesions of the periapical region of teeth 32, 31 and 41 with a well-defined radiolucent border. Root perforations with deviated chamber accesses are visible in the cervical aspect of the root of teeth 32, 31 and 42

DISCUSSION In the clinical case FCOD was diagnosed based on the clinical and radiographic findings. The patient was a middle aged female, with multiple radiolucent-radiopaque lesions on the mandible. Affected non endodontically treated teeth tested positive to pulp testing. The fact, that the perforated teeth still had some vital pulp tissue present at the begining of our treatment helped solidify our diagnosis.

CLINICAL RELEVANCE Although rare, it is important to consider FCOD as a differential diagnosis for periapical pathology and eliminate nonendodontic origin of lesions of tooth-supporting structures and thus avoid unnecesarry root canal treatment.

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European Society of Endodontology (ESE) 22nd Biennial congress

Splendore-Hoeppli phenomenon in apical actinomycosis: 2-year follow-up.

CP085

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Introduction: Actinomycosis is a chronic infectious disease caused by obligate or facultative anaerobic Gram-positive bacteria[1,2]. It is uncommon and presents with various clinical manifestations, such as abscesses, fistulas, and fibrosis, affecting both soft and hard tissues. It is clinically and radiographically indistinguishable from apical periodontitis.

Case presentation: A 25-year-old female patient, with no relevant medical history, presented for retreatment of tooth 46 due to a persistent apical lesion and history of chronic apical abscess. Clinical and radiographic examination revealed an obstructed root canal and a diffuse periapical radiolucency (Fig. 1 A-C). A diagnosis of Acute apical abscess was established, and the patient was referred for exploratory surgery. Histopathological examination of the biopsy revealed the Splendore-Hoeppli phenomenon, indicating the presence of actinomycosis (Fig. 2). A non-surgical endodontic retreatment approach was chosen. Follow-ups were conducted at 7 days, 1 month, 3 months, 1 year, and 2 years (Fig. 1 D-H). The patient showed no signs or symptoms, and radiographically, bone healing of the lesion was observed.

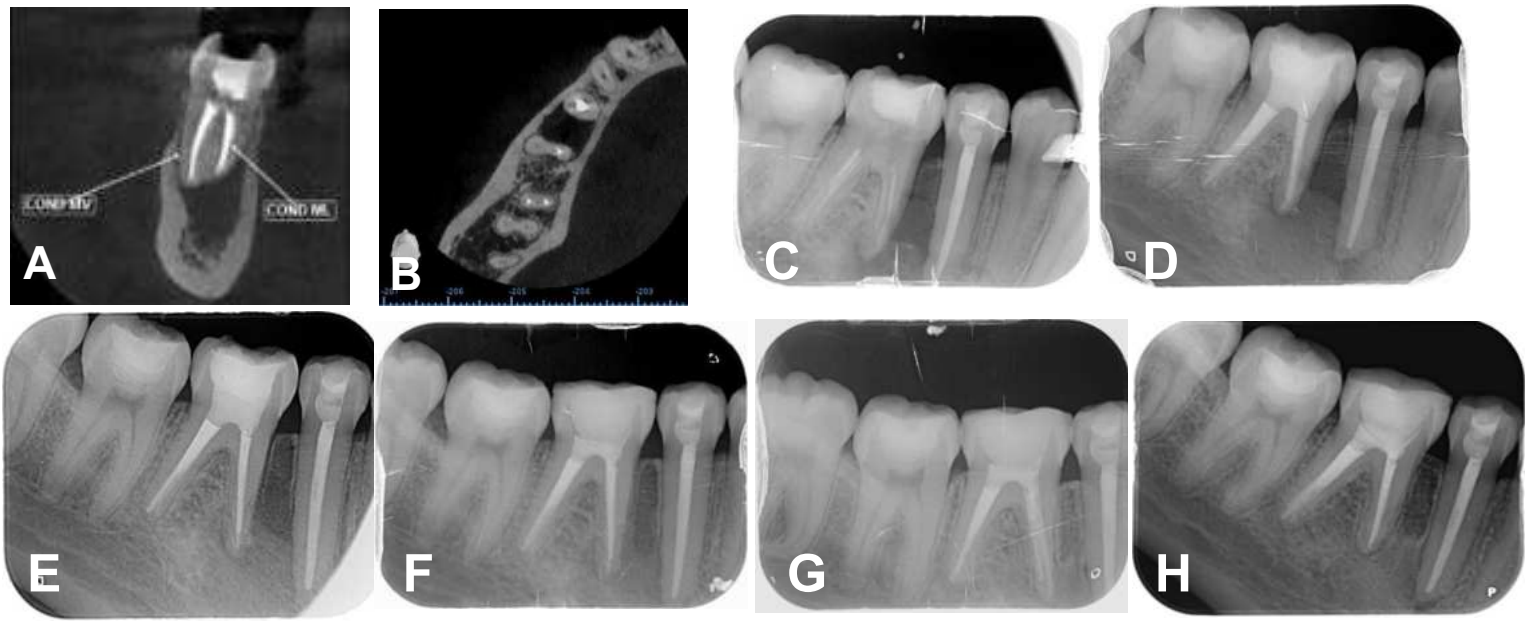

Figure 1: A) and B) Pre-treatment CBCT slices, C) Pre-treatment radiograph, D) Immediate post-obturation control, E) 30-day follow-up, F) 3-month follow-up, G) 12-month follow-up H) 24-month follow-up.

Discussion: Apical actinomycosis usually presents histological patterns described as the Splendore-Hoeppli phenomenon. This is characterized by microorganisms or biologically inert substances surrounded by eosinophilic material radiating from them[3-5,8]. Depending on the affected site, the infection may show heterogeneous behavior and different clinical presentations. The treatment for apical actinomycosis is primary endodontic therapy or retreatment to eliminate the intraradicular infection[4-7].

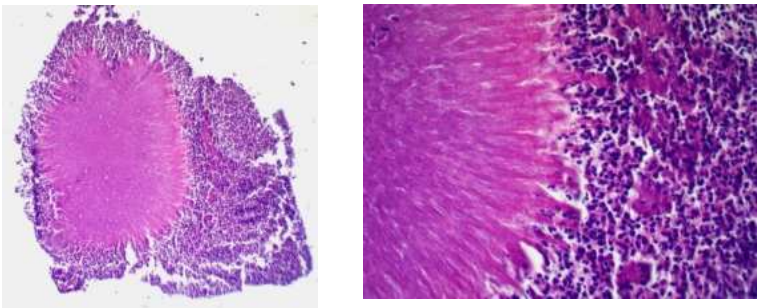

Figure 2: Histological section. Inflammatory reaction rich in eosinophils, histiocytes, epithelioid cells, and giant cells. Deposition of antigen-antibody complexes and inflammatory cell debris.

Clínical Relevance: Actinomycosis is a rare and underdiagnosed condition due to its various clinical presentations. Sample collection and histopathological study are the only methods to reach a definitive diagnosis. To understand the role of *Actinomyces* spp. in persistent apical infections, it is recommended to collect samples during surgical interventions for histopathological analysis.

References

CP086

Implant As The Fate Of Improper Restored Root Canal Treated Tooth

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Aim: This poster presentation aims to increase the awareness of restoring the endodontically treated teeth with the proper restoration.

Introduction: The coronal seal acts as a physical barrier between the oral environment and the root canal filling material. It's extremely important. Even if you have worked under a rubber-dam, done a good mechanical removal using endodontic files, done a good chemical removal of microbes using irrigant, followed by a excellent obturation and apical sealing; in order to completely strangulate bacteria, you must achieve a perfect coronal seal. Gutta percha by itself can't resist the percolation/penetration of bacteria inside the root canal system. This is why the coronal seal is so important.

Case Presentation: A healthy 42-year-old male patient has attended our clinic after lingering pain in his lower left quadrant. His chief complaint was he could not sleep well for the last five days. After clinical and radiographic examinations were done and according to the signs and symptoms the diagnosis was symptomatic irreversible pulpitis with normal periapical tissue. The treatment plan was to do a root canal treatment for lower left second molar as sensibility test showed anormal respond in comparison to other normal teeth then restore the tooth with an indirect restoration. On distal surface of the tooth there was a very deep cavity as shown in (Fig.1a,1b). After mandibular block anesthesia was done and under rubber-dam isolation caries excavation was initiated and unsupported enamel was removed. After that deep marginal elevation was achieved for the distal surface to cut off the leakage from that side. Then, the root canal treatment was initiated. Working length was measured using Propex Pixi (Dentsply Sirona, Erlangen, Germany). After that mechanical preparation was done using VDW Rotate (VDW, Munich, Germany) with chemical disinfection by sodium hypochlorite (5%) with continuous irrigation and activation by sonic activator EndoActivator (Dentsply Sirona, Erlangen, Germany). The root canal system was obturated by sealer based obturation technique with VDW gutta-percha and calcium silicate-based root canal sealer (Ceraseal Metabiomed, Korea). The post-operative periapical X-ray was taken (Fig.2). The tooth was restored using light cured composite G-ænial posterior composite (GC International AG, Luzern, Switzerland) and cusp reduction was done. The second appointment was planned to prepare the tooth for indirect restoration and take an impression. Unfortunately, the patient did not show up. After 14 months the same patient applied to the clinic with pain on the same quadrant the intra-oral examination showed a crack tooth syndrome (Fig.3). The treatment plan changed to extraction of the tooth and two implants to restore the function in that quadrant (Fig.4,5).


Fig:1a


Fig:1b


Fig:2


Fig:4


Fig:3


Fig:5

Discussion:

A study by Dr. Torabinejad suggested that well sealed canals with poor coronal sealing can be re-penetrated by bacteria up to the apex for 2-3 weeks[(1)]. This is very important because if the temporary filling you have done can't serve the patient for two weeks, you have to re-do the root canal treatment and re-doing the treatment is harder on so many levels. So you need to optimize the coronal seal from the very beginning. Better safe than sorry, get it right from the first place. Before starting the root canal treatment, we have to assess the amount the remaining tooth structure. It is accepted that root-treated teeth are more brittle than normal teeth[(2)]. In posterior teeth, large cuspal heights and group function can generate greater lateral forces compared to canine-protected occlusions[(3)]. In molars, factors such as occlusal patterns and parafunctional habits play an important role[(4)]. In this case, after deep marginal elevation was done and assessment of the remaining tooth structure, it was suggested to restore the tooth with an indirect restoration, but the patient did not respond to this recommendation and unfortunately lost the tooth 14 months later. Crowns have been proven to function well as a long-term restoration for endodontically treated teeth[(5)].Even more the success rate of indirect restoration increases with the number of remaining walls[(6,7)]. So, in such cases, it is important to increase the education of the patients about the importance of covering the reaming tooth structure probable in order to increase the potential success rate of the treatment and to ensure that indirect restorations will not be an over-treatment.

Clinical relevance: Root canal treatment prevalence is increasing worldwide as our main goal is to save the tooth and periapical area free of infection. It is also important to restore the tooth probably to ensure that our treatment last longer and patient satisfaction as a result. The first principle of medicine is do not hurt our patient, so we must increase the trust between us and our patients.

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Cone-beam computed tomography (CBCT) in Root Resorption: A Key Tool for Treatment Planning Despite Diagnostic Challenges

CP088

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Aim: To describe the use of CBCT in diagnosing and managing a rare resorption in a maxillary central incisor.

Introduction

CBCT is essential for accurately assessing both internal and external resorptive lesions, providing critical guidance for treatment. While it is not easy to definitively diagnose external cervical resorption (ECR) or internal root resorption (IRR) using two-dimensional periapical (PA) radiographs, CBCT—particularly axial views—offers a more definitive evaluation of the true nature of these lesions. Its successful application in individual case studies further confirms its reliability for diagnosis and treatment planning. (1,2).

External Cervical Resorption (ECR)

ECR lacks a classic radiographic appearance and may appear radiolucent, radiopaque, or mixed on periapical (PA) radiographs. Early ECR defects are nonbacterial and lack acute inflammation, but later, bacterial colonization of the dentinal tubules may trigger periodontal or pulpal inflammation. Lesions of external root resorption appear as cloudy radiolucencies in the cervical region of the tooth with poorly defined borders. The root canal walls remain visible and run vertically through the defect. This indicates that the resorptive process occurs on the external surface of the root rather than within the canal. (2,3)

Internal Root Resorption (IRR)

IRR is characterized by progressive dentin destruction due to chronic inflammation, with the pulp initially remaining partially vital (typically in the apical region) but eventually undergoing necrosis. Radiographically, the lesion presents as a well-defined, oval radiolucency, resulting in canal wall expansion and disruption of the pulp chamber outline, producing a characteristic balloon-like appearance. (4,5)

Case Report

A 19-year-old male in generally good health with a history of dentoalveolar trauma at the age of 9 was referred to the Department of Endodontics at Sheba Hospital. Two months earlier, initial endodontic debridement had been performed on teeth #11 and #12 by a general practitioner. The patient was referred for an endodontic evaluation due to suspected resorption in the middle third of the root canal.

Clinical examination revealed temporary palatal restorations on teeth #11 and #12. The teeth showed no sensitivity to palpation or percussion. Periodontal probing depths were within normal limits, measuring up to 3 mm

A **PA radiograph** of tooth #11 (Figure 1a) revealed an extensive, round radiolucent area in the middle third of the root. Intact canal walls were visible within the radiolucent enlargement. The patient was referred for CBCT to analyze further and diagnose the type of resorption.

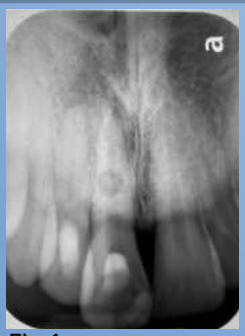
Fig.1a


Fig.1b


Fig.1c

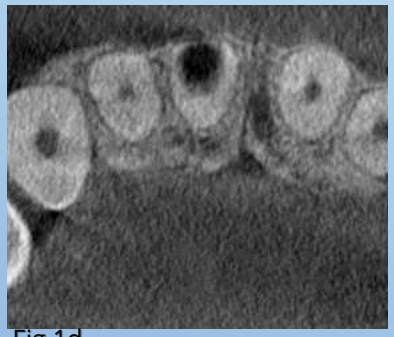
Fig.1d


Fig.1e

Sagittal and coronal CBCT planes (Figure 1b, 1c) revealed an irregular, well-defined radiolucent area in the middle third of the root, causing loss of continuity of the root canal walls. The absence of discernible canal borders within this region suggests resorptive or destructive changes affecting the dentinal structure.

The axial CBCT plane (Figure 1d) revealed a well-defined, round radiolucent area in which the root canal walls were not discernible. The radiolucency exhibited a narrow subcresᵾtal communication with the periradicular tissues. Adjacent to this communication, an additional radiolucent defect was observed, extending through the buccal cortical plate.

The diagnoses were previously initiated therapy, asymptomatic apical periodontitis, and root resorption with differential diagnosis: ECR or IRR with perforation (2).

A decision regarding the treatment plan was made: an internal approach involving chemomechanical preparation, adjunctive use of the XP Finisher, and obturation with a tricalcium silicate-based sealer and gutta-percha. (Figure 1e)

Cinical Relevance – In this case, CBCT did not provide a definitive diagnosis but facilitated the localization and size assessment of the perforation/point of entry, directly influencing the treatment plan. This is similar to cases of IRR with a narrow perforation/point of entry and ECR with a narrow perforation/point of entry.

Discussion

Diagnosing root resorption can be challenging, particularly due to the limitations of conventional radiographs. In this case, CBCT allowed for a more detailed assessment of the lesion's extent and cortical involvement. The presence of discernible root canal walls was more indicative of ECR rather than internal root resorption, although a definitive diagnosis remained inconclusive. While CBCT does not always provide a clear distinction between ECR and IRR with perforation, it significantly enhances visualization and influenced the treatment plan by facilitating the identification of the perforation.

Conclusion: The utilization of CBCT greatly enhanced the examiner's ability to formulate the most suitable treatment strategy, despite not providing a definitive diagnosis.

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Clinical Management of a Recurrent External Cervical Resorption: Case Report

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Aim: To present a surgical treatment alternative for external cervical resorption (ECR) following recurrence of initial therapy.

Introduction: CP089

ECR is a pathological process that originates at the cervical area of the tooth, generated by odontoclast activation. The ECR occurs in three stages: initiation, propagation, and repair (1). Treatment options include internal repair through endodontic therapy and external repair with or without endodontic treatment (2). The present case report describes an initial orthograde approach that resulted in recurrence after 5 years. Subsequently, a surgical approach was performed to preserve the tooth.

Case Presentation:

In 2018, a 12-year-old female patient was presented with an asymptomatic apical periodontitis and an ECR in tooth 2.1. The classification of the ECR was class 3 (Heithersay) (3) and 3BP according to Patel`s Classification (4)

The tooth showed no response to pulp sensitivity tests and exhibited bleeding on probing in the distal region where the resorptive defect was located. Based on the CBCT and periapical radiographs (Fig.1,2), an **internal repair approach was indicated through orthograde endodontic treatment.**

First appointment (2018):

- Endodontic access was performed to reach the resorptive tissue and the canal.
- Cleaning was made using ultrasonic activation (E3D Helse® Ultrasonic tip) and long-neck round burs (Meisinger® CA L 191A 012).
- After mechanical debridement, 90% trichloroacetic acid was applied for 1 minute, followed by calcium hydroxide medication (Ultracal) for 1wk.

Second appointment (After 1 week):

- The root canal and resorption defect were sealed with **Biodentine (Septodont®) through the access cavity via an orthograde** approach. (Fig.3,4)

Fig 1. Initial x-ray

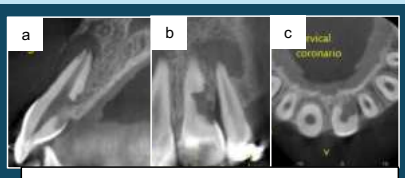

Fig 2. Initial CBCT (a) sagital view. (b) coronal view) (c) axial view.

Fig 3. Immediatly postop x-ray

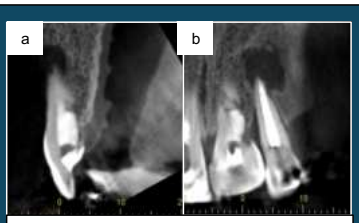

Fig 4. Immediatly postop CBCT. (a) sagital view. (b) coronal view.

Fig 5. 6m follow up X-Ray | Fig 6. 12m follow up X-Ray | Fig 7. 32 m follow up x-ray | Fig 8.40m follow up x-ray

Follow-up:

- The patient was monitored at 6m (Fig.5), 12m (Fig.6) , 32m (Fig.7), 40m (Fig 8), and 5 years post-treatment.
- At 5y, recurrence of the resorptive lesion was evident on radiographic and CBCT examination (Fig.9,10) and was proposed a surgical external repair

Surgical approach (2023 After 5y of initial treatment):

- A marginal flap was elevated to access the defect (Fig.11).
- The lesion was cleaned using ultrasonic tips and burs, and the defect was restored with Biodentine (Septodont®). (Fig.12-13)
- One week post-surgery, composite resin (Beautifull Flow Plus X A1, Shofu®) was applied over the Biodentine-exposed in cervical area for esthetic reasons.

12-month follow-up:

- Radiographic and CBCT evaluation revealed significant bone loss in the distal and palatal areas, but the tooth remained asymptomatic and free of infection with no symptoms. (Fig.14,15)

Fig 9. 60m (5y) follow up x-ray

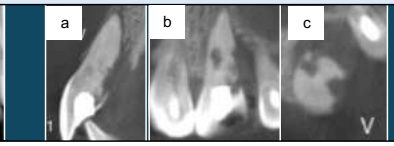

Fig 10. 60m (5y) follow up x-ray and CBCT revealed ECR`s recurrence (a) sagital view. (b) coronal view) (c) axial view.

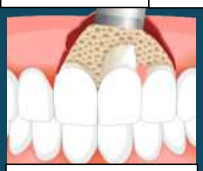

Fig 11. Schematic representation of surgical approach

Fig 12. Biodentine application during the surgery

Fig 13. Immediatly postop. (after syrgery

Fig 14. 1y postop x-ray after surgery approach

Fig 15. 1y postop CBCT after surgery approach. (a) sagital view (b) coronal view

Discussion: The treatment approach for ECR depends primarily on the location, accessibility, and extent of the defect. Current literature suggests that class 1, 2 and 3 Heithersay`s defects can be successfully managed through external repair with or without endodontic treatment, achieving a success rate of approximately 70% (5)

ECR recurrence remains a major challenge and is a key factor in treatment failure, as observed in this case 5 years after the initial procedure (6).

After recurrence, extensive structural damage of the tooth and periodontium led to the decision to perform surgical repair. Despite the initially guarded prognosis, one-year follow-up after surgery showed tooth survival and function.

Clinical Relevance:

This case highlights the importance of a comprehensive treatment plan when managing ECR. Recurrence is the most common complication following both surgical and orthograde approaches.

This report presents a surgical technique for managing recurrent ECR, following failure of an internal repair approach.

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PARIS CHALLENGES, OPPORTUNITIES AND NEW PERSPECTIVES IN ENDODONTOLOGY 3-6 SEPTEMBER 2025 ese

CP090

External cervical resorptions in maxillary canines

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Aim: External cervical resorption (ECR) is a difficult and underdiagnosed dental hard tissue lesion. Due to its asymptomatic course and frequently hidden location, it is often overlooked in regular dental check-ups. This case report aims to highlight the importance of early diagnosis and appropriate treatment strategies to preserve canines affected by ECR.

Introduction: Although the prevalence of ECR is estimated to be below 1%, improved diagnostic tools and increasing awareness in the dental profession have contributed to an apparent increase in cases (1,2). The exact aetiology of ECR is still unclear. Nevertheless, several risk factors have been identified, including orthodontic treatment, trauma, periodontal therapy and chemical challenges (e.g. internal bleaching) (1, 3). Maxillary incisors and molars are most commonly affected by ECR, as monitored by routine radiographs (3). However ECR can also occur in canines as a sequela to trauma or orthodontic treatment, yet is often only detected at an advanced stage due to a lack of radiographic monitoring.

Case presentation: A 59-year-old woman presented with occasional discomfort in the maxillary left canine (tooth 23). Clinical examination revealed normal responses to cold tests and percussion, but increased probing depths (4-5 mm) with palatal pus discharge (Fig. 1 a-b). Periapical radiographs showed a circular radiolucency (ø 5 mm) near the cemento-enamel junction (Fig. 2). Cone-beam computed tomography (CBCT) revealed the exact extent of the lesion with a wide palatal entry point and no hard tissue repair (Fig. 3 a-c). The ECR was identified as a 2Bd using the 3D Patel classification system (5). The patient had a history of orthodontic treatment but no known trauma or parafunctional habits.

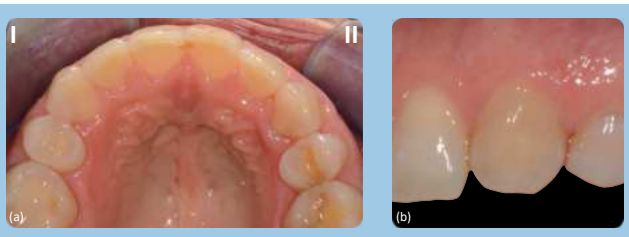

Fig. 1: Initial clinical situation: Palatal view, normal dental conditions, inflamed palatal gingiva on tooth 23 (a). Buccal view without clinical abnormalities. Patient came to the practice because of a second opinion (b). The private dentist did not find any cause for her discomfort and did not take any radiograph.

Fig. 2: Periapical radiograph with a prominent intraradicular radiolucency

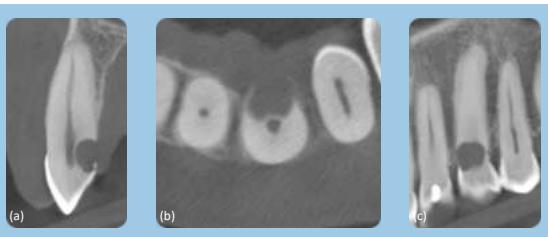

Fig. 3: CBCT findings: The sagital section clearly shows the extension of the ECR in the coronal apical direction. The pulp is only protected from the resorption tissue by a thin layer of (pre)dentin (a). In the axial section, the mesio-distal expansion is particularly obvious. The tendency of the resorption to expand in a circumpulpal direction can also be seen (b). View of the coronal section (c).

Treatment: Due to the lesion's size and symptoms, a two-step approach was performed:

1. **Endodontic treatment:** The root canal was prepared chemo-mechanically (ProTaper Gold, F5, Dentsply Sirona) and filled using warm vertical compaction (AH Plus sealer, gutta-percha) (Fig. 4 a-b).
2. **Surgical management**: A palatal muco-periosteal flap was elevated, and the resorptive tissue was removed completely. Bleeding was controlled and a minimal crown lengthening was performed. The cavity was filled with a flowable composite (SDR® flow+, Dentsply Sirona), and the flap was repositioned and sutured (Fig. 5 a-d).

At the one year follow-up, the patient was asymptomatic, with stable probing depths and no signs of inflammation (Fig. 6).

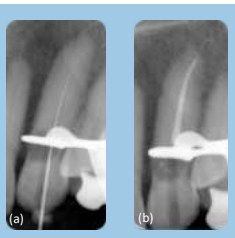

Fig. 4: X-ray measurement with a ISO 15 K-file to check the endometric length determination (a). Control radiograph of the completed root canal filling (b).

Fig. 5: Course of the surgical procedure: The defect was visualised after sulcular incision palatally. The resorption tissue is still visible (a). The resorption tissue was removed completely using diamond and rose burs under water cooling (b). The bleeding was stopped with pellets soaked in 25% aluminium chloride gel (ViscoStat Clear, Ultradent). The cavity was then filled adhesively with a flowable composite (SDR® flow +, Dentsply Sirona) and carefully polished (c). The flap was readapted and fixed with absorbable sutures (5-0 VICRYLTM, Ethicon), as the patient was unable to attend a follow-up check for suture removal (d).

Fig. 6: One year follow-up control radiograph.

Discussion: Canines are frequently missed in routine radiographic examinations, which may explain why ECR is often detected late in these teeth (4). ECR is characterised by resorption of the root surface due to loss of the protective cementoid (precementum) layer, exposing the underlying mineralised tissue to osteoclastic activity (2, 4). Orthodontic forces have been associated with ECR, especially in canines. These teeth require frequent complex movement due to eruption deviations, making them susceptible to ECR.

Typically, ECR lesions develop in the cervical region of the root, where they infiltrate laterally and circumferentially around the pulp. The 2D classification according to Heithersay (1 to 4) relates the severity of the lesion to treatment prognosis. Lesions categorised as grade 3 or 4 have a poor prognosis due to the limited restorative options (1). Radiographically, the ECR appears as an irregular radiolucency that differs from the pulp chamber. A high-resolution CBCT can be used to determine the extent of the defect and so facilitate treatment decisions. Patel and co-authors have published a classification specially adapted to three-dimensional imaging with corresponding treatment recommendations (5, 6). Moreover, apparent repair of ECR by hard tissue can lead towards monitoring rather than intervention (7).

Early detection of ECR is crucial. ECR can remain undetected until signs and symptoms manifest (4), at which point complex interventions are required. The first clinical sign of ECR, often referred to as 'pink tooth', typically occurs at a late stage of progression, when the lesion has already caused significant damage (Fig. 7). Therefore, sensitivity testing and radiographic monitoring in patients with extensive orthodontic treatment or history of trauma, can help to improve early detection of ECR in canines.

As shown in Figures 8 and 9, the lack of routine radiographic monitoring of canines can lead to delayed detection of ECR, making conservative treatment impossible. However, as shown in Figure 10, if detected early, combined internal and external treatment is possible.

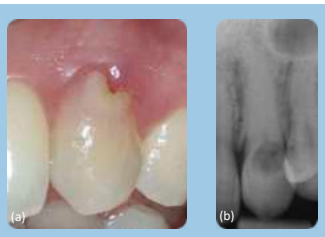

Fig. 7: Clinical manifestation on a maxillary canine of a „pink tooth", which is caused by the ingrowth of the heavily perfused resorptive tissue which shines through the thin residual hard tissues (a). Radiograph of the affected tooth (b).

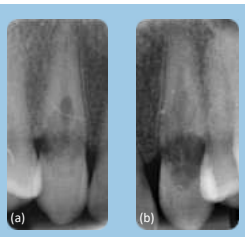

Fig. 8: External cervical resorption of a tooth (a) 13 and (b) 23 of a Heithersay's class 4 in a 39-year-old female patient after orthodontic treatment during adolescence.

Fig. 9: External cervical resorption tooth 13 shown (a) on the X-ray film of a Heithersay's class 4, (b) in the CBCT of a 3D Patel classification 3Dp.

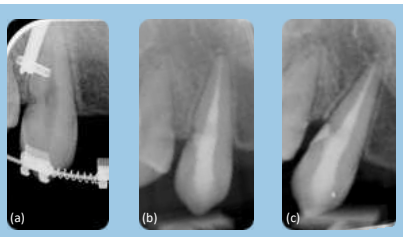

Fig. 10: External cervical resorption of a tooth 13 after orthodontic movement in a 20-year-old patient. (a) Situation with orthodontic appliance still in situ, (b) after an attempt to completely peel the resorptive defect from the inside, and (c) after external correction.

Conclusion : The increasing prevalence of ECR necessitates greater awareness and proactive radiographic monitoring, particularly in patients with risk factors such as orthodontic treatment and dental trauma. Canines require special attention in that regard, as they are not radiographically monitored for caries. Early diagnosis facilitates conservative treatment approaches, preserving tooth structure and function.

Clinical Relevance

- ECR is often asymptomatic and diagnosed incidentally.
- Orthodontic treatment is a significant risk factor.
- CBCT is valuable for lesion assessment.
- Timely intervention improves prognosis.

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Management of External Cervical Resorption
A Case Report

CP091

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Aim

This report describes an upper right canine with external invasive cervical resorption. The case was managed via an external approach, and the pulp status was further monitored.

Case presentation

A 61-year-old male patient was referred from his general dentist for suspected resorption of tooth 13 (Fig. 1). A pink-red defect (Fig. 2) was present on the mesio-cervical aspect of the tooth. The patient was in good general health and asymptomatic. There was no history of trauma or orthodontic treatment. The clinical tests revealed no pain on percussion or palpation, and the tooth tested positive to the cold test. The reaction was similar to the reaction of the contralateral canine and adjacent teeth. The periapical radiograph (Fig. 3) revealed a large defect around the cervical area that extended under the crestal bone. The contour of the root canal was visible through the defect. There was no apical radiolucency or abnormal PDL on the radiograph. Tooth 13 was diagnosed with external invasive cervical resorption and categorised as Class 3 according to the Heithersay classification[1]. A small view CBCT was taken, and the defect was classified as 2BP according to the Patel classification[2]. The CBCT showed the portal of entry on the buccal side of the tooth with a large extension of the defect to the mesial and palatal sides. The defect was in close proximity to the root canal with possible but not obvious communication (Fig. 7).

The defect was managed through an external approach[3]. A buccal and palatal flap were raised, and limited root lengthening was performed. The defect was isolated with a dental dam (Fig. 8) using clamps on teeth 13 and 16. In order to improve the visibility and to create better access, the buccal and palatal extent of the defect were enlarged (Fig. 9). The granulation tissue was removed, and the defect was rinsed with 5% NaOCl (Fig. 10). A visual examination was carried out, and it did not reveal clear communication to the pulp. Indirect pulp capping was performed using MTA putty (Fig. 11). The interproximal side was restored using an automatrix for the deep margin elevation (Fig. 12) and a transparent matrix for restoring the proximal contour. The restoration was polished extensively (Fig. 13), and the result was evaluated radiographically (Fig. 4) before closing the buccal and palatal flaps.

Discussion

As there was no obvious communication with the root canal and no signs of infection, no root canal treatment was initiated. The patient was scheduled for removal of sutures and evaluation at 1 week and follow-up appointments at 1 , 3, and 6 months (Fig. 6).

Taking CBCT was crucial for understanding the real extent of the defect and for choosing the best approach[2]. The interproximal position of the defect was hard to access and complicated the clinical procedure. Thorough preparation of the case was essential.

Conclusion and Clinical relevance

The aetiology of external invasive resorption is still poorly understood. The contemporary treatment is focused on cleaning and restoring the defect. The PPRS protects the pulp from penetration of the resorptive defect until the advanced stage of the defect. By close proximity to the pulp with no signs of infection or complaints, hydrolytic cements can be applied, and pulp vitality can be followed up.

Fig. 1: Initial photograph

Fig. 2: The defect

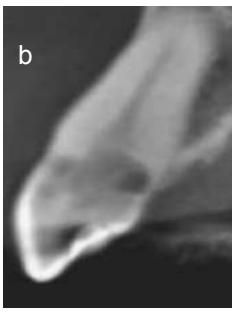
Fig. 3: Initial X-ray

Fig. 4: X-ray Intraoperative

Fig. 5: 1 week post-op X-ray

Fig. 6: 1 month post-op X-ray

Fig. 7:
CBCT slices
a: axial
b: sagittal
c: coronal



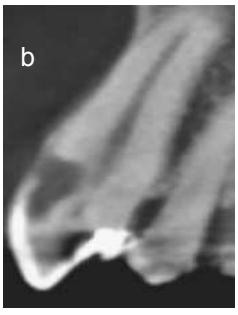


Fig. 8: Bucal an palatal flap

Fig. 9: Isolation and enlargement

Fig. 10: Granulation tissue removed

Fig. 11: MTA putty

Fig. 12: Deep margin elevation

Fig. 13: Final result

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CP092

Management of invasive cervical root resorption: Endodontic and surgical approach

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AIM: This case report of a tooth 45 with invasive cervical root resorption (ICR) aims to illustrate an endodontic treatment option for preserving the tooth in function.

INTRODUCTION: A 28-years-old patient presented to our clinic with the request for a dental rehabilitation. During the treatment of tooth 45, a resorption lacuna filled with a granuloma was found after removal of the cervical filling. ICR can occur without causing clinical symptoms, frequently leading to a late discovery of the lesions. Oftentimes, endodontic treatment of teeth with ICR is inevitable.

Fig. 1: preoperative radiograph indicating ICR Heithersay Class III- radiographic lenghth measurement - root canal filling - postoperative 1.5 years later - postoperative 3 years later - postoperative 4 years later, with newly occurred mesial resorption lacuna – postoperative 4 years later, with treated resorption lacuna

CASE PRESENTATION: Tooth 45 showed an insufficient cervical restoration, but was clinically without signs and symptoms. A preoperative radiograph indicated an ICR Heithersay Class III (Heithersay, 1999). After local anaesthesia, the cervical filling was removed under a dental dam. An extensive granuloma was found. After haemostasis using *sodium hypochlorite (NaOCl) 3%*, an adhesive composite resin (*Estelite Quick, Tokuyama Dental*) restoration was placed using a self-etch universal bonding (*OptiBond XTR, Kerr*). An access cavity was prepared and the resorption lacuna was excavated. Perforation was visually and tactilely excluded using an OPMI. Radiographic lenghth determination was carried out. The root canal was instrumented using *Hedstrom* files and rinsed with *NaOCl 3%*. Subsequently, the root canal was medicated with *Ledermix* for 1 week. In a second appointment, the root canal was prepared using *F6 Skytaper* files (40.06, *Komet*) and rinsed with NaOCl 3% by PUI using *EDDY (VDW)*. The root canal was medicated with $Ca(OH)_2$ for 2 weeks and the cavity temporarily sealed with a self-adhesive composite (*VertiseFlow, Kerr*). In a third appointment, the root canal was instrumented and rinsed with *NaOCl 3%* by PUI. The root canal was then dried with paper points. A *Biodentine (Septodont)* root canal filling was placed using a plugger and PUI activation. The postoperative radiograph showed a homogeneous root canal filling. Regular follow-ups over a period of 3 years showed a bland condition. After 4 years, a newly formed resorption lacuna on tooth 45 was detected. This was treated surgically: A full-thickness papilla elevation flap was created under local anaesthesia to expose the resorption lacuna. The lacuna was excavated and cleansed with *NaOCl 3%*. Subsequently, an adhesive composite resin restoration (*Estelite Quick, Tokuyama Dental*) using a self-etch universal bonding *(OptiBond XTR, Kerr*) was placed. The flap was repositioned and sutured. A postoperative radiograph showed complete filling of the resorption lacuna. 4.5 years after initial treatment, the tooth is in situ and the conditions are bland.

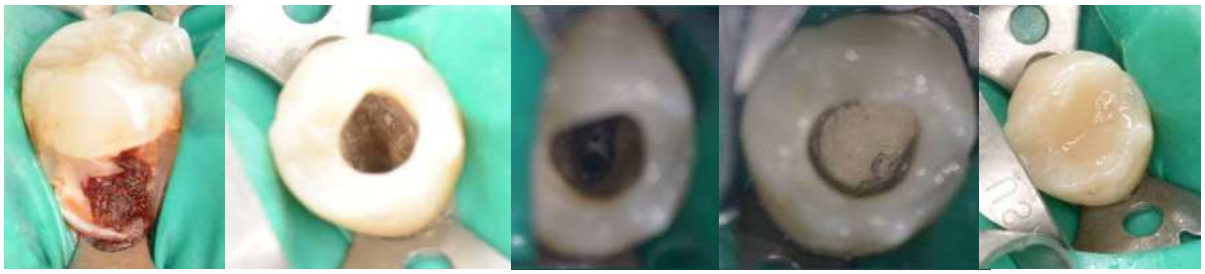

Fig. 2: granuloma – resorption lacuna – final instrumentation of root canal – root canal filling Biodentine – composite resin filling

DISCUSSION: In this case, the ICR was an incidental finding on a single tooth radiograph. In this case, endodontic treatment was unavoidable. A CBCT would have been beneficial for a more precise diagnosis and planning, but the patient refused this. Nevertheless, if treatment is carried out using anticlastic agents such as Ledermix, and hydraulic calcium silicate materials and NaOCl 3% *(Heithersay, 1994)*, the chances of successful treatment are high. The case can be considered a success, as the maximum possible protection of the tooth structure was achieved and the tooth is still in situ without any symptoms 4.5 years after the initial treatment.

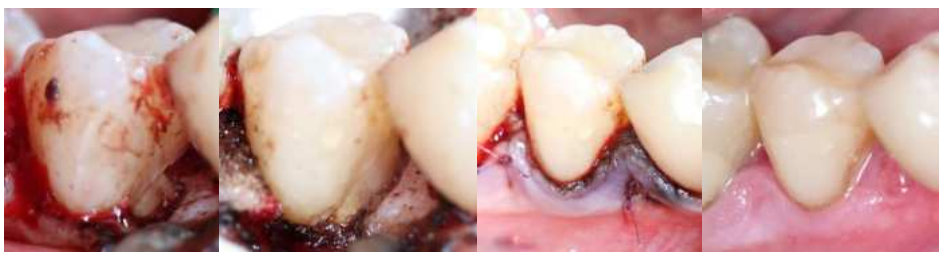

Fig. 3: surgically exposed newly occurred resorption lacuna – completely excavated and restored resorption lacuna – sutures – postoperative situation 1 month later

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CLINICAL RELEVANCE: ICR can occur without causing clinical symptoms, frequently leading to a late discovery of the lesions. For correct diagnosis of ICR and treatment planning, three dimensional imaging is essential. Oftentimes, endodontic treatment of teeth with ICR is inevitable, even in combination with a surgical approach. If the treatment is carried out lege artis using hydraulic calcium silicate materials, the prognosis for successful treatment is high.

Universität Basel

CP094

UZB

Class 2Bp External Cervical Resorption - Internal Repair and Root Canal Treatment of a Maxillary Molar

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Aim

To describe the endodontic and restorative treatment of a Class 2Bp (Patel et al.) External Cervical Resorption (ECR) in a maxillary molar.

Introduction

ECRs often present as an incidental finding during clinical and radiographic examination. If retention of the affected tooth is desired and the tooth appears to be treatable, the goals of treatment are to remove resorptive tissue, restore the defect, and seal the portal(s) of entry to prevent recurrence.

Case Presentation

In a 52-year-old patient, a resorption of tooth 16 was detected during a routine check-up in a bitewing radiograph (Fig 1a). The tooth was clinically asymptomatic and reacted to the cold test. CBCT imaging was performed for 3D extent assessment and treatment planning (Fig 1b-e).

The treatment was performed in two visits. In the first visit, access cavity preparation was performed and the well-perfused resorptive tissue (Fig 2a) was removed through the access cavity using long neck burs. The intraoperative findings revealed partially necrotic pulp tissue in the mb and db canal (despite healthy periapical conditions in CBCT and positive cold test prior to therapy), so that no vital pulp therapy was performed and a pulpectomy was carried out instead (Fig 2c). Preparation of the root canals, a calcium hydroxide dressing and a temporary restoration were completed.

The second visit two weeks later involved the complete preparation and disinfection of the root canal system (Fig 3a-b). Minor resorptive tissue remnants were successfully removed in the meantime due to the tissue-dissolving properties of calcium hydroxide, so that no further resorptive tissue was visible, even in the area of the portal of entry (Fig 3c). After master cone radiograph, obturation of the root canal system was performed using warm-vertical compaction and the access cavity and resorptive defect were restored with a composite material (Fig 4).

Discussion

When ECR is in a progressive stage and the affected tooth appears to be treatable, the treatment options are external repair, internal repair or intentional replantation. In cases where the resorptive defects are localised mainly within the internal tooth structures (coronal and radicular dentine) with only a small portal of entry, internal repair may be favoured due to its less invasive approach compared to external repair. However, in most cases, internal repair is only feasible in combination with endodontic treatment and should therefore be limited to ECR lesions where pulpal involvement is likely.

Clinical Relevance

CBCT allows a precise assessment of the nature and extent of a defect caused by ECR and is therefore beneficial for treatment planning. Internal repair of an ECR can be carried out successfully and is enhanced by precise treatment using a surgical microscope.

Reference

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Fig 1: Radiological findings in a bitewing radiograph (a), sagittal and axial CBCT views (b, c). Portal of entry at the mesio-palatal site (d, e).

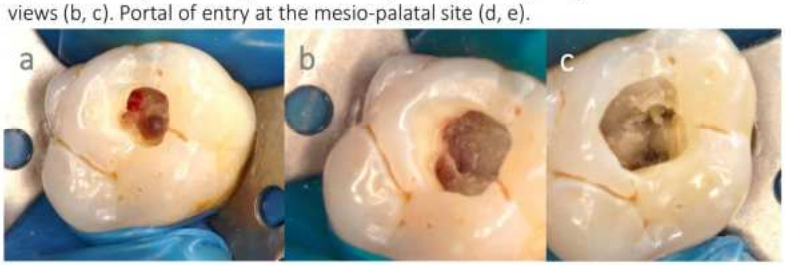

Fig 2: Visible resorptive tissue through the access cavity (a, b). Necrotic pulp tissue in mb and db canal (c).

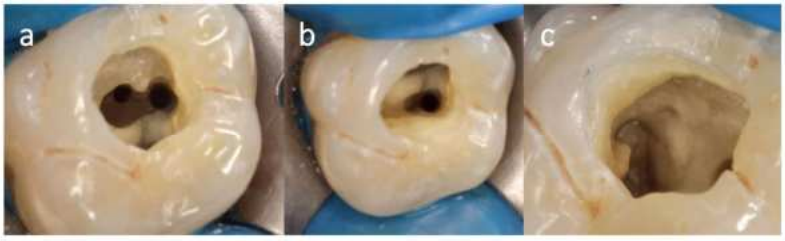

Fig 3: Completed root canal preparation in mb1, mb2 canal (a) and db canal (b). Palatal site of the access cavity and defect after complete removal of vital resorptive tissue with visible portal of entry (c).

Fig 4: Master cones after final root canal preparation (a), master cone radiograph (b), radiograph after warm-vertical compaction (c) and final restoration of resorptive defect and endodontic access cavity with a composite material (d).

CP095

Management of Advanced Internal Inflammatory Root Resorption: A Combined Non-Surgical and Surgical Approach – A Case Report

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Aim: This case report aims to illustrate the combined nonsurgical endodontic management of advanced inflammatory internal root resorption (IIRR) in a maxillary central incisor, utilizing mineral trioxide aggregate MTA obturation followed by an apicoectomy.

Introduction: Root resorption (RR) is a physiological or pathological process that results in the loss of dental tissues. There are various types of resorption affecting teeth and surrounding tissues(1). The aetiology of IRR is unclear. Several potential predisposing factors have been suggested, including traumatic dental injuries (TDI) (2), and pulp inflammation as a reaction of the tissue to infection approaching the area of resorption (3). Three-dimensional imaging has shown such defects to usually present with an oval or circular-shaped radiolucency (ballooning) of the root canal outline(4). They are mostly asymptomatic and discovered by chance on routine radiographic examinations(5), tissue loss can be extensive and often unrestorable.

Case presentation: A relieved, male patient with no significant medical history was referred for evaluation and treatment of tooth #21 due to a history of pain when chewing and on palpation, it started one week ago, spontaneous in nature, characterized as dull localized pain, scored 4 out of 10 (based on visual analogue scale), aggravated on touch and mastication. He did not take any medications or do anything to relieve the pain. The patient sustained an injury in his face after being accidentally hit by his friend's elbow on his upper lip and front teeth area specifically while engaging in a contact sport (football).

The patient reported visiting a private dental clinic after 3 weeks from the incident to replace the missing incisal fragments resulted from the trauma. The patient reported being informed that the tooth was necrotic and required RCT. However, he declined the proposed treatment at that time due to fear and anxiety. Intraoral examination revealed that anterior teeth restorations exhibit improper contours and a small, round nodule with no purulent discharge resembling a closed sinus tract at the apical region. The endodontic assessment of the tooth in question gave a negative response to the thermal cold test. And moderate tenderness to palpation, with normal periodontal depths, no bleeding on probing , and a grade 1 mobility. Radiographic interpretation shows a large well-defined circumscribed, oval-shaped low density of the canal outline ; lesion size is 4.5mm x 6mm between middle-apical thirds of the root. Circumferentially spreading >270° around the tooth, with pulpal involvement and root perforation at the distal and labial root surfaces. The apical portion of 2.3 remains intact without association of bone resorption. A wider canal diameter extending to the apical foramen in the infected tooth in comparison to the adjacent control tooth with the normal condition #11, without evidence of periapical bone resorption. The tooth was diagnosed as pulp necrosis with normal periapical tissues associated with internal inflammatory root resorption.

Treatment plan: non-surgical root canal treatment in 2 visits with the use of calcium hydroxide as an intracanal medicament, obturation with (MTA) apical plug and gutta percha in warm vertical compaction technique, redo Cl IV resin restorations and follow by Apicoectomy. 3 months later, the patient reported no complaints; the symptoms was relieved, and the endodontic evaluation showed normal responses and an unchanged mobility grade.

Discussion: Although this tooth had lowered chances to survive in the long term, the main goal of this treatment approach was to stop the resoptive lesion progression and retain the tooth as long as possible before the invitable future tx. of implant placement which was clearly discussed and explained to the patient. In this case, we used calcium hydroxide, which has various advantages such as its antibacterial effects to maximize the disinfection procedures, ease of use, and biocompatibility(6). bioactive hydraulic silicate cement such as (MTA) has satisfactory properties, including favourable sealing ability, mechanical strength and a capacity to promote periradicular tissue healing(7-9). Due to the irregular nature of the resorption area, using the thermo-plastic root canal filling techniques are more effective(10). The apical sealing of the material was evaluated surgically. The combined treatment approach aimed at disinfecting the root canal system and eliminating vital apical pulp tissue, which is sustaining the IRR with complete removal of the resorptive tissue from the root canal system, to prevent further loss of hard tissue.

Clinical relevance: Advanced internal inflammatory root resorption presents a significant challenge in endodontic management, often requiring a tailored approach that considers both surgical and non-surgical interventions. This case demonstrates how a combination of treatment modalities can contribute to a favorable outcome, even in complex cases with a guarded prognosis. Accurate diagnosis, facilitated by cone-beam computed tomography (CBCT), plays a crucial role in assessing the extent of resorption and planning an appropriate intervention. In this case, despite the severity of resorption, the decision to maintain the tooth was supported by a stable periodontal condition.

The follow-up appointment confirmed the maintenance of a functional tooth without increased mobility and showed favorable signs of healing. The patient is highly satisfied with the outcome, highlighting the significance of patient-centered care in treatment planning. This case demonstrates the potential for conservative approaches to extend the functional lifespan of compromised teeth while prioritizing patient satisfaction and quality of life.

Fig.2 Frontal clinical photograph showing the sinus tract apical to tooth #21

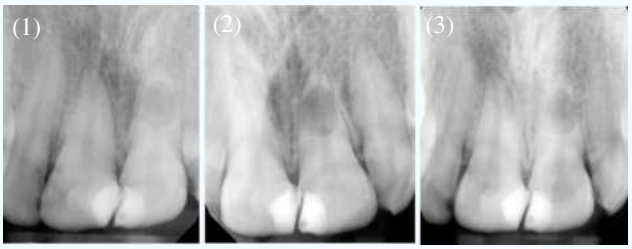

Fig.1 Periapical radiographs of the left maxillary central incisor, tooth #21 from (1) mesial angulation. (2) Straight angulation. (3) Distal angulation

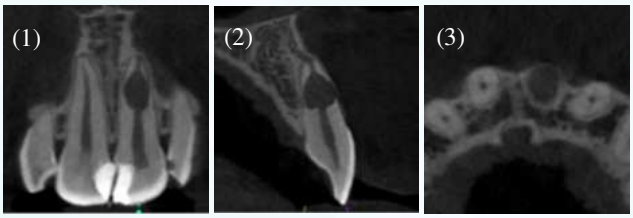

Fig.3 CBCT images of tooth #21 from (1) Coronal. (2) Sagittal (3) Axial section.

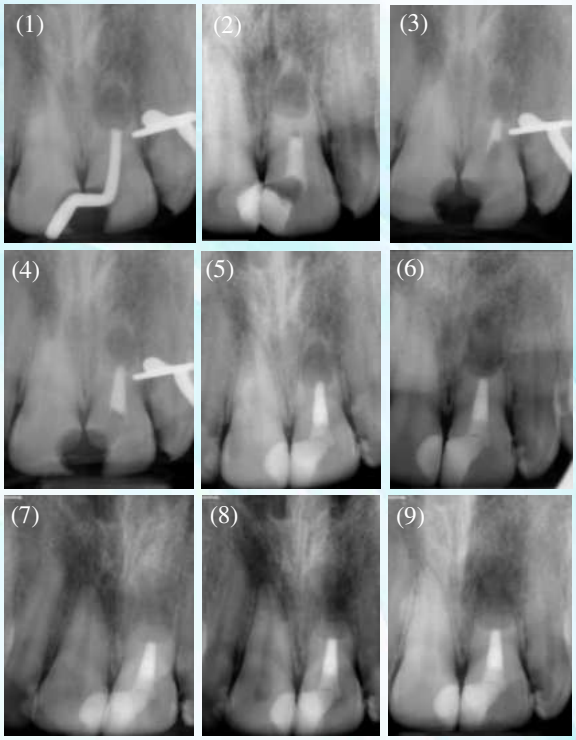

Fig.4 (1-5) Non-surgical root canal treatment with MTA plug and warm vertical compaction. (6) Immediate post-surgery. (7-9) 3 months follow-up.

Fig.2 Frontal clinical photograph at 3 months recall.

References:

CP096

INTEGRATED NON-SURGICAL AND SURGICAL MANAGEMENT OF PERFORATING INTERNAL ROOT RESORPTION: AN 8-YEAR FOLLOW-UP CASE REPORT

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BACKGROUND

Root resorption is a pathological process characterized by the loss of mineralized dental tissue due to the activity of clastic cells. According to the 2023 European Society of Endodontology (ESE) Position Statement, internal root resorption (IRR) originates from within the root canal space due to damage or alteration of the odontoblastic layer and predentin, often as a result of chronic pulp inflammation or trauma. IRR is often asymptomatic but may be discovered through radiographic examination or become symptomatic when perforation occurs. Cone-beam computed tomography (CBCT) is critical for diagnosing and differentiating IRR from external root resorption (ERR), especially in cases with canal wall defects or suspected perforations.

CASE PRESENTATION

A 24-year-old female with a history of orthodontic treatment and a Class III restoration presented with biting discomfort and discoloration of tooth #7. Clinical examination revealed tenderness to percussion and mild discoloration. Periapical radiographs revealed a periapical radiolucency. CBCT imaging demonstrated a well-circumscribed radiolucent defect expanding from within the root canal space at the middle third of the root, consistent with perforating internal root resorption, in accordance with ESE classification criteria (Figure 1 (Pre-operative CBCT)). The pulp diagnosis was necrotic pulp with symptomatic apical periodontitis. A pre-operative periapical radiograph also revealed a periapical radiolucency consistent with apical periodontitis (Figure 2).

Figure 1: CBCT images showing tooth #7 in the sagital,coronal and axial views.

FIRST VISIT

Tooth #7 was isolated using a rubber dam. Under a surgical microscope, the pulp chamber was accessed, and profuse bleeding was noted—indicative of granulation tissue within the resorptive defect. Manual cleaning and shaping were performed to a master apical file size 45 K-file (Figure 3 (Working length radiograph during first visit)). The canal was irrigated with 2% chlorhexidine. Calcium hydroxide was placed as an intracanal medicament, and a size 45 gutta-percha cone was inserted to maintain canal patency (Figure 4 (Calcium hydroxide dressing with gutta-percha in first visit)).

Figure 2: pre operative PA

Figure 3: Working file PA

Figure 4: Calcium hydroxide with GP

Figure 5: Second visit :post surgery

Figure 6: Intra operative clinical picture of the surgery

Figure 7: Immediate post operative after 3rd visit

Figure 8: eight years follow up

References

SECOND VISIT

Two weeks later, surgical intervention was performed under local anesthesia. A submarginal full-thickness flap was reflected. Granulation tissue was debrided (Figure 6) Intraoperative clinical view of root defect before and after repair)), and the perforating resorptive defect was sealed with bioceramic putty (FKG). A bone graft (Geistlich Bio-Oss, 1cc) was placed in the apical and middle third to support regeneration (Figure 5)Post-surgical radiograph with bone graft)).

THIRD VISIT

After confirming the setting of the bioceramic material one month later, final canal irrigation was completed using sodium hypochlorite, and obturation was performed using a hydraulic condensation technique (Figure7) Post-operative radiograph after final obturation in third visit)).

FOLLOW UP

At the 8-year follow-up, the patient remained asymptomatic. Radiographic examination revealed complete healing of the periapical lesion and maintenance of bone structure (Figure 8)Eight-year follow-up radiograph)), indicating successful long-term outcomes with conservative and surgical intervention.

CONCLUSION

This case demonstrates successful management of perforating internal root resorption, consistent with the ESE position that treatment should aim to arrest resorptive progression, disinfect the canal system, and restore integrity using bioactive materials. CBCT was instrumental in diagnosis and treatment planning. This case supports a conservative, patient-centered approach over more invasive options like extraction and implant placement.

Extensive Internal and Replacement Root Resorption of Maxillary Incisors Following Repeated Dental Trauma

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CP097

Aim

To present a clinical case of internal and replacement root resorption in immature permanent incisors following repeated dental trauma in a child.

Introduction

Root resorption due to odontoclastic activation following trauma is a known process. However, the specific type—internal, external, or replacement—remains less predictable. Endodontic treatment is considered a preventive measure but may not always halt clastic activity.

Case Presentation

First Episode of Dental Trauma

A 10-year-old female patient experienced her first dental trauma during a routine ENT procedure under general sedation. The diagnosis included avulsion of tooth 21 and lateral luxation of tooth 11, both with incomplete root development. Immediate repositioning and splinting were performed within minutes(Fig 1). The splint was maintained for 4 weeks. Follow-up confirmed continued root development and PDL healing (Fig.2 -12-month post-trauma PA).

Second Episode of Dental Trauma

1.5 years after the first episode of trauma, the patient sustained a second trauma involving avulsion of teeth 11 and 21. Repositioning and splinting were performed 1.5 hours post-injury, with the splint maintained for 4 weeks. Endodontic treatment was initiated 4 weeks post-trauma (Fig.3)in two visits, using $Ca(OH)_2$ as an intracanal medicament between visits.

Four Years Later

A sinus tract was present vestibular. Periapical radiographs revealed extensive internal root resorption of tooth 11(Fig.4) and replacement resorption of tooth 21(Fig.5). Tooth 11 was retreated using XP-endo Finisher, NaOCl irrigation and obturated with Bio-ceramic sealer and gutta-percha(Fig.6).

Discussion

This clinical case demonstrates that timely endodontic treatment may not always prevent internal root resorption, as commonly reported. It suggests that factors beyond pulp involvement—such as trauma-related dentin damage—may play a role. Additionally, poor adhesion of gutta-percha to canal walls may allow fluid ingress and sustained irritation, contributing to resorption.

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Management of Invasive Cervical Resorption through Endodontic and Surgical Treatment – A Case Report

CP098

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Aim: To present a clinical case of successful treatment of invasive cervical resorption in the right mandibular first molar.

Introduction: Cervical resorption is external root resorption that often presents a significant diagnostic and therapeutic challenge. It typically originates in the cervical region of the tooth and can progress rapidly, leading to extensive structural damage if not treated promptly. Effective management often requires a multidisciplinary approach, combining endodontic treatment with surgical intervention to eliminate resorptive tissue and achive complete restoration of the affected tooth.

Case report: A 50-year-old female patient was referred for endodontic treatment of the right mandibular first molar. She had spontaneous pain and a slight discomfort in that region. A retroalveolar radiograph revealed irregular radiolucent defects in the cervical region, near the cemento-enamel junction (Figure 1.). The toot responded negatively to percussion test and had a slightly delayed response to electrical pulp test. Cone beam computed tomography (CBCT) was done using field of view 5 × 5 and axial, sagittal, and horizontal sections were obtained that aided in the diagnosis of an external cervical resorption (Figure 2, 3, 4.). After access cavity preparation, straight line access was achieved and the canals was instrumented with a full rotation rotary file system. Obturation was completed with a one syringe calcium silicate-based sealer using single cone technique. The quality of the obturation was assessed radiographically (Figure 5.). After obturation, an incision and detachment of flap was performed following periodontal surgical principles (Figure 6a, 6b.) and the infraosseous region of the resorption was sealed with Biodentine bioceramic cement (Septodont, France), (Figure 7.). Final restoration was completed using the open sandwich technique in combination with composite materials. The one-year follow up radiograph revealed no evidence of pathological changes (Picture 8.).

Figure 1.
Preoperative retroalveolar radiograph.

Figure 5.
Post-obturation retroalveolar radiograph.

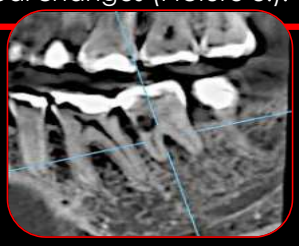

Figure 2. Coronal section of CBCT.

Figure 3. Sagital section of CBCT.

Figure 4. Axial section of CBCT.

Figure 8.
Control retroalveolar radiograph after one-year follow up.

Figure 6a. Region of defect.

Figure 6b. Resorption defect.

Figure 7. Application of Biodentine.

Discussion: A careful evaluation of CBCT images is essential for an accurate diagnosis of cervical resorption, as retroalveolar radiographs can only detect mesial and distal extensions of the lesion. CBCT provides a three-dimensional view, allowing for a more precise assessment of the resorptive defect's extent and severity, which is crucial for treatment planning. Endodontic treatment in this case was performed using a calcium silicate-based sealer and a single cone technique, both of which have demonstrated effective apical and lateral sealing properties. For the surgical management of the resorptive lesion, Biodentine was selected as the sealing material due to its excellent biocompatibility, dentin-like mechanical properties, and superior sealing ability.

Clinical relevance: This case highlights the importance of early detection and precise diagnosis of external cervical resorption using CBCT imaging, as conventional radiographs may not fully reveal the extent of the lesion. A combination of endodontic, surgical and restorative approaches was necessary to manage the defect and preserve the affected tooth. The use of Biodentine for sealing the resorptive defect and calcium silicate-based obturation ensured optimal biological compatibility and long-term prognosis.

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Management of a Severe Corono-radicular Dilaceration with Apicoectomy: A Five-Year Follow-Up Case Report

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• Aim

To describe the endodontic management of a severe corono-radicular dilaceration with apical transfixation, treated by apicoectomy.

• Introduction

Impacted teeth present significant clinical challenges, particularly when their position leads to anatomical complications. Cone beam computed tomography (CBCT) combined with advanced segmentation techniques enhances diagnostic accuracy and aids in minimally invasive treatment planning *(1)*.

• Case Presentation

An 8-year-old female patient was referred to the Department of Endodontics at Lyon University Hospital for a temporarily retained incisor (Fig. 1A). The panoramic radiograph revealed that the permanent tooth was erupting in an inverted position, which was progressively uprighted over two years with orthodontic treatment.

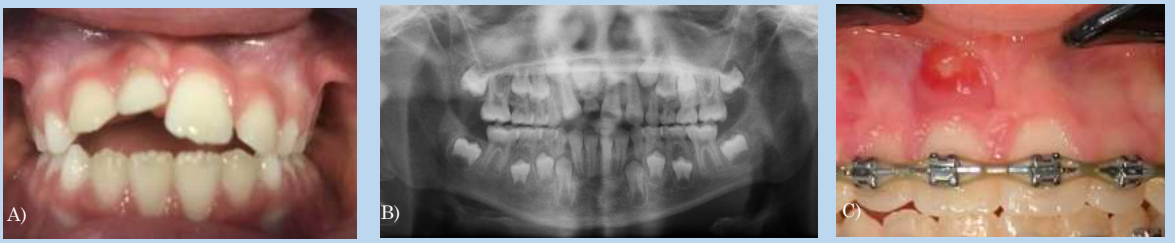

Fig.1 : Initial management with (A) vestibular view at 8 years old, showing a persistent temporary incisor, (B) orthopantomogram revealing the permanent tooth erupting in an inverted position, and (C) vestibular view after orthodontic treatment, showing cortical bone perforation.

On the day of consultation, the patient presented with apex transfixation through the cortical bone, associated with mucosal inflammation but without an apical abscess. The tooth responded positively to thermal testing (Fig. 1C). Cone beam computed tomography (CBCT) and segmentation analysis revealed a severe corono-radicular dilaceration of 180° and an apex penetrating the cortical bone (2).

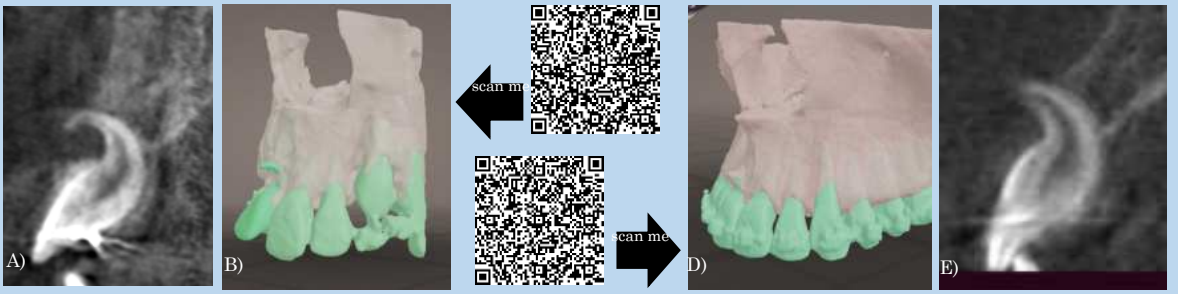

Fig.2 : 3D analysis before apicoectomy with (a) axial view of the CBCT and (b) segmented dental structures; and after apicoectomy at the 3-year follow-up, with (a) axial view of the CBCT and (b) segmented structures revealing a new fenestration.

After discussion with the parents, a decision was made to perform a 3-mm apicoectomy (Fig. 2A,B). Following the procedure, the apex no longer transfixated the cortical bone, and at the 6-month and 1-year follow-up, thermal sensitivity remained normal. At the 3-year follow-up, after final orthodontic adjustments, CBCT revealed that the apex had again impinged on the cortical bone (Fig. 2B,C), leading to a second apicoectomy.

• Discussion

The recurrence of cortical perforation highlights the need for long-term monitoring in cases of corono-radicular dilaceration. Additionally, the preservation of pulp vitality despite apicoectomy raises questions about the limits and indications of vital pulp therapy in such cases.

• Conclusion & Clinical Relevance

This case demonstrates the value of minimally invasive management for dilacerated teeth with apical transfixation.

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Successful healing following endodontic treatment of an autotransplanted third molar: a clinical case report

CP100

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Aim

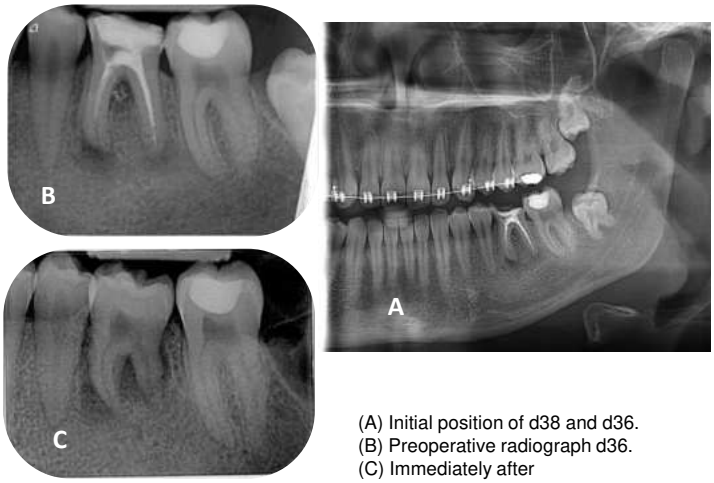
This case report aims to demonstrate the clinical success of endodontic therapy following third molar autotransplantation.

Introduction

Autotransplantation presents a biological and cost-effective alternative to implants and prosthetics, especially for younger patients, when replacing a lost mandibular first molar. While immature teeth can heal while maintaining pulpal vitality, endodontic treatment is essential for autotransplanted permanent teeth with a closed apex because of the lower likelihood of revascularization. This case report describes the successful healing of an autotransplanted mature third molar five months after endodontic treatment.

Case presenation

A 21-year-old male patient in generally good health was referred for evaluation of d36, which was deemed unrestorable due to extensive loss of coronal tooth structure and thus required extraction. The diagnoses were previously treated tooth, chronic apical periodontitis and suspected furcal perforation.
The third molar, located distal to the compromised tooth, has suitable characteristics as a donor tooth and was selected for autotransplantation following the extraction of D36.
To ensure minimal extraoral time the d36 was extracted before d38 explantation. The full mucoperiosteal flap was raised, the bone was removed via rotary burs and saline irrigation, and the tooth was atraumatically extracted using dental forceps with limited pressure. Immediately after extraction, the tooth was replanted in the socket of tooth 36 and an extraoral time of a few seconds was achieved. The recipient site was anatomically wider and no preparation was needed, except for gentle curettage. The transplanted tooth was placed in the infra-occlusion position, fixed with a suture for 7 days to achieve sufficient initial stability, and a periapical radiograph was taken to evaluate its position.
Four weeks later, root canal treatment was performed for d38 in one visit under rubber dam isolation and microscope (Zeiss Extaro 300) control. Three root canals were located and instrumented with Protaper Ultimate F2 (Dentply Sirona), and the working length was determined with TriAutoZx2+ (J Morita). Irrigated with 3% sodium hypochlorite solution during instrumentation.



(A) Initial position of d38 and d36.
(B) Preoperative radiograph d36.
(C) Immediately after

Before obturation irrigation was performed with 3% sodium hypochlorite and 17% EDTA with distilled water irrigation between solutions. Ultrasonic activation was done with Irrisafe (Acteon), final irrigant was 3% sodium hyplochorlite. Root canal obturation was performed with AH+ root canal sealer (Dentsply Sirona), and warm vertical compaction technique.
A glass ionomer liner and cavity restoration with a bonded composite restoration was placed using G-Premio Bond, GC G-aenial posterior.
Follow ups were made 1 weak, 1 month, 5 months post-surgery. Radiographically, a complete periapical healing at the recipient site was observed.

(D) Postoperative x-ray of D38 root canal treatment. (E) 5-month control.

Discussion

Autotransplantation offers a biological and cost-effective alternative to implants and prosthetics, particularly in adolescent patients, without interfering with the active bone growth. Several factors were important for the success of this case - the surgical technique, ensuring minimal extraoral time, proper handling of the donor tooth, atraumatic extraction. [2,4,5] Studies have shown that reducing extraoral time significantly improves periodontal ligament viability[1,2,4,5]. In this case, the recipient site required no additional preparation beyond gentle curettage, which contributed to the preservation of the periodontal ligament and facilitated optimal healing. In cases where recipient site needs adjustments technology enables prior planning of a computer-aided prototyping 3-dimentional model for the osteotomy guide.
Endodontic treatment plays a critical role in the long-term prognosis of autotransplanted teeth with a closed apex and should be carried out 2-4 weeks post- surgery, allowing to avoid external root resorption or infection[3,4,5]. A single-visit endodontic treatment with immediate restoration was chosen to minimize the risk of interappointment reinfection while ensuring optimal disinfection and sealing of the root canal system.
Although long-term follow-up is preferred, the current status of the tooth is asymptomatic, in functional occlusion, with the healing of the surrounding bone suggest a positive outcome.

Clinical relevance

This case underscores the importance of proper case selection, precise surgical technique, and well-timed endodontic intervention in achieving successful outcomes in autotransplantation of teeth with mature apices. While long-term monitoring remains essential, this approach provides a promising alternative for managing non-restorable molars, particularly in young patients where maintaining alveolar bone is crucial for future prosthetic or orthodontic considerations.

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MANAGEMENT OF A COMPLICATED CROWN-ROOT FRACTURE USING THE BENEX EXTRACTION SYSTEM: A CASE REPORT

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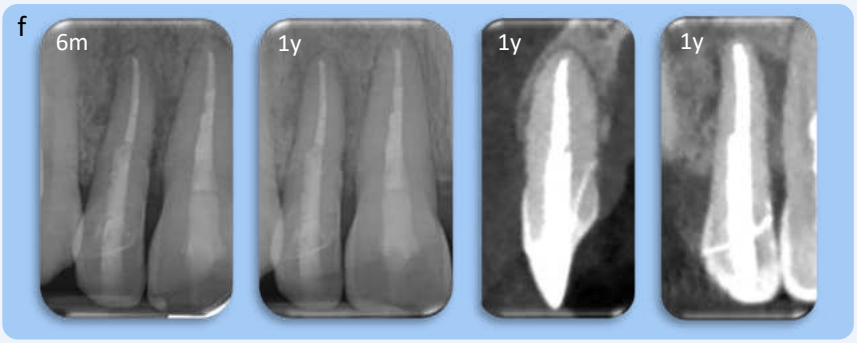
AIM & INTRODUCTION

To present an alternative treatment of a deep crown-root fracture, with the goal of preserving the patient's own dentition and maintaining long-term functionality. This case report highlights the management of a complicated crown-root fracture of tooth 12 following a traumatic fall of a 34-year-old woman (ASA score 1). The treatment involved intentional reimplantation using the Benex® extraction system, followed by endodontic therapy and post placement.

CASE PRESENTATION

a) During the emergency treatment, the teeth were splinted with flexible NiTi wire. CBCT images showed a complicated crown-root fracture extending beneath the bone level. At the second appointment, a pulpectomy was done on tooth 12. b) At the third appointment, the coronal segment was removed in one piece. Intentional reimplantation was done using the Benex® extraction system. c) Both parts were reattached with G-ænial Universal Injectable after etching and the Clearfil SE adhesive system. d) Tooth 12 was repositioned in the socket and stabilized with a flexible splint. e) In the last appointment, the endodontic treatment was completed and a post was placed to gain retention for the restoration.



f) 6 months and 1 year follow-up revealed a bone remodeling process around the root of 12. No signs of infection were present and the patient experienced no clinical complaints. There was no sensitivity on palpation, no mobility or signs of ankylosis observable. Palatal there was a periodontal pocket of 6 mm, mesiopalatal and distopalatal 5 mm.

DISCUSSION

Palatal, compared to the initial situation, 3 mm of bone was lost due to the presence of composite at the bone level forcing relocation of the biological width. Further follow-up should be done to see if any symptoms of ankylosis appear.

CLINICAL RELEVANCE

The Benex® extraction system opens doors for treatment strategies that were previously not possible, offering a cost-effective solution for managing complex dental trauma. This approach preserves the natural tooth while maintaining esthetics and function, while keeping future treatment modalities open.

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The authors have no conflict of interest.

References

Intentional Replantation of Mandibular Second Molar with Asymptomatic Apical Periodontitis: A Case Report

CP102

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Aim

To present a case of intentional replantation of a mandibular second molar with asymptomatic apical periodontitis.

Introduction

Microorganisms are the primary cause of periapical periodontitis, and the goal of root canal treatment is to prevent or improve periapical periodontitis. Root canal treatment usually fails when the treatment is carried out inadequately. However, even when the treatment follows certain standards, some cases may still experience failure (Siqueira, 2001). If the non-surgical endodontic treatment failed, the surgical endodontics may be the next treatment option.

Case Report

A 34-year-old male was referred for evaluation of an increasing periradicular radiolucency around tooth 37, detected during a routine follow-up five years after treatment. The tooth had undergone root canal treatment with post and crown placement. The patient was asymptomatic. Clinical examination revealed no sensitivity to percussion or palpation, deep pockets, or mobility. Periapical radiograph revealed a periradicular radiolucent lesion measuring 4mm x 5mm at the apex of the mesial root of tooth 37 (Figure 1A). Based on these findings, tooth 37 was diagnosed as previously treated with asymptomatic apical periodontitis. Computed tomographic imaging confirmed an intact cortical bone and a safe distance between the tooth and the inferior alveolar nerve. There was no visible fracture or perforation, but apical transportation was present (Figure 1B, C,D). The patient opted for intentional replantation. The extracted tooth had an intact, slightly curved root with no obvious fractures or leakage. Overextended gutta-percha was noted at the mesial root apex (Figure 2A, B). Microscopic examination revealed a faint line at the mesial root apex but no cracks (Figure 2C, D, E). Apicoectomy was performed, followed by root-end preparation and filling with MTA (Figure 2F, G, H). The tooth was replanted with suture splinting (Figure 2I). At the 2-week follow-up, the patient was asymptomatic, and the replanted tooth had grade I mobility. At the five-month follow-up, the patient remained asymptomatic, and radiograph revealed no periradicular radiolucency (Figure 2J). At the one-year follow-up, clinical and radiographic evaluations remained normal (Figure 2K, L).

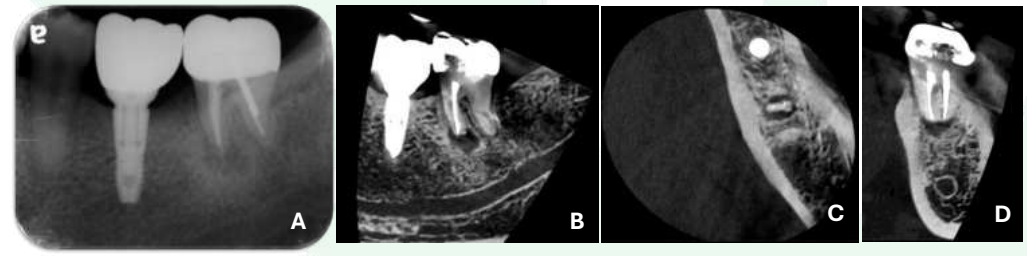

Figure 1. (A) The preoperative radiograph showed a periradicular radiolucent lesion at the apex of the mesial root of tooth 37. (B) Sagittal view of computed tomographic imaging showed transportation in the mesial root. (C) Axial view of computed tomographic imaging showed a well-defined, low-density area limited to the mesial root. No obvious fracture or perforation was observed. (D) Coronal view of computed tomographic imaging showed intact cortical bone and a safe distance between the tooth and the inferior alveolar nerve.

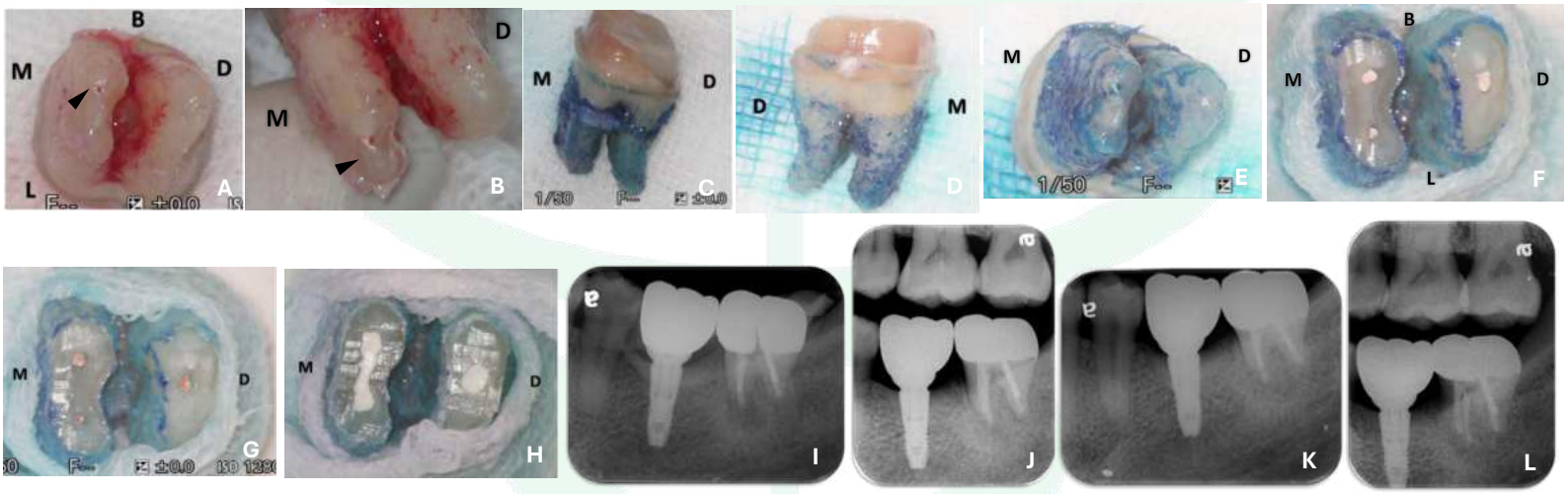

Figure 2. (A,B) Gutta-percha extruded beyond apical foramen of mesiobuccal root (arrow). (C, D, E) Root surface inspection. (F) Isthmus between mesiobuccal and mesiolingual canals and leakage in mesiolingual canal was noted after apicoectomy. (G, H) Root-end preparation and retrograde filling with MTA. (I) Postoperative radiograph. (J) Radiograph at 5-month recall. (K, L) Radiograph at the 12-month recall.

Discussion

Potential causes of post treatment endodontic disease include persistent intraradicular infection, secondary infection, coronal leakage, extraradicular infection and nonmicrobial factors (Siqueira *et al*., 2014). In this case, intraoperative findings revealed a leaky canal, an inadequately filled isthmus, and extruded gutta-percha. The quality of the coronal sealing appeared satisfactory, suggesting that intraradicular infection was the primary cause of failure in the previous non-surgical root canal treatment. Overfilling, vertical root fracture, perforation, or accessory canals could not be ruled out as contributing factors.

Conclusion & Clinical Relevance

Post-treatment apical periodontitis typically peaks within the first year after root canal treatment (Ørstavik, 1996), with intraradicular infection being the primary cause (Siqueira *et al*., 2014). Management should be based on the underlying cause, feasibility and prognosis. Treatment options include follow-up observation, non-surgical retreatment, surgical intervention, or extraction. Clear communication is essential to ensure the patient understands the risks, benefits, and alternatives.

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CP104

Clinical Efficacy of Intentional Replantation for Preservation of Natural Dentition in a Complex Endodontic Scenario Following Unsuccessful Retreatment: A 12-Month Follow-Up Case Report

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AIM

This case report aims to evaluate the clinical outcomes of intentional replantation over a 12-month follow-up period in a case where non-surgical retreatment was unsuccessful and surgical endodontic treatment was deemed inappropriate.

INTRODUCTION

Intentional replantation involves deliberate tooth extraction, extraoral endodontic treatment, and replantation, preserving natural dentition and minimizing procedural complications (1,2).

CASE PRESENTATION

A 29-year-old female patient was referred to the Endodontics Department, Faculty of Dentistry, Çukurova University, due to persistent clinical and radiographic symptoms in her right mandibular first molar (tooth 46), despite root canal treatment performed three years earlier. Medical and dental histories revealed no systemic diseases, medication use, or allergies. Clinical examination showed tooth 46 was positive to percussion but negative to palpation. Radiographic evaluation identified a periapical lesion (>5 mm) involving teeth 46 and 47 (Figure 1). Non-surgical retreatment was performed on tooth 46, while tooth 47, which tested vital, was monitored (Figure 2). At the 12-month follow-up after retreatment, tooth 46 was clinically asymptomatic but showed no radiographic evidence of healing (Figure 3); therefore, intentional replantation was planned. Due to the large extent of the periapical lesion, apical surgery would have entailed a wide surgical exposure, posing a risk of postoperative discomfort. Furthermore, the vitality of tooth 47 would have been compromised, necessitating root canal therapy. In light of these considerations, intentional replantation was deemed a more conservative and favorable treatment choice.

Following atraumatic extraction, a 3-mm apical root resection was performed to eliminate canal irregularities, accessory, and lateral canals. A retrograde cavity was prepared and obturated with Mineral Trioxide Aggregate (MTA) (Figure 4a). Care was taken to keep the tooth moist throughout the procedure (Figure 4b). Granulation and infected tissues were carefully removed from the socket. Initial replantation attempts were unsuccessful due to the presence of undercut areas within the bone cavity, necessitating further root resection, which, in the mesial canals, exceeded 3 mm, followed by repetition of the retrograde filling procedure (Figure 5). After successful repositioning into the socket, the tooth was stabilized using an 8-ligature suture and composite splint. Prosthetic rehabilitation was performed at the 6-month follow-up.

Figure 1. Initial orthopantomograph of the patient

Figure 2

Figure 3

Figure 4a

Figure 4b

Figure 5

DISCUSSION

Clinical evaluations at the 1-, 3-, 6-, and 12-month follow-ups revealed progressive clinical improvement, with the tooth remaining asymptomatic and mobility scores decreasing from 2 to 0. Radiographs taken at 6 and 12 months demonstrated significant resolution of the periapical lesion and regeneration of the periodontal ligament, consistent with findings reported in the existing literatüre.

CLINICAL RELEVANCE

Intentional replantation is a valuable treatment option as an alternative to tooth extraction, offering effective control of periapical infection, preservation of bone tissue, and maintenance of the natural tooth structure.

Figure 6. Postoperative 6 months

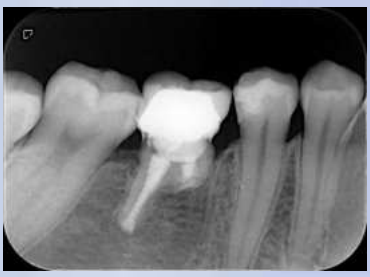

Figure 7. Postoperative 12 months

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CP105

INTENTIONAL REPLANTATION OF AN ENDODONTICALLY TREATED TOOTH

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AIM: To present a case of intentional replantation and review the selection criteria and clinical protocol of endodontically treated teeth eligible for this treatment option.

INTRODUCTION: Intentional replantation (IR) is the purposeful extraction and reinsertion of an endodontically treated tooth into its socket to correct an apparent clinical or radiographic endodontic failure.

CASE PRESENTATION: A 50-year-old female patient was referred for non-surgical retreatment of the maxillary second molar (#17) due to inadequate root canal treatment and apical radiolucency. Clinical examination revealed a cast restoration, buccal tenderness on palpation, and no significant probing depths or percussion pain. Radiographic findings confirmed a cast post and core with underfilling and apical radiolucency. The diagnosis was asymptomatic apical periodontitis, and retreatment was planned. Following coronal disassembly, a two-visit root canal retreatment was performed using calcium hydroxide as an intracanal medicament (**Figs. 1, 2, 3, 4**).

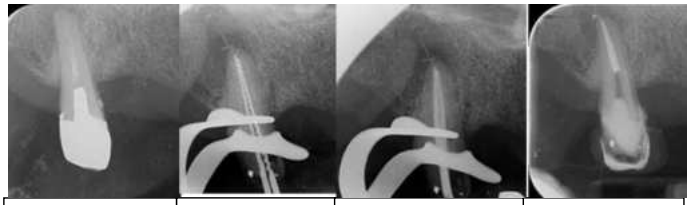


Figure 1. Pre-op | Figure 2. Working length | Figure 3. Cone-fit | Figure 4. Post-op

One month post-treatment, the patient presented with a sinus tract and deep periodontal pockets (>12 mm). Gutta-percha tracing led to the apex, and CBCT revealed a large periapical radiolucency (**Figs. 5, 6, 7**). Differential diagnoses included persistent intra-radicular infection, extra-radicular infection, and vertical root fracture (VRF). Given the recent retreatment, treatment options were evaluated, and **intentional replantation (IR)** was chosen due to favorable root anatomy and the ability to directly inspect for VRF.

Survival	Success
86 % (62%- 98%)	**77%** (33%- 95%)

INDICATIONS:

1. failure of non-surgical treatment or apical surgery
2. non accessible surgical site
3. proximity to sensitive anatomic spaces

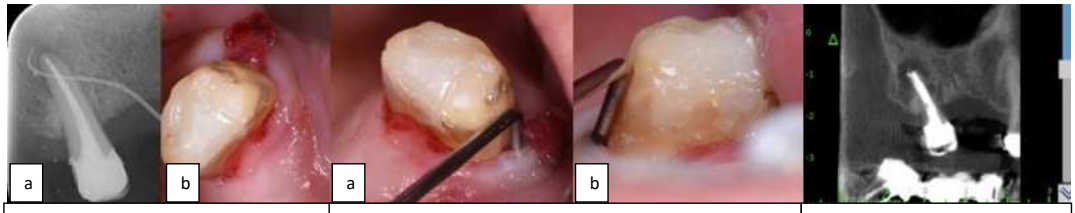


Figure 5. Sinus tract tracing (a, b) | Figure 6. Pockets buccally (a) and palatally (b)

Figure 7. CBCT (sagittal slice)

Pre-op prognostic factors:

1. Sinus tract/ abscess
2. Pockets > 6mm in 2 or more sites
3. Age > 40 years

Intra-op prognostic factors:

1. Extra oral time <15'
2. Tissue handing during extraction
3. Medium for maintaining PDL cell viability
4. Root resection and preparation

Following informed consent, IR was performed under 4% articaine (1:100,000 epinephrine) anesthesia. The tooth was carefully extracted and examined under a dental operating microscope, ruling out VRF. The apical 3 mm of the root was resected, stained with methylene blue, and prepared for retrofilling with tricalcium silicate putty (NeoPUTTY, Avalon Biomed, Houston, TX, USA). Total extraoral time was 15 minutes, with the root irrigated with DMEM to preserve PDL viability. The tooth was repositioned, stabilized with sutures, and left undisturbed (**Figs. 8, 9, 10**).

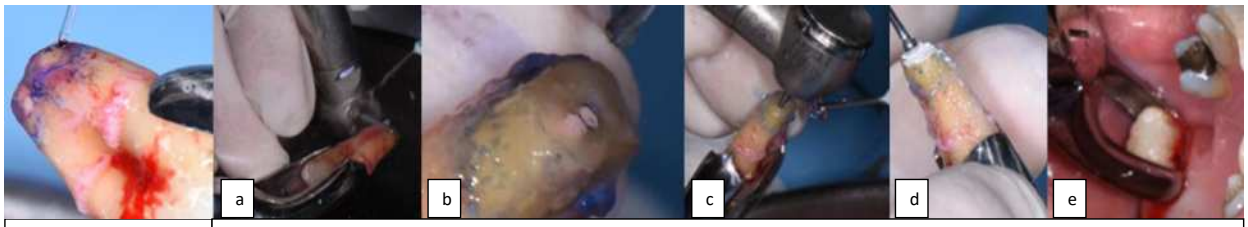


Figure 8 .Methylene blue stain | Figure 9. Root-end resection (a), inspection (b), retro-cavity preparation (c), root-end filling (d) and socket reinsertion (e)

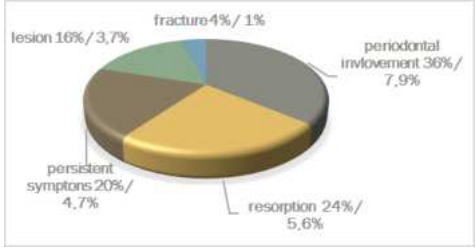
At the 2-week follow-up, the sutures were removed, and stabilization was deemed sufficient. The patient remained symptom-free, with resolution of the sinus tract. At 1, 3, and 7 months, clinical and radiographic evaluations confirmed ongoing healing, no signs of infection, and normal pocket depths (**Fig. 11**).

DISCUSSION: IR, when performed with modern techniques, is a viable treatment option for permanent teeth with apical periodontitis that have not responded favorably following non-surgical root canal treatment/retreatment or endodontic surgery. According to current research survival rate is 86%[a]. Key elements to the success of the technique are careful case selection, extra-oral manipulation time less than 15 min and atraumatic handling of the root surface. Most common complications include periodontal involvement, resorption, persistence of symptoms, aggravation of periapical lesion and fracture. Most frequently they occur within 1 year, while late complications may arise 3-4 years post-op. Therefore, long term follow-up is essential.

Figure 10. Fixation with suture and post-op

Figure 11. 7-month post-op

MOST COMMON COMPLICATIONS



CLINICAL RELEVANCE

IR is a viable technique for the management of teeth with apical periodontitis when non-surgical treatment/retreatment or apical surgery is not an option. Case selection is a primary factor for success. From a technical standpoint, incorporating modern endodontic techniques, including the use of the DOM, appropriate medium for PDL cell viability maintenance, and the use of biocompatible root-end filling materials, may improve success or survival rates of intentionally replanted teeth.

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NCES

CP106

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Palatogingival Groove: Endodontic-Intentional Reimplantation Management—A Case Report

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AIM - This case report describes the successful management of a maxillary lateral incisor with a deep palatogingival groove extending to the root apex, accompanied by advanced periodontal destruction. Although the initial prognosis was poor, a combined endodontic and surgical approach involving intentional reimplantation resulted in a favorable clinical outcome.

INTRODUCTION -The palatogingival groove is a developmental anomaly that initiates at the cingulum and extends apically beyond the cementoenamel junction, terminating variably along the root surface. Its funnel-like configuration predisposes the site to plaque accumulation and subsequent localized periodontal inflammation. In some cases, the groove communicates with the pulp through accessory canals, complicating the diagnosis and prognosis. This anomaly may remain undetected until both periodontal destruction and pulpal involvement are present. Early identification and a multidisciplinary treatment strategy are essential to preserve the affected tooth.

CASE REPORT- A 42-year-old male patient in good systemic health presented to our clinic with pain localized to the right maxillary anterior region. Clinical examination revealed that tooth #12 (FDI notation) had an intact crown without caries or fractures, responded negatively to vitality testing, and was sensitive to percussion. Additionally, the tooth exhibited abnormal mobility. A 10-mm periodontal pocket with purulent exudate was noted on the distopalatal aspect, associated with a radicular groove (Fig. 1A). Radiographic evaluation revealed a radiolucent lesion involving both teeth #12 and #11, both of which were non-vital and demonstrated apical periodontal ligament widening. A distinct radiolucent line, suggestive of a palatogingival groove, was also evident (Fig. 1B).
Initially, periodontal flap surgery combined with root canal treatment was proposed; however, the patient declined this option. Consequently, intentional replantation was presented as an alternative and accepted by the patient. The treatment plan was subsequently revised to include this approach. Following informed consent, root canal therapy was performed under rubber dam isolation. The canal was obturated using cold lateral condensation with gutta-percha and a bioceramic sealer.

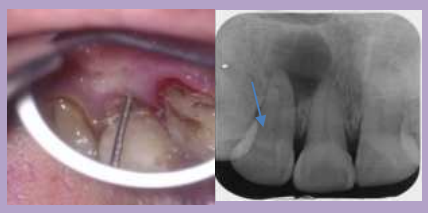

Fig1A Fig1B

Fig2A Fig2B

Intentional Reimplantation Procedure

One hour before the procedure, the patient rinsed with 0.12% chlorhexidine gluconate and received 600 mg of ibuprofen. Under local anesthesia, tooth #12 was atraumatically extracted by Operator #1 and immediately stored in Hank's Balanced Salt Solution. Simultaneously, Operator #2 curetted the socket. The apical groove was sealed using glass ionomer cement, and all granulation tissue was meticulously removed from the apex. A 3-mm retrograde cavity was then prepared using ultrasonic tips and obturated with MTA Angelus putty (Fig. 2A-B). The tooth was reimplanted within three minutes and stabilized with a non-rigid splint. Follow-up was planned for splint removal after two weeks."

At the 2-week follow-up, clinical symptoms had resolved, and tooth mobility was reduced. A soft diet was recommended. At both 3- and 6-month recall visits, the tooth remained asymptomatic and functional, with radiographic findings demonstrating ongoing periapical healing (Fig. 3A–B).

post-op 3 m post-op 6 m

Fig3A Fig3B

DISCUSSION - The palatogingival groove acts as a "plaque trap," facilitating the development of endodontic-periodontal lesions through potential communication via accessory canals or the apical foramen. The prognosis largely depends on the depth and extent of the groove, as well as the degree of associated periodontal destruction. Teeth exhibiting minimal mobility and shallow grooves may be successfully managed with odontoplasty and periodontal debridement. Although advances in implantology and modern endodontic techniques have reduced the frequency of intentional replantation, it remains a viable therapeutic option in carefully selected cases.

CLINICAL RELEVANCE - Teeth with palatogingival grooves often require more than isolated endodontic or periodontal treatment. With accurate diagnosis and a multidisciplinary approach, the prognosis can be significantly improved even in initially unfavorable cases.

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INTENTIONAL REIMPLANTATION CASE STUDY

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CP107

uic barcelona

AIM

Intentional reimplantation is a viable alternative for cases where conventional endodontic retreatment or apical surgery is not feasible. This case presents a successful reimplantation of a previously treated tooth with symptomatic apical periodontitis.

PRODUCTION

Intentional reimplantation involves the deliberate extraction, extraoral treatment, and reinsertion of a tooth into its original socket. It is considered when other treatment modalities, such as non-surgical retreatment or apical surgery, are not suitable.

CASE PRESENTATION

A female patient classified as ASA 1 presented with the chief complaint of experiencing pain while biting. Clinical examination revealed pain associated with biting , pain on percussion and absence of pockets. After careful examination of the x-ray , the presence of a separated broken instrument was suspected The patient had a previously treated tooth diagnosed with symptomatic apical periodontitis. The thickness of the cortical bone and the limited access made endodontic surgery very challenging . Considering the condition, the treatment plan involved intentional reimplantation as a last attempt to save the tooth .

PROCEDURE

The procedure began with preoperative preparation, including disinfection with 0.12% chlorhexidine and relief of the tooth from occlusal contact. The tooth was then extracted using only forceps, ensuring minimal trauma. A sterile gauze was placed over the socket immediately after extraction.

Once extracted, the tooth was carefully handled by the enamel or with sterile gauze soaked in saline to prevent contamination. The mesial caries was repaired using 3M Single Step Bond Universal adhesive and composite. Throughout the extraoral phase, the root was continuously hydrated with saline. A 3mm root resection was performed, followed by a 3mm root-end preparation. The root-end was then filled using composite flow material.

Following these extraoral modifications, the tooth was gently repositioned into its original socket. The patient was instructed to bite on a cotton roll to aid stabilization. The tooth was splinted for three weeks to allow proper healing. The entire extraoral time was kept to a minimum, totaling 14 minutes, to optimize reimplantation success.

DISCUSSION

Intentional reimplantation serves as a salvage procedure when other treatment options are exhausted. The key factors influencing success include minimal extraoral time, proper handling, and minimal damage to the periodontal ligaments.

CLINICAL RELEVANCE

This case highlights the significance of intentional reimplantation as a conservative yet effective approach in endodontic treatment. It underscores the importance of precise extraoral handling and technique-sensitive reinsertion to ensure positive outcomes.

OUTCOME& FOLLOW UP

The expected outcomes included a reduction in pain and the preservation of tooth function and periapical healing . 4 months later the patient is free of any symptoms and there is a reduction of the periapical radiolucency.

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- Intentional replantation: a procedure as a last resort Armita Rouhani 1, Babak Javidi, Morteza Habibi, Hamid Jafarzadeh
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Endodontic Management of Autotransplanted Third Mandibular Molar: 6 Years Follow-up

CP108

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Aim

To discuss the workflow protocol of endodontic treatment and report on a 6 years follow-up of an autotransplanted mandibular third molar.

Introduction

Autotransplantation is an option for the treatment of a compromised tooth, surgically replacing it with another tooth from the same individual, especially when the implant treatment is not yet possible [1]. Tooth loss as a result of persistent chronic apical periodontitis or resorbtion is one of the most common indication, especially when the first molars are involved [2]. Due to its technique-sensitive nature, successful autotransplantation requires meticulous planning and precise execution, ensuring favorable long-term outcomes and the survival of the transplanted tooth [3].

Case Presentation

A 20 years old male patient presented in the clinic wishing to restore his mandbular molars (Fig 1). First and second mandibular molars on the left side were atraumatic extracted and the third molar was repositioned in the place of the first molar (Fig 2). After the surgical repositioning, a flowable composite retainer was used to fix in place the autotransplated molar and the occlusion was adjusted (Fig 3, 4).

Fig 1

Fig 2.

Fig 3.

Fig. 4

Fig. 5 (A, B, C, D, E)

Fig. 6

After 4 weeks, the single visit root canal treatment was performed (Fig 5) under magnification, through a limited access cavity (Fig. 5 A, B), using rotary files in a continuous rotational motion and continuous wave obturation technique (Fig. 5C, 5D). In the end, a direct composite restoration was placed (Fig. 5E) and an immediate X-ray was taken to check the endodontic obturation (Fig. 6). After a few days, tooth was restored using a bonded indirect composite overlay and the patient was monitored over 1 month, 6 months and every year after. In Figure 7 it can be observed the radiological aspect after 3 years.

At the 6 years follow-up appointment, we clinically checked the occlusion (Fig.8), did the periodontal probing (Fig. 9) and performed also a CBCT (Fig. 10) for the radiological check-up. We noticed tooth was functional and asymptomatic.

Fig. 7

Fig. 8

Fig. 9

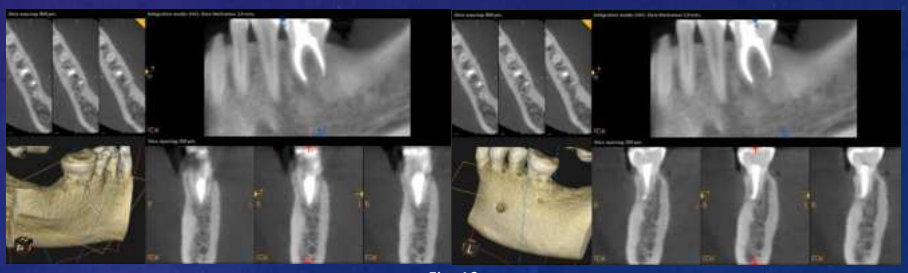

Fig. 10

Discussion

Performing a root canal treatment on an auto-transplanted tooth requires some attention to applying the rubber dam, drilling and using rotary files [3]. The root canal obturation technique plays a crucial role in minimizing the risk of material extrusion, which may act as an irritant and potentially delay or even impede bone healing [4]. There is no agreement regarding the protocol of routinely endodontic treatment [5]. Further research directions on prognostic indicators and factors affecting the success of autogenous tooth transplantation are required [6].

Clinical Relevance

Clinicians should be well-informed about all viable options for preserving dental hard tissues, particularly in cases involving tooth loss in young healthy patients for whom implant-prosthetic therapy is not yet a viable option. Autogenous tooth transplantation represents a highly effective alternative, especially when combined with endodontic treatment.

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CP109

Treatment of Severe Extrusive Luxation - Two Cases with one-year Follow-up

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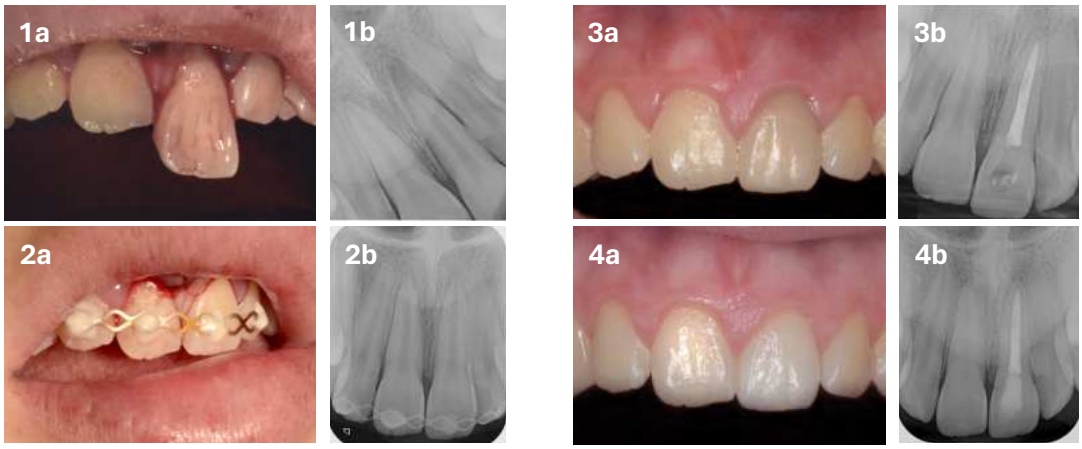
Aim

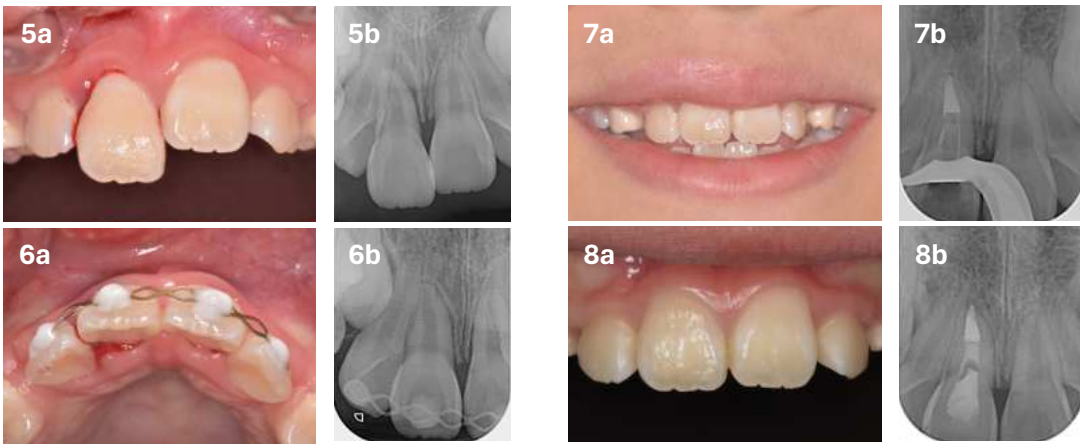
To discuss the treatment of two young patients, suffering extrusive luxation on central incisors with complete root formation, including repositioning, splinting, root canal treatment and one-year follow-up.

Case Presentation

Both patients presented with a severely dislocated central incisor after colliding with a friend while playing catch. Teeth were initially repositioned from their extruded and in one case rotated position and supported with a titanium trauma splint. Due to the extent of dislocation and the mature root status, root canal treatment was initiated within one week after trauma and a corticosteroid-antibiotic paste was applied to reduce the risk of external resorption.



Patient 1, *12 years old. 1a,b: initial trauma where 21 was turned 180 degrees, had not been avulsed according to the patient and was still attached to the periodontal ligament. 2a,b: Splint from 12-22; was removed after 2 weeks. 3a,b: Status after successful repositioning and root canal treatment, 5 months after trauma. 4a,b: Follow-up one year after root canal treatment and internal bleaching, showing no signs of inflammation clinically or radiographically.*



Patient 2, *9 years old. 5a,b: initial extrusion of 11 with typical bleeding from the gingival sulcus. 6a,b: Splint from 12-22, was removed after 4 weeks as hypermobility remained at two-week-mark. 7a,b: Status after successful repositioning and root canal treatment, 3 months after trauma. 8a,b: Follow-up one year after root canal treatment, showing no signs of inflammation clinically or radiographically.*

Two weeks after the accidents, the intracanal dressing was changed to calcium hydroxide. The splints were removed after two and four weeks respectively. Root canal fillings were performed after thorough disinfection of the root canal system with NaOCl using Guttapercha and an epoxide-amine resin sealer. Follow-ups after one year showed no signs of inflammation clinically or radiographically.

Discussion

Successful repositioning and regaining of physiological mobility was possible in both cases. No inflammatory or resorptive complications nor clinical complaints of the young patients occurred up to one year after root canal treatment.

Conclusion & Clinical Relevance

- Immediate repositioning and stabilization are essential for proper healing of periodontal ligament and maintaining esthetical und functional integrity [1].
- Displacement of ≥ 2 mm necessitates a root canal treatment in teeth with a complete root formation [1], corticosteroid- antibiotic paste can be used as anti-resorptive therapy [2].
- The splinting period after extrusive trauma should be 1-2 weeks [3], but can be extended with persistently increased tooth mobility and in accordance with patients' needs.

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Funding and Acknowledgement

EO (Clinician Scientist Programme Step 1, ELAN) and EM (Junior Project J103) were supported by the Interdisciplinary Center for Clinical Research (IZKF) at the University Hospital of the University Erlangen-Nürnberg.

Management of a severe (S) shaped central incisor with open apex using Calcium Silicate putty

CP110

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Aim : To highlight the clinical application, and handling of silicate-based cement in putty consistency for the management of a maxillary central incisor with a severe S-shaped curvature and an open apex.

Introduction : Managing severe root curvatures with open apices is a double challenge due to negotiation and apical sealing difficulties. Traditional methods like calcium hydroxide apexification and MTA plugs have treatment duration and handling limitations, respectively. This case report presents the management of an S-shaped central incisor with an open apex, using Calcium Silicate putty (Total Fill)for effective sealing and root end closure.

Case Presentation:

History

- 17 years old male patient.
- Medically fit and well.
- History of trauma 10 years ago, with pain tooth #21 four years ago.
- RCT initiated one year ago and due to severe curvature tooth was dressed, with $Ca(OH)_2$
- Referred to Postgraduate unit, Cardiff University Dental Hospital.

Clinical Examination (FIG 1)

- Low lip line
- Thick gingival phenotype
- Generalized marginal erythema
- Class III molar and incisal relationship

UL1

- Gray-yellowish discoloration
- No tenderness to percussion or palpation
- No response cold test or EPT

Radiograph (IOPA) (RG 1)

- Normal interdental bone level
- Radiopaque material coronally consistent with temporary filing and apically with intercanal medicaments
- Severe double curve "S" shape
- Open apex with large apical radiolucency

Diagnoses

- Generalized plaque induced gingivitis
- Tooth #21 previously initiated root canal treatment with asymptomatic periodontitis
- Acquired tooth loss

Treatment Plan

- Personalized oral hygiene advice and PMPR according to (West et al., 2021)
- Study models used to create silicone index, based on diagnostic wax up
- Under local anesthetic and rubber dam isolation
- Provisional restoration removed and tooth was re-accessed (FIG 2)
- Irrigation with saline and 2.5% sodium hypochlorite and with manual file to remove remaining calcium hydroxide
- Working length determination using electronic apex locater, and WL radiograph with (25-K) file was taken (RG 2)
- Second visit : canal wide no mechanical preparation mainly irrigation with agitation using Endoactivator and manual agitation
- Apical gauging constriction < size 70 file.
- Third visit: final irrigation protocol according to (Duncan et al., 2023)


Figure 1

- Calcium silicate putty obturation applied using pre-measured apical pluggers, and confirmed with IOPA (FIG 3, RG3)
- Vitrebond was used to cover the putty after setting
- PTFE tape placed on top of Vitrebond and on the buccal wall of the cavity and sealed with pink Fuji palatally to check aesthetic improvement. The final decision on bleaching will be made when the patient turns 18 (RG 3)

Discussion

Managing an S-shaped canal with an open apex presents significant challenges due to difficulty negotiating the canal and sealing the apex. While MTA plugs, are effective, they can be difficult to handle in irregular canals. In this case, a silicate-based bioceramic putty cement was chosen in this case for its improved handling, adaptability, and biocompatibility properties. Its putty consistency allowed for precise placement, ensuring a reliable apical barrier and which can help in promoting periapical healing.

Clinical Relevance

Calcium Silicate putty, offers better handling properties than MTA is demonstrated here in managing a severely curved, double-bend root canal system with an open apex. Clinical trials and long term follow ups are required to validate its clinical use.

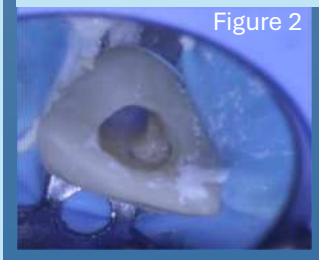
Figure 2

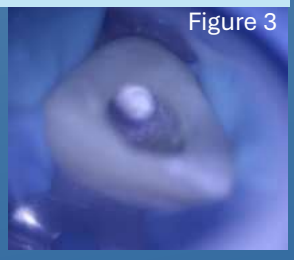
Figure 3

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RG 1


RG 2


RG 3

Nonsurgical Root Canal Therapy for Large Cyst-like Inflammatory Periapical Lesion

CP111

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AIM

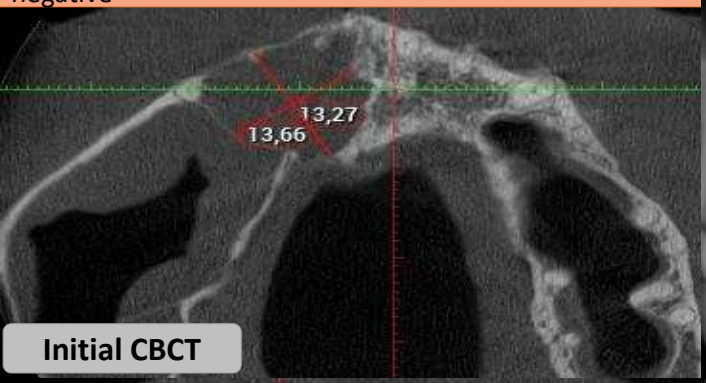
In this case report, it is intended to demonstrate that cyst-like large periapical lesions can heal through orthograde root canal treatment.

INTRODUCTION

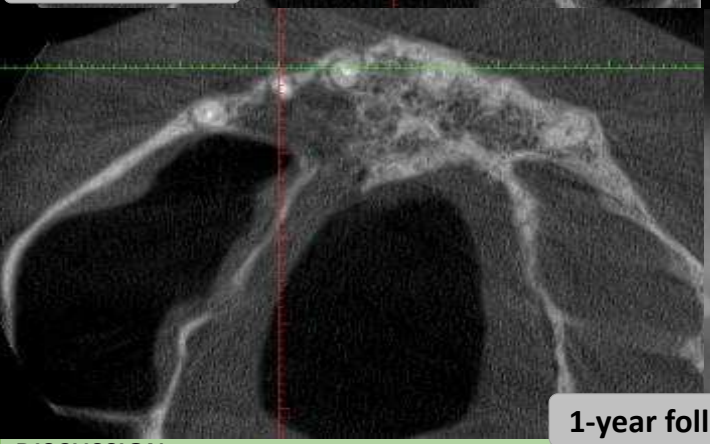
Periradicular lesions are caused by the host's defense mechanism against microorganisms and their by-products(1) Studies have shown that nonsurgical root canal treatment induces regression and healing by stimulating apoptosis and programmed cell death in the periapical area.(2)

CASE

Systemically healthy, 28-year-old male patient was referred to our clinic for a routine examination. A large periapical radiolucency was observed in the region of teeth 11, 12, and 13. The largest diameter of the cyst-like periapical lesion was 13.66 mm on the CBCT scan. Palpation, percussion, and vitality tests were all negative



Initial CBCT



1-year follow up

DISCUSSION

Lesions originating from apical periodontitis, whether granuloma or cyst, primarily arise due to microorganisms in the root canal. The elimination of microbial load within the root canal system and hermetic apical seal play a significant role in the treatment.(1) For these reasons, root canal therapy should be attempted before any surgical intervention.(2),(3)

CLINICAL RELEVANCE

Three-dimensional assessment with CBCT plays a crucial role. Irrigation activation and intracanal antibacterial medicaments are effective in reducing the bacterial load. A hermetic apical seal and homogeneous root canal filling increase the chances of treatment success.

First Session: The Scope K7 (Scope Endo, Turkey) rotary file system was used, and preparation for all teeth was completed with a 50/0.6 file. Calcium hydroxide was placed in the root canals.

Initial PA

Rubber-dam placement

Gutta fitting

MTA placement

Post-op

Second Session: Final irrigation was performed with 5.25% NaOCl, saline, and 17% EDTA, using the Woodpecker Endo 3 ultrasonic device (Guilin Woodpecker,China). Apical plug technique with MTA (PD,Switzerland) was applied to all the teeth, and rest of the root canals were filled with thermoplastic gutta-percha technique (Fi-G (Guilin Woodpecker,China)). All teeth were restored with composite resin. Radiographs taken at the 3rd, 6th, and 12th months showed healing, and no clinical symptoms developed.

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Divergence Reversibility of Root Adjacent to an Endodontic Origine Radiolucent Area. A Case Series and a Proposed Mechanism

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CP112

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Aim

To report cases with a pre-operative root divergence to an interdental radiolucency of endodontic origine and its repositioning following endodontic therapy.

Introduction

The differential diagnosis of inter-dental radiolucency with adjacent non vital tooth divergence is vast. Lateral periodontitis of endodontic origin is one of them due to a possible lateral canal infection. Radiolucency adjacent to or surrounding the apical area has, in the majority of cases, a microbial intra-radicular etiology (1). Presence of lateral canal Documented cases of interdental radiolucency of endodontic origin with adjacent root divergence are scarce. Moreover, to our best knowledge, the reversibility of root divergence in such cases was not yet documented in the literature.

Cases Report

Case 1

A 21-year-old, healthy male, with a history of dental trauma five years ago, was referred to the Department of Endodontics for examination. As a result of that injury, tooth 31 suffered an uncomplicated crown fracture, and teeth 32-41 suffered a concussion(Fig 1.a). At a 4-week follow-up, there were no signs of significant issues. Ten months later, radiolucency was observed around teeth 31, 32, and 41 (Fig 1.b). Teeth 31 and 32 showed signs of pulp necrosis and a divergency of the roots 31-41 was observed. Root canal treatment was performed on teeth 31 and 32. One year later, the teeth showed signs of healing, with no symptoms and their positions restored to normal, confirmed by radiographic measurements.(Fig 1.c).

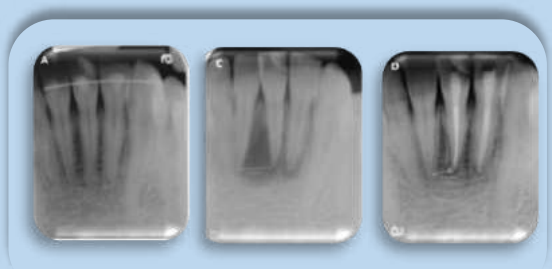

Fig.1.a Fig.1.b Fig.1.c

Fig.2.a Fig.2.b Fig.2.c

Case 2

A 19-year-old woman was referred with severe facial swelling and pain in her upper left anterior teeth (Fig 2.a). Clinically, she had significant facial and intraoral swelling (Fig 2.a), with tooth 22 showing grade I mobility, suppuration, and no response to cold pulp testing. Radiographs revealed an extensive radiolucent area around teeth 22 and 23 and divergency of the roots. Diagnosis was pulp necrosis and an acute abscess in tooth 22 (Fig 2.b). Root canal treatment was performed on tooth 22. Year later, there was no sensitivity, and radiographs showed healing, and no divergency (Fig 2.c).

Fig.3.a Fig.3.b

Case 3

A 19-year-old male presented with severe pain in his lower right central incisor (tooth 41), grade II mobility, and no response to thermal testing. Radiographs revealed a large radiolucent area around teeth 31 to 42 and divergence of the root with tooth 31. Diagnosis was pulp necrosis and an acute apical abscess(Fig 3.a). Root canal treatment was performed on tooth 41, and symptoms resolved after the first visit. One year later, the tooth was symptom-free, with healed radiographs and normal mobility, and roots of teeth 41 and 31 without divergency (Fig 3.b).

Discussion

We can hypothesize that this movement, driven by mechanical pressure from surrounding tissues: fluid accumulation in a cyst or abscess, granulation tissue growth or expansion of lining epithelium. This resemble orthodontic tooth movement induced by applied forces. Additionally, just as collagen turnover in the periodontal ligament plays a crucial role in orthodontic relapse (4), a similar turnover process may facilitate the root's return to its original position after the pressure was disappeared. The observed realignment of roots following periapical and periradicular healing suggests that inflammation-induced bone resorption plays a key role in root divergence, while subsequent healing and mechanical forces contribute to root convergence.

Clinical relevance

It's essential to recognize that in cases of root divergency, the underlying cause may often be endodontic in nature. Performing a root canal treatment in many cases, will cause healing and realignment of tooth to their natural position, without additional orthodontic intervention. Follow up must be recommended.

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CP113

Treatment of Large Periapical Lesions with Non-Surgical Endodontic Treatment: Case Series

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Aim

The aim of this case series is to evaluate the healing outcomes in cases of teeth with large periapical lesions and intraoral swelling on palatal region through root canal treatment and to present the clinical results.

İntroduction

Due to various factors, such as dental caries and trauma, can lead to pulp damage, resulting in the loss of tooth vitality. This condition may give rise to periapical lesions, which, if untreated, can progress into intraoral or extraoral abscesses. In cases of large periapical lesions, root canal treatment can effectively promote healing of the surrounding dental tissues without the need for surgical intervention by removing the damaged pulp tissue. This case series presents the non surgical treatment of maxillary anterior teeth diagnosed with intraoral abscess and apical lesions.

Case Description

Initial radiograph

Final radiograph

6-months follow up radiograph

Initial

6 months follow up

Case 1

A systemically healthy female patient presented to the Department of Endodontics at Marmara University, Faculty of Dentistry with acute pain and intraoral swelling. Radiographic examination revealed a periapical lesion associated with the roots of teeth numbers 11 and 12. Clinical examination indicated percussion sensitivity in the affected teeth, and electric pulp testing yielded a non-vital response. Access cavities were prepared under rubber dam isolation, allowing entry into the root canals. Drainage was achieved using 2,5% NaOCl irrigation and microsuction. The working length was determined with an electronic apex locator and confirmed radiographically. After chemomechanical preparation, calcium hydroxide $Ca(OH)_2$ was placed in the canals, and the patient was scheduled for a follow-up visit after two weeks. During the control session, the patient reported resolution of symptoms, and the intraoral swelling had reduced. $Ca(OH)_2$ was removed using passive ultrasonic activation (Woodpecker, China), but persistent drainage was observed from tooth number 12. Irrigation and microsuction techniques were continued, and $Ca(OH)_2$ was reintroduced into the canals. After another two-week interval, the patient returned with complete resolution of symptoms and absence of intraoral swelling. Final irrigation protocols were applied with %2.5 NaOCl, %17 EDTA and finished with sterile saline solution. Ensuring that the canals were dry before obturation. The canals were subsequently filled using the cold lateral condensation technique with gutta-percha and a resin-based sealer (AdSeal, Meta Biomed, Korea). 6 months post-treatment, radiographic evaluation demonstrated new bone formation, indicative of periapical healing.

Case 2

A systemically healthy 31-year-old male patient was referred to our clinic with similar clinical and radiological findings. The treatment process was conducted according to the protocols applied in Case 1. As a result of the treatment, it was observed that periapical lesions regressed, intraoral swelling decreased, and patient complaints disappeared. 6 months and 1 year post-treatment, radiographic evaluation demostrated new bone formation, indicative of periapical healing.

Initial radiograph

6-months follow up radiograph

1-years follow up radiograph

Initial

6 months follow up

Discussion

The success of root canal treatment in the healing of periapical lesions is fundamentally dependent on the elimination of microbial infection. Irrigation plays a critical role in reducing microbial flora within infected canals and dissolving necrotic tissue. Drainage is particularly crucial in the management of large lesions, as effective drainage leads to symptom relief and often negates the need for systemic antibiotic therapy. In this case series, root canal treatments were performed without the administration of antibiotics. There is no significant difference on healing between surgical and non surgical approaches In this case series it is seen that even in the early follow up there is evident healing signs. The healing rate in teeth with periapical lesions is approximately 10% lower compared to those without lesions. However, certain studies indicate that the size of the lesion does not have a statistically significant impact on the success rate of non-surgical root canal treatment.

Clinical Relevance

In the cases with large periapical lesions and swelling, surgical approaches might be the first treatment choice that comes to mind but that lesions can be heal with only non surgical root canal treatment. Effective irrgation and drainage and close follow up is essential.

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Clinical and Radiographic Evaluation of Non-Surgical Root Canal Treatment in the Healing of Periapical Lesions: A Case Series

CP114

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Aim: The aim of this case series is to evaluate the success of clinical and radiographic follow-up of ten teeth treated with non-surgical root canal treatment.

Introduction: Periapical lesions are among the most common pathological conditions affecting teeth, originating from microbial invasion of the root canal system, leading to inflammation and destruction of periapical tissues. They typically occur as a result of a localized inflammatory reaction to intraradicular infection. The primary and most effective treatment approach is non-surgical root canal treatment. One of the ultimate goals of endodontic treatment is the elimination of bacteria from the root canals, which play a decisive role in the development of periapical lesions.

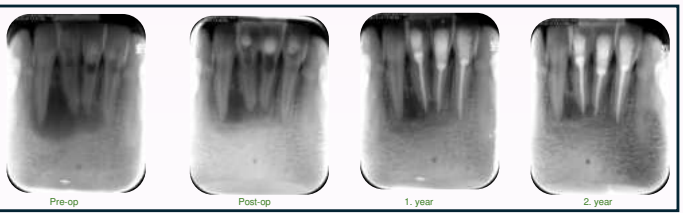
CASE 1

CASE 2

CASE 3

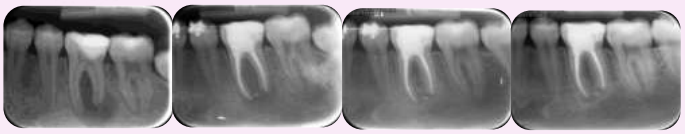
CASE 4

CASE 5



Case Presentation:: Radiological examination of 10 teeth from 10 patients revealed the presence of large periapical lesions surrounding the roots. Clinical examination indicated severe percussion pain and discomfort during mastication in all cases. All teeth were non-vital Root canal treatments were performed under rubber dam isolation, and access cavities were prepared accordingly. Working lengths were determined with an electronic apex locator. The root canals were shaped with Protaper Ultimate (Dentsply Maillefer, Ballaigues, Switzerland) Passive ultrasonic irrigation was performed using 2.5% sodium hypochlorite (NaOCl) and 17% ethylenediaminetetraacetic acid (EDTA). Calcium hydroxide was used as an intracanal medication, and temporary restorations were placed with glass ionomer cement. Two weeks later, in the second session, calcium hydroxide was removed, followed by final irrigation with 17% EDTA, 2.5% NaOCl, distilled water, and 2% chlorhexidine. The canals were obturated using the single-cone technique with a bioceramic sealer (BioRoot RCS; Septodont, Saint Maur Des Fosses, France), and permanent restorations were completed with composite resin.All patients were recalled periodically every three months for two years, and clinical and radiographic evaluations were performed during each follow-up.

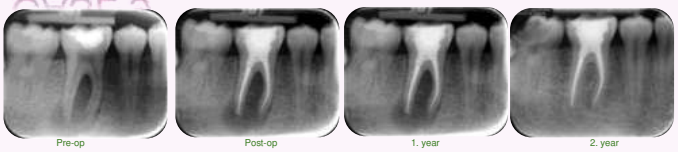
CASE 6



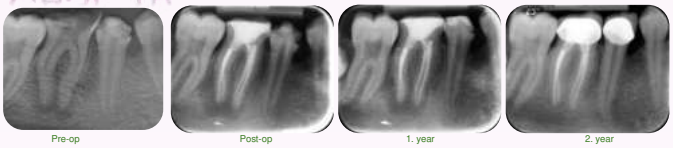
CASE 7

CASE 8

CASE 9



CASE 10



Discussion: This case series demonstrates the effectiveness of non-surgical root canal treatment in healing large periapical lesions. Over a two-year follow-up, all treated teeth remained asymptomatic, and periapical lesions showed significant reduction in size, with healing beginning as early as the third month. The success of the treatment emphasizes the importance of thorough root canal disinfection, particularly using ultrasonic-activated irrigation with sodium hypochlorite and EDTA, which effectively cleans complex canal systems. The use of calcium hydroxide intracanal medication also contributed to periapical healing. The application of bioceramic sealer (BioRoot RCS) with the single-cone technique ensured optimal sealing and supported the success of the treatment. These findings confirm that non-surgical endodontic retreatment can effectively treat large periapical lesions, highlighting the importance of proper disinfection and sealing for long-term tooth preservation.

Clinical Relevance: This study demonstrates that non-surgical endodontic retreatment can effectively promote the healing of large periapical lesions. The findings highlight the importance of thorough disinfection, including ultrasonic-activated irrigation and calcium hydroxide medication, in achieving predictable periapical healing and long-term tooth preservation.

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Healing of large periapical cyst-like lesions: A non-surgical endodontic treatment approach; 2 Case Reports with 4 and 6 years follow up

CP115

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Aim

To present healing of 2 large periapical cyst-like lesions with conservative treatment by root canal treatment alone.

Introduction

Various studies have shown that with a radiographic lesion size of 200 mm^2 or larger, the incidence of cysts is equal to or greater than 92%.[1] Dentists generally have the impression that large periapical lesions have a reduced tendency to heal after root canal treatment, especially those with clear borders that resemble bone cysts radiographically.[2]

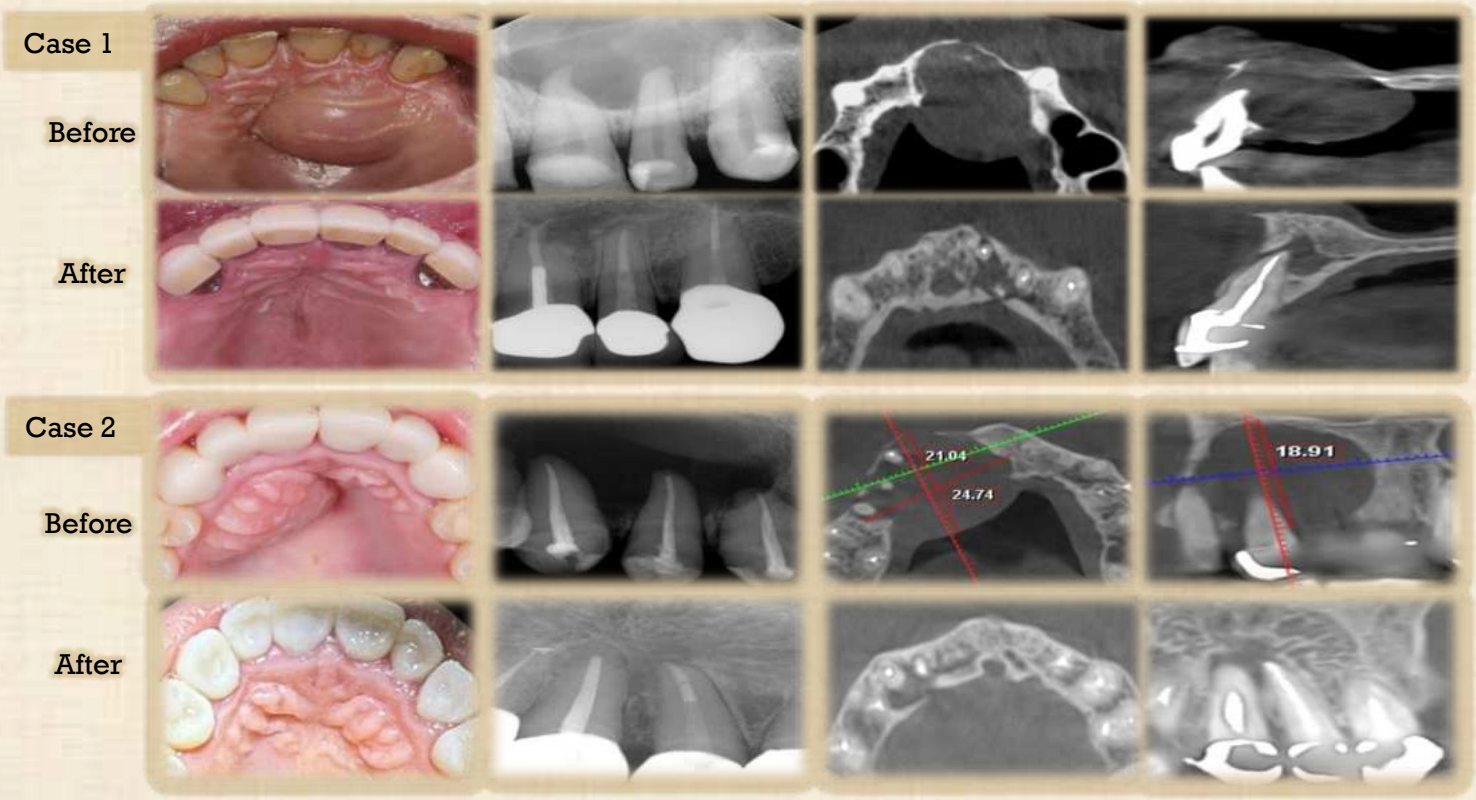
Case Presentation

Case 1 : 40 years old male patient, presented to the clinic with large palatal swelling in the left side. The swelling arise from 4 years and didn't relieve. Teeth #21 and 22 didn't respond to vitality test while other teeth respond normally. Radiograph showed large well-circumscribed radiolucency. Teeth 21 and 22 diagnosed as necrotic pulp with acute apical abscess.

Case 2 : 34 years old female patient, had large palatal swelling and sinus tract on buccal gingiva of right side. Patient mentioned that swelling appear from 5 years. All upper anterior teeth had inadequate root canal treatment and connected FPDs. Radiograph showed large well-circumscribed radiolucency. Tooth #15 diagnosed as irreversible pulpitis, tooth #14 diagnosed as normal pulp while teeth #13,12 and 11 diagnosed as previously treated with chronic apical abscess.

Treatment : Both patients treated in the same way. Rubber dam isolation, chemo mechanical instrumentation until size X5 Protaper next file to facilitate drainage through the canal and ensure adequate cleaning and removal of infected dentine and irrigation with full concentration sodium hypochlorite. H-file size 25 used beyond the apex to disturb cyst-like periapical tissue, calcium hydroxide applied for one week then obturation using bioceramic putty as apical plug and back fill with gutta percha.

Follow up : Swellings subsided after one month in both. Follow up after six years in case 1 and 4 years in case 2 showed that they are asymptomatic and radiographs revealed that significant bone regeneration and healed by scar tissue.



Discussion

The exact mechanism by which periapical cysts heal is not clearly understood. In the past they believe that large periapical lesions will not heal without surgical intervention. Many case series used long time dressing of calcium hydroxide or decompression techniques to have success and healing of large periapical lesions.[3,4] Seltzer suggested that over-instrumentation allowed the drainage of the cystic fluid, which then allowed the degeneration of the epithelial cells.[5] As well as calcium silicate–based cements are biocompatible with the potential to induce proliferation and osteogenic differentiation of human bone marrow stem cells.[6] In these cases I did over-instrumentation to disturb the epithelium lining layer and bioceramic material obturation material to stimulate healing and bone remodelling.

Clinical relevance

This paper suggests that surgical removal of periapical lesion of pulpal origin is not mandatory, and that, irrespective of the size of the lesion, every effort should be made to treat such lesions by conservative means.

References

Endodontic Management in PostCOVID Secondary Adrenal Insufficiency: A Case Report

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CP117

Aim: To demonstrate the interdisciplinary treatment of endodontic patient with secondary adrenal insufficiency at high risk of adrenal crisis.

Introduction: Adrenal insufficiency (prevalence 0.12‰) can complicate endodontic treatment due to patients' impaired stress response. COVID-19 may cause this condition through hypophysitis, affecting the pituitary gland via several mechanisms. For patients at high risk of adrenal crisis, dental procedures that could trigger such crises require preoperative assessment, stress reduction protocols, and adjusted glucocorticoid regimens, with dose adjustments implemented prior to treatment in consultation with an endocrinologist. Literature on dental management of these patients remains limited.

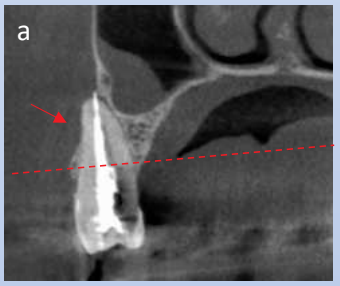
Figure 1: Preoperative (a) and postoperative (b) periapical radiographs.
Double contour of distal periodontal ligament space indicates the possibility of complex root canal system morphology and requires CBCT scanning (a).

Case presentation: A 52-year-old female patient diagnosed with secondary adrenal insufficiency due to hypophysitis as a post-COVID-19 complication was referred to our Department. Due to the secondary adrenal insufficiency, the patient was on a regular hydrocortisone regimen of 10 mg (morning) + 10 mg (afternoon) + 5 mg (evening) daily.

After a root canal obturation on tooth 25 by her general dentist, the patient developed severe toothache, which prompted her to increase her hydrocortisone dose to 10 mg + 10 mg + 10 mg. She then suffered an adrenal crisis (with diarrhea, abdominal pain, vomiting and severe weakness), which required admission to the emergency medical care. During the endodontic examination, the patient reported severe pain radiating to her left eye region. The tooth was sensitive to percussion and palpation tests. Periapical radiograph demonstrated a porous root canal filling with extrusion of material beyond the apex (Figure 1a). Additionally, a CBCT scan demonstrated the extrusion of the filling material beyond the apex and a buccal fenestration of the cortical bone (Figure 2). Based on radiographic findings, endodontic retreatment was indicated.

To mitigate the risk of complications during the endodontic procedure, we consulted the patient's endocrinologist before the appointment to establish an appropriate stress-dosing protocol for the retreatment. The hydrocortisone dosage was increased to 20 mg + 20 mg + 10 mg prior to the procedure, for a few days. The existing access cavity was round instead of oval (Figure 3a). After removal of porous root canal obturation, partial remaining roof of the pulp chamber was found and removed, and the uninstrumented palatal root canal and isthmus were located (Figure 3c). The whole root canal system was instrumented, irrigated, and medicated with CaOH. Because the vestibular abscess was present, an incision was made, and drain was applied. The patient returned, reporting pain and swelling, another incision was made, the antibiotics were prescribed for 3 weeks, daily follow-up checkups were conducted, during which the abscess reduced, but the patient continued to report pain in her left zygomatic region. Following self-adjustment of her stress therapy, the patient required readmission to emergency care due to another adrenal crisis.

Seven weeks after removing the previous filling, the dental condition showed significant improvement, enabling the completion of the final root canal filling, using gutta-percha and AH Plus paste (Figure 1b). However, the patient continues to report palpation sensitivity in the apical region of the tooth and consistently indicates pain in the left cheek area 3 months later (Figure 4). The persistent palpation sensitivity may be attributed to the buccal fenestration, which could be causing soft tissue irritation.



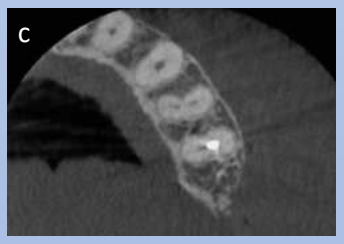


Figure 2: Preoperative CBCT scan.
Coronal view (a): note the buccal fenestration of the cortical bone – red arrow; the red dashed line marks the position of the axial view; sagittal view (b); axial view (c).

Discussion: This case highlights the importance of detecting the secondary adrenal insufficiency and appropriate adjustment corticosteroid supplementation before dental procedures that may trigger a significant stress response in patients at high risk of adrenal crisis. Prolonged postoperative healing discomfort could be attributed to the patient's compromised stress response, impaired inflammatory regulation, and altered tissue repair mechanisms resulting from the underlying adrenal insufficiency.

Clinical Relevance: Patients with adrenal insufficiency require strict adherence to corticosteroid supplementation protocols prior to dental procedures to prevent potentially life-threatening adrenal crisis. Interdisciplinary communication with endocrinologists is essential for safe management of these medically complex patients.

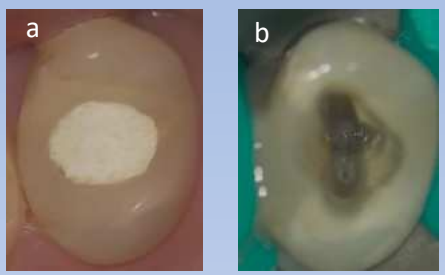


Figure 3: First session of the retreatment.
Existing access cavity (a), palatal root canal and isthmus after the gutta-percha removal (b).

Figure 4: 3-month follow-up periapical radiograph.

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Complex Endodontic Management in a Case of Chronic Apical Periodontitis, Chronic Apical Abscess and Extraoral Sinus Tract

CP118

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Aim

This study aims to delineate the treatment and follow-up procedures for a 15-year-old female patient diagnosed with chronic apical periodontitis (CAP) in the right mandibular first molar (tooth 46) and chronic apical abscess (CAA) with an extraoral sinus tract in the left mandibular first molar (tooth 36).

Introduction

Chronic apical periodontitis (CAP) and chronic apical abscess (CAA) are inflammatory conditions that often result from persistent pulp infection. When these conditions lead to the formation of an extraoral sinus tract, the clinical scenario becomes even more complex. Advances in imaging technology, particularly cone beam computed tomography (CBCT), advances in imaging technology, particularly cone beam computed tomography (CBCT), played a crucial role in this case by enabling detailed assessment of the periapical lesions and their relationship with surrounding anatomical structures. CBCT provided valuable diagnostic information that could not be obtained from conventional periapical radiographs alone, thus contributing significantly to accurate treatment planning and long-term follow-up evaluation have significantly enhanced our ability to diagnose and plan treatment in such challenging cases. This case report describes the endodontic management of a 15-year-old female patient presenting with CAP in one mandibular molar and CAA with an extraoral sinus tract in the contralateral molar. The report emphasizes the importance of comprehensive clinical and radiographic evaluation in achieving successful treatment outcomes.

Case Presentation

The primary complaint of the 15-year-old female patient who presented to the clinic was the discomfort in her left first mandibular molar. The intraoral examination revealed swelling and tenderness in this region, whereas the extraoral examination revealed a sinus tract. The right mandibular molar is asmptomatic. Large lesions were observed at the apices of both of these teeth during radiographic examinations using periapical radiography and CBCT. Both teeth received orthograde root canal therapy. The appointments were executed simultaneously. The right lower molar was treated in one visit, whereas the left lower molar, which presented with an extraoral sinus tract, required two visits for treatment.

Figure 1. Panoramic Film

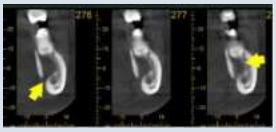

Figure 2. Sagittal CBCT

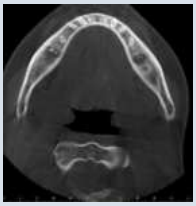

Figure 3. Axial CBCT

Figure 4. Gutta percha check of 46

Figure 5. Gutta percha check of 36

Figure 6. Post-op periapical film of 46

Figure 7. Post-op periapical film of 36

Figure 8. One year follow up

Figure 9. One year follow up

Figure 10. Extraoral sinus tract

Figure 11. Healing of extraoral sinus tract

Case Presentation

All procedures conducted under a rubber dam. The Woodpecker apex locator was utilized to determine the root canal lengths of both teeth following access to the root canals.. The crown-down method was utilized to expand the canals using Endoart Gold rotary files. Gutta-percha and AH Plus resin-based sealer were utilized to obturate the canals. Subsequently, composite restoration was executed. Subsequent radiographs were acquired. Radiographic follow-up after one year revealed periapical healing, while the extraoral sinus tract had completely resolved, indicating both radiographic and clinical success.

Discussion and Conclusion

The treatment of this case involved a methodical approach tailored to the specific challenges presented by bilateral mandibular molars. Although the right molar was asymptomatic, radiographic findings revealed significant periapical lesions, warranting proactive treatment. The left molar, which was symptomatic and associated with an extraoral sinus tract, required immediate attention. The use of CBCT allowed for precise assessment of the lesion size and extent, thereby guiding the endodontic intervention. Following meticulous cleaning, shaping, and obturation procedures, clinical and radiographic follow-ups confirmed the resolution of the periapical pathology and closure of the sinus tract. This case underscores that with the integration of advanced imaging techniques and careful endodontic protocols, even complex presentations in young patients can be managed successfully without resorting to more invasive surgical procedures.

Clinical Relevance

- Emphasizes the role of CBCT in accurately diagnosing and planning treatment for complex endodontic cases.
- Highlights the necessity of treating both symptomatic and asymptomatic teeth when periapical pathology is evident.
- Demonstrates that comprehensive, non-surgical endodontic management can lead to the resolution of both intraoral and extraoral manifestations.
- Serves as a reminder of the importance of individualized treatment planning and long-term follow-up to ensure sustained clinical success.

Contact

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CP119 Successful Healing Of Large Periradicular Lesion- A Case Report

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Aim: To present successful healing of a large periradicular lesion after a non-surgical root canal retreatment.

Introduction: The outcome of a non-surgical treatment of large apical lesions is always being a challenge for a therapist. A prerequisite for successful endodontic therapy is adequate chemomechanical root canal preparation, three-dimensional hermetic obturation and adequate restoration.

The 15-year-old male patient was reffered by the oral surgeon for endodontic therapy. Clinical examination revealed the presence of extraoral and intraoral swelling in the area of upper incisors and canine on the right side. Also the presence of an ntraoral incision with iodoform gauze was observed. Analysis of the retroalveolar radiograph (Fig. 1) revealed a prominent radiolucency associated with teeth #11, #12 and #13. The patient reported a traumatic injury 4 years ago. Tooth #11 was primarly endodontically treated 3 years ago, while tooth #12 was treated several month ago, when the previous dentist also required CBCT (Fig 2).

Figure 1. Preoperative retroalveolar radiograph

Figure 2. CBCT section: (a) coronal plane; (b) axial plane; (c) sagital plane associated with teeth #11(d) sagital plane associated with area between teeth #12 and #13 showing a large diffuse radiolucency involving the palatal cortical lamella

A temporary filling was present on both teeth, with no definitive restorations. Previous root canal fillings were removed with ProTaper Universal retreatment files D1-D3 (Dentsply Maillefer, Ballaigues, Switzerland) from teeth #11 and #12 . Tooth #13 was also endodonticly treated. Chemomechanical preparation on tooth #13 was performed with Reciproc (R-40), and on tooth #12 with (R-50). Tooth #11 was additionally enlarged by a manual K-file #80 under copious irrigation with 5 mL 2.5% NaOCl with a 27 gauge needle. Ultrasonic activation was preformed using Endo 3 Ultrasonic Activator (Woodpacker Medical Instrument Co.) 3 times during 20s for each root canal. Fresh $Ca(OH)_2$ paste was applied as an intracanal medicament and cavities were closed with a temporary filling material (Cavit, 3M ESPE, Germany) for two weeks. In the second visit, the teeth were still slightly sensitive to percussion and periapical secretion was present. During this session, fresh $Ca(OH)_2$ paste mixed with iodine and was applied as an intracanal medication for two weeks. Next time, the same procedure was repeated for another 3 weeks. Subsequently, the medication was mechanically removed from the root canals and the final irrigation procedure was performed with 5 mL 2.5% NaOCl, 17% ethylenediaminetetraacetic acid (EDTA) (Endo-Solution; PPH Cerkamed) and distilled water, respectively, and canals were dried with paper points. Root canal treatment was completed with a single cone technique using a bioactive calcium silicate sealer Well-Root ST (Vericom Co., Korea). Teeth were restored with a composite material Gradia Direct®. 3 months after endodontic treatment the patient was asymptomatic and control radiographs (Fig. 3) revealed a significantly smaller lesion. Next control radiographs, taken 5 months after obturation, revealed extensive healing of the periraducular lesion (Fig. 4 a,b).

Figure 3. Retroalveolar radiograph after 3 months

Figure 4. Retroalveolar radiograph after 5 months (a,b)

Discussion: Untimely and inadequate primary endodontic therapy without final restoration led to extensive bone loss. CBCT provided a three-dimensional view and enabled precise assessment of the extention and severity of the resorptive defect. Calcium silicate-based sealer was used due to its prolonged antimicrobial effect and stimulating effect on the repair process.

Clinical relevance: Despite the size of the lesion, non-surgical endodontic treatment, which included adequate chemomechanical root canal preparation, enhanced by the activation of irrigants, obturation with a bioceramic sealer and appropriate definitive coronary restauration led to substantial healing. Due to damage of the palatine cortex, surgical therapy would likely lead to the appearance of a bicortical defect and subsequent impaired bone healing.

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Comprehensive Emergency Management of Acute Apical Abscess: Two Case Reports

CP122

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AIM: This case series provides a detailed analysis of the diagnostic processes and therapeutic approaches employed in the management of acute apical abscesses occurring in two distinct anatomical regions, highlighting the clinical decision-making and treatment outcomes.

INTRODUCTION: Acute apical abscesses are common dental infections caused by bacterial contamination of the root canal system[1]. Left untreated, they can lead to severe complications. Clinically, they present with pain, swelling, and possibly systemic symptoms like fever and lymphadenopathy[2]. Prompt diagnosis and treatment, including clinical and radiographic evaluation, are essential. Management often involves endodontic therapy, surgical intervention, and adjunctive antibiotics when necessary.

Case 1: A 23-year-old systemically healthy female patient presented to our clinic with complaints of sudden-onset pain and swelling in the upper right maxilla. According to the patient's medical history, the pain began abruptly and progressively worsened throughout the day, resulting in swelling severe enough to extend over the right eye (Fig. 1a). Clinical and radiographic examination revealed percussion pain and periapical lesions associated with the maxillary right second premolar and first molar teeth (#15 and #16) (Fig. 2a). The patient's vital signs were recorded as a body temperature of 38°C and a pulse rate of 100 bpm.

Initial Intervention

Following the administration of local anesthesia and rubber dam isolation, access cavities were prepared in the affected teeth. Chemomechanical preparation was performed; however, no drainage was obtained. Based on the clinical findings, the patient was referred to the emergency department of the Faculty of Medicine for further assessment and management.

Hospital Course

A week later, the patient re-consulted our clinic, and it was understood that they had been **hospitalized** due to elevated CRP levels (Tab. 1) and the risk of **preseptal cellulitis.** It was also noted that during the hospital stay, intravenous antibiotic therapy was administered. After clinical improvement and normalization of CRP levels, it was learned that the patient had been referred back to our clinic for the completion of endodontic treatment.

Endodontic Treatment

In the second session, chemomechanical preparation was completed, and **calcium hydroxide** was placed as an intracanal medicament. By the third session, the patient's symptoms had resolved, and the calcium hydroxide was removed (Fig. 1b). Final irrigation was performed using **2.5% NaOCl** and **17% EDTA** with ultrasonic activation to ensure thorough disinfection. The treatment was successfully completed by obturating the root canals with **gutta-percha** and a **bioceramic-based sealer (Fig. 2b) with the 3-month follow-up radiograph is shown (Fig. 2c).**

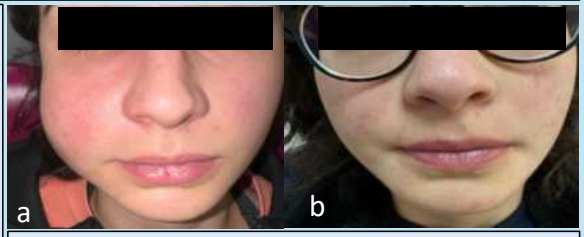

Fig. 1: (a) Preoperative extraoral photograph, (b) Postoperative extraoral photograph.

Value C-reactive protein	Reference range
Preoperative: 51.92 mg/L	0 - 5
Postoperative: 0.5 mg/L	0 – 5

Tab. 1: Elevated preoperative levels of C-reactive protein (CRP) are associated with systemic inflammation.

Fig. 2: (a) Pre-op radiograph (b) Post-op radiograph (c) 3-month follow-up radiograph.

Fig. 3: (a) Preoperative extraoral photograph, (b) Postoperative extraoral photograph.

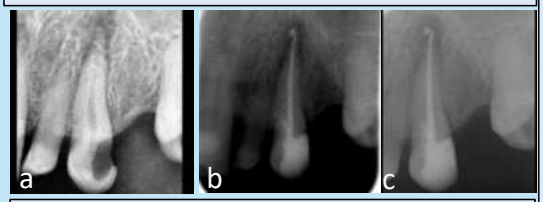

Fig. 4: (a) Preoperative radiograph, (b) Postoperative radiograph. (c) 3-month follow-up radiograph.

Case 2: A 60-year-old female patient presented to our clinic with complaints of sudden-onset pain and swelling in the left maxilla. Medical anamnesis revealed no systemic disease, and the symptoms had begun two days prior. On the day of presentation, increased swelling and ecchymosis in the left infraorbital region were observed (Fig. 3a). Clinical and radiographic examination revealed percussion pain, and a periapical lesion associated with the maxillary right canine (#13) (Fig. 4a).

Initial Intervention:

Local anesthesia was administered, and rubber dam isolation was ensured. An access cavity was prepared, and chemomechanical preparation was completed. Drainage of the abscess through the root canal was attempted but was not sufficient. The patient was then prescribed **Clindamycin 600 mg IM** twice daily for five days.

Follow-up Appointment:

The patient was observed daily for the first three days and then on alternate days. **Calcium hydroxide** was applied as an **intracanal medicament**.

Final Appointment:

Resolution of symptoms was observed (Fig. 3b), and the **calcium hydroxide** was removed. Final irrigation was performed with **2.5% NaOCl** and **17% EDTA**, activated ultrasonically. The treatment was completed by obturating the root canals with a **bioceramic-based sealer** and **gutta-percha (Fig. 4b) and the 3-month follow-up radiograph is shown (Fig. 4c).**

DISCUSSION: These cases highlight the importance of early intervention in the management of acute periapical infections. Proper antibiotic use prevents the spread of infection, stabilizes the patient's overall condition, and facilitates the treatment process. Acute periapical abscesses can lead to a clinical condition severe enough to require hospitalization, indicating that the infection may rapidly develop into systemic complications. Controlling the infection during the initial intervention enhances the effectiveness of the treatment process and is essential for successful management.

CONCLUSION & CLINICAL RELEVANCE: **Appropriate and timely antibiotic therapy, along with proper initial intervention,** are critical in the management of acute periapical infections and improve the effectiveness of the treatment process.

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CP123

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DENS EVAGINATUS IN TWO ADJACENT MANDIBULAR PREMOLARS: A CASE REPORT

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AIM: Clinical management of two adjacent apical abscesses caused by the uncommon occurrence of Dens Evaginatus, a developmental aberration.

INTRODUCTION: Dens evaginatus (DE) is a developmental anomaly of unknown aetiology. It results in the formation of a tubercle projection, which often contains pulp tissue; leading to frequent pulpal complications [1]. DE is most common in Mongoloids, with the highest prevalence reported to be 6.3%[2]. Bicuspids are most affected [1].

CASE PRESENTATION: A 43-year-old male of Chinese descent, with an unremarkable medical history, was referred for two swellings on his lower left side, which he reported have been present sporadically for six years. The mandibular left first and second premolars were not tender to percussion, and did not respond to pulp sensibility tests.
A large radiolucency was evident on both the periapical radiograph and the CBCT. Both teeth were diagnosed with a pulpless and infected root canal system with a chronic apical abscess. Multi-visit root canal treatments with calcium hydroxide as a medicament were completed and reviewed a year later. Direct composite restorations were placed coronally.

Figures: Pre-operative radiograph, CBCT, intra-oral images, post-operative and review radiographs

DISCUSSION: DE is more prevalent in individuals of Mongoloid origin. Sixty percent of the world's population lives in Asia[3], as well as large diasporas across the globe. Though DE is thought to be rare, its prevalence may rise over-time due to population growth.

CLINICAL RELEVANCE:

- **Increased awareness of DE required for early detection and treat by preventative and conservative means such as sealants, VPT, and REP.**
- **The pre-operative presence of a draining sinus is a negative prognostic factor [4]. Intracanal medicaments increase treatment predictability in infected cases.**

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Endodontic Treatment of Upper Lateral Incisor Tooth with Dens in Dente: A Case Report

Sevinc Sevgi DDS

AIM- Successful root canal treatment requires detailed analysis of the relevant condition, accurate diagnosis and treatment planning. Our aim in this case report is to perform a correct preliminary radiographic evaluation of the tooth planned for treatment and to perform a successful treatment by paying attention to these preliminary studies during treatment according to the findings made.

INTRODUCTION- The success of endodontic therapy depends on the through elimination of the infected pulp tissue and microorganisms, and the complete three-dimensional sealing of the root canal space. Major causes of post-treatment disease failure are the inability to locate and debride all canals in the root canal system or the improper obturation of root canals. The root canal system of dens in dente is characterized by morphological and anatomical complexity, which is why the diagnosis and treatment planning of such cases are considered difficult. Most cases are detected during a routine radiological examination using a panoramic radiograph, periapical radiograph, and advanced imaging techniques such as CBCT. Clinically, a morphological change in the crown or a deep foramen cecum can indicate its diagnosis. The presence of an invagination is clinically significant since it poses an increased risk of dental caries, pulp pathosis, and periodontitis. Histologically, fragile hypomineralized enamel is often seen at the site of intussusception.

CASE PRESENTATION- A 22 year old male patient presented to the dental clinic with severe pain in the upper area. It was learned that there was no systemic disorder in the anamnesis taken form patient. As a result of clinical examination, the caries was detected on the distal surface of the patient's upper lateral tooth. In the percussion and palpation tests were negative. There was no mobility in the tooth. Vitality of the tooth was positive. Sinus tract and swelling were not observed in the soft tissues. Radiological examination revealed no periapical pathology in the roots of the tooth and lamina dura. At the same time, a 'dens in dente' image is observed in the tooth (Figure 1.)The patient was diagnosed with pulpitis and root canal treatment was planned. The patient was informed about all procedures and informed consent form was signed.

Figure 1. Pre-op radiography

Figure 2. Access cavity and root canals orifices

The tooth was anesthetized with infiltrative nerve block by using ultracaine DS Fort (4% articaine with epinephrine 1/100,000, Hoechst Marion Roussel, Frankfurt, Germany). After preparing an access cavity to the relevent tooth, a rubber-dam was placed for isolation. The pulpal floor was carefully examined with a magnification loupe (4.6x, Exam Vision, Samso, Denmark) and three canals were identified. It was observed that the three canals of the tooth were located in the mesiodistal direction in the middle region of the tooth (Figure 2.). The root canals lengths were determined using an apex locater with type #10 K file (Dentsply Maillefer, Ballaigues, Sweden). After this, cleaning and shaping procedures were performed using the Protaper Universal rotary system (Dentsply Maillefer, Ballaigues, Sweden) using the step-down technique to size #F1. Irrigation was caried out with 5% NaOCl during instrumentation. When the instrumental process was finished,, irrigation activation was performed for 30 seconds at 10,000 rpm with Eddy (VDW GmbH, Munich, Germany) in each canal. After then the last irrigation was performed with 17% EDTA, saline and 5% NaOCl. The root canals were dried with absorbent points and appropriate gutta-percha points were placed. Radiologically, the gutta-percha points were checked and then the root canals were obturated using a resin-based sealer (Dia-Proseal, Diadent) and the relevant tooth was restored with composite (Figure 3). After than a follow-up appointment was scheduled for the patient 6 months later. The patient 6 month control appointment, the tooth was asymptomatic and no periapical pathology was observed on the radiograph.

Figure 3. Gutta-percha control, postoperative and 6 months follow radiograph.

DISCUSSION-. The best-known classification of dens in dente is Oehler's 1957 classification, in which he described them as coronal and radicular invaginations (Figure 4.). Radiological imaging is very important in the diagnosis and treatment planning of such anatomical malformations. CBCT imaging allows the determination of the type of invagination and the selection of appropriate treatment. In our case, CBCT imaging was not performed because all canals were accessible and at the same time there was no access to CBCT during the procedure. Our case is classified as type IIIb according to Oehler's definition. In this classification, invagination is complete and reaches the pulpal cavity and from there to the apical foramen. The most important thing in this case is the complete mechanical and chemical cleaning of the root canal system with complex morphology. For this purpose, in our case, solution activation was performed for the inaccessible areas. In many cases, teeth become devitalized due to invagination and cause periapical pathologies, and therefore apical surgery is required. However, in our case, we did not need apical surgery because our tooth was vital and microorganisms did not reach the periapical region. In teeth with complex root canal anatomy such as dens in dente, even if all procedures are performed correctly, these cases need to be followed up in the future due to the possibility that they cannot be reached due to anatomical variations and cleaning cannot be done completely.

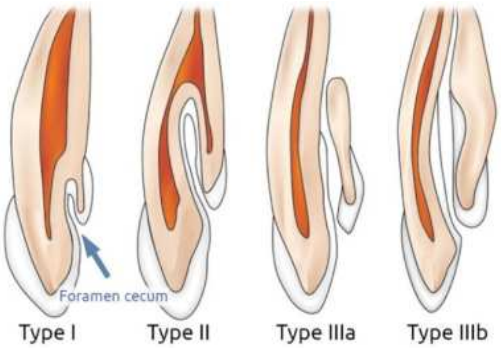

Figure 4. Oehler's dens in dente classifications.

CLINICAL RELEVANCE-Dens in dente varies between societies, but its incidence in the population has reached up to 10%. In many cases, it is asymptomatic, so every patient who comes for treatment and control should be examined and diagnosed considering the presence of many anatomical malformations.

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Root Canal Variations of Mandibular Incisors : Case series.

CP125

جامعة بيروت العربية
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Aim

To describe exceptional root canal variations of mandibular incisors observed in Cone Beam Computed Tomography (CBCT) scans of three different patients.

Introduction

Endodontic treatment depends on proper debridement of root canal space and optimal cleaning and disinfection. (De Almeida et al. 2013) The difficulty of achieving this goal can be due to the presence of complexities within the root canal system. (Mustafa et al. 2025) Adequate knowledge of root canal morphology and its possible variations is essential for good endodontic treatment outcome. It has been shown that mandibular incisors can show canal system complexities such as the presence of a second canal with different root canal configurations. (Magat et al. 2024, Han et al. 2014)

CBCT is an essential imaging method that can provide detailed insights of the internal anatomy of teeth, significantly contributing to accurate diagnosis and treatment planning in endodontics. (Mustafa et al. 2025) Contrary to other laboratory methods such as staining and clearing techniques and micro-computed tomography (Micro-CT), CBCT can be used in-vivo being non-destructive and accurate.

Authors state that ethnic background can significantly affect the root canal configurations observed in mandibular incisors. (Martins et al. 2023) This indicates the importance of reporting root canal configurations and variations from all countries throughout the world.

Case Presentation

CBCT scans were retrieved from Beirut Arab University Faculty of Dentistry patients' clinical records (DenTrooper Educational, SOL-T, Beirut, Lebanon). These scans were acquired with Carestream dental CS 9600 unit (Carestream, Atlanta, United States). No CBCT volumes were obtained specifically for the purpose of this study. During reviewing, three scans presented canal variations in mandibular incisors and are illustrated in Figure 1. Ahmed et al. (2017) classification system was used to describe the root canal anatomy, ${}^{n}TN^{x}$, where n refers to number of roots, TN to tooth number and x to canal configuration. All cases presented one root.

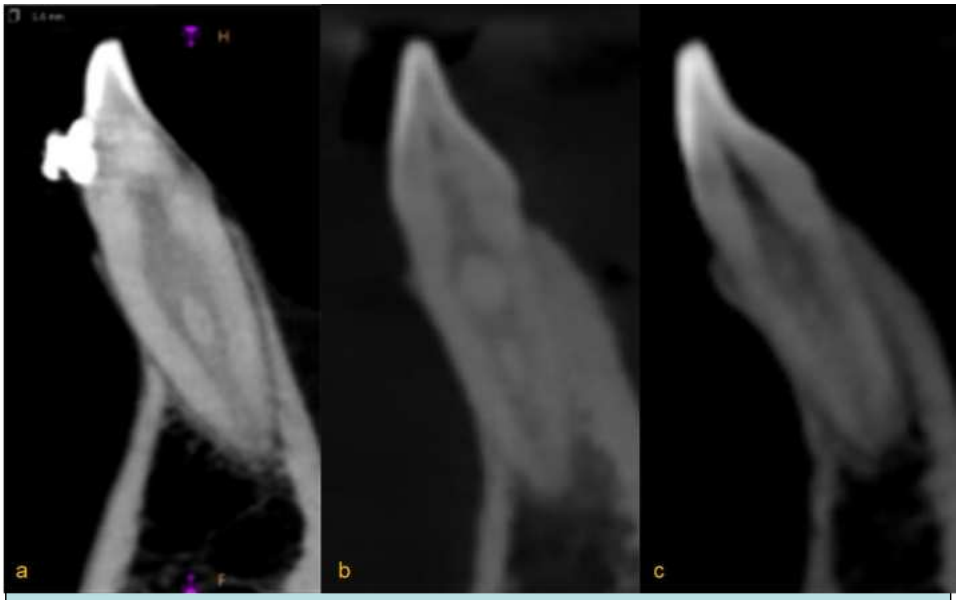

Figure 1: Representative images of the anatomical variations seen on CBCT sagittal view, ${}^{1}42^{1\text{-}2\text{-}1\text{-}2\text{-}1}$ (a), ${}^{1}42^{2\text{-}1\text{-}2\text{-}1}$ (b), and ${}^{1}41^{1\text{-}2\text{-}1\text{-}2\text{-}1}$ (c).

The first case involved a mandibular lateral incisor presenting one canal that leaves the pulp chamber, divides and then rejoins within the body of the root, re-divides into two small canal branches short of the apex before rejoining and exiting as one canal ${}^{1}42^{1\text{-}2\text{-}1\text{-}2\text{-}1}$. (Figure 1a). In the second case, a mandibular lateral incisor from a 26-years old Syrian male, presented two separate canals leaving the pulp chamber, merging within the body of the root, re-dividing, and finally merging to exit as one canal, ${}^{1}42^{2\text{-}1\text{-}2\text{-}1}$. (Figure 1b). The third and final case involved a mandibular central incisors. A similar canal configuration to the first case was noted ${}^{1}41^{1\text{-}2\text{-}1\text{-}2\text{-}1}$, but with the canal divisions occurring higher within the body of the root in the third case. (Figure 1c). For cases one and three, both patients were aged 22 years old, Lebanese and males.

Discussion

Mandibular incisors can present a second canal in varying prevalence, with a study reporting a high 51% occurrence in a Syrian population. (Martins et al. 2023) Syria and Lebanon are neighboring countries with similarities in environment, demographics as well as shared family-ties. This indicates that both Syrian and Lebanese population could have similar tendency of prevalent double canaled mandibular incisors, together with some root canal variations within these teeth. Taking into consideration possible variations in canal anatomy is important when planning for an endodontic procedure in order to mitigate treatment failure. The imaging device used in this report is CBCT. It is an effective and accurate tool that has been used in many root canal anatomy studies. (Mustafa et al. 2025, Magat et al. 2024) Root canal anatomy was described based on Ahmed et al. 2017 classification that enables accurate characterization of root and canal anatomy and compensates for the limitations present in Vertucci classification. (Ahmed et al. 2017) The root canal variations illustrated in this report have been reported in a Chinese (Han et al. (2014), Turkish (Arslan et al. 2015) and Brazilian (De Almeida et al. 2013) populations, but to the best of our knowledge for the first time in a Lebanese and Syrian populations

Clinical Relevance

The root canal morphology in mandibular incisors can have variations. For good root canal therapy outcome, it is important for a clinician to have thorough knowledge of the anatomy and its variations. Clinicians should also perform additional radiographs in different angulations, use a Dental Operating Microscope (DOM) and use CBCT when needed to efficiently detect the complex anatomical configuration.

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Non-Surgical Management of Type II Dens Invaginatus in a Maxillary Lateral Incisor: A Case Report

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Aim: This case report aims to describe the clinical management of a maxillary lateral incisor with Type II Dens Invaginatus (DI) using non-surgical root canal treatment.

Introduction: DI is a developmental anomaly that can complicate endodontic treatment due to its complex anatomy. Oehlers classified DI into three types, with Type II cases involving an invagination extending beyond the enamel-cementum junction, often close to the dental pulp but without direct communication with the periodontal ligament. Proper diagnosis and treatment planning are crucial to avoid complications such as pulpal necrosis and periapical infections.

Case Report: A 19-year-old systemically healthy female patient was referred for the treatment of her upper left lateral incisor, which presented with a peg-shaped morphology. Clinical and radiographic examinations revealed an acute apical abscess and apical radiolucency (Fig.2). Cone-beam computed tomography (CBCT) confirmed Type II DI (Figs 1a,1b). Non-surgical root canal treatment was performed using rubber dam isolation. Access to the canal was achieved through the invagination with the aid of a dental microscope (x16) and long-shaft burs. The canal was shaped with hand instruments and irrigated with 2.5% Sodium hypochlorite (NaOCl) and 17% ethylenediaminetetraacetic acid (EDTA). Intracanal medication (Calciplus, Imicryl, USA) was placed between sessions. After two weeks at the second appointment., the canal was obturated by gutta-percha and epoxy resin sealer (Endoplus,Presidental,Germany) , and the final restoration was completed using composite resin and metal-ceramic crown prothesis.

Figure 1a

Figure 1b

Preoperative photograph

Postoperative photograph

Figure 2

Figure 3

Discussion: CBCT played a crucial role in diagnosing the complex internal anatomy of DI, allowing for precise treatment planning. Non-surgical management effectively eliminated infection and promoted periapical healing.

Clinical Relevance: An 18-month follow-up showed significant periapical healing (Fig.3), demonstrating that root canal treatment can be a viable approach for treating Type II DI without the need for surgical intervention.

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Dens Invaginatus Clinical Treatment Management: A Case Report

CP127

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Aim

This case report presents the non-surgical management of Type 2 Dens Invaginatus, aiming to evaluate the clinical success of a conservative approach and its one-year follow-up.

Introduction

Dens invaginatus, also known as dens in dente, is a rare developmental dental anomaly resulting from the invagination of the enamel organ into the dental papilla before calcification (Plascencia et al. 2017). First described by Ploquet in 1794 in a whale's tooth, it was later reported in human dentition by Socrates in 1856 (Alenazy et al. 2017). This anomaly predominantly affects maxillary lateral incisors, with a reported incidence ranging from 0.3% to 10% (Kfir et al. 2013). Disruptions in the growth rate of the inner enamel epithelium lead to invagination, increasing bacterial accumulation and predisposing to dental caries, pulpal necrosis, and periapical pathologies (Gallacher, Ali, and Bhakta 2016).
Oehler's classified dens invaginatus into three types (Oehlers 1957) (Figure 1):

- Type I: Confined to the crown of the tooth.
- Type II: Extends into the root but terminates as a blind sac.
- Type III: The most severe form, communicating with the periodontal ligament either laterally (IIIa) or apically (IIIb).

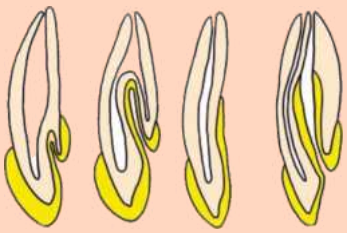

Figure 1. Oehler's dens invaginatus classification

Endodontic management of dens invaginatus presents significant challenges due to its complex root canal anatomy, necessitating meticulous decontamination and disinfection. Advanced imaging techniques such as cone beam computed tomography (CBCT) are essential for accurate diagnosis and treatment planning (Goel, Nawal, and Talwar 2017). This case report presents the nonsurgical management of Type II dens invaginatus using mineral trioxide aggregate (MTA), demonstrating an effective approach for the endodontic treatment of this anomaly.

Case Presentation

A 15-year-old female patient presented to our clinic with a complaint of an intraoral sinus tract on the vestibular mucosa. Clinical and radiographic examinations, including periapical radiography and CBCT, led to the diagnosis of Oehlers Type 2 Dens Invaginatus. In the first visit, necrosis and chronic apical abscess associated with dens invaginatus, rather than caries, were detected (Figure 2-4).

Figure 2. Initial radiograph of tooth #12 showing a periapical lesion due to Dens Invaginatus.

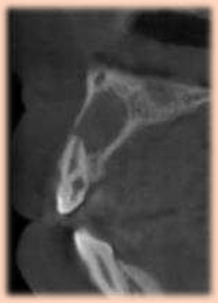

Figure 3. Cone-beam computed tomography (CBCT) image of tooth #12 demonstrating Oehlers Type 2 Dens Invaginatus.

Figure 4. Intraoral clinical image showing a sinus tract on the vestibular mucosa associated with tooth #12.

Under rubber dam isolation, an access cavity was prepared, revealing a connection between the invaginated cavity and the main canal. The working length was determined (Figure 5), irregular invaginated areas were cleaned using ultrasonic tips, and the canal was disinfected with 5.25% sodium hypochloride (NaOCl) irrigation. Subsequently, calcium hydroxide ($Ca(OH)_2$) was applied as an intracanal medicament, and the tooth was temporarily sealed.
At the two-week follow-up, the sinus tract was observed to have healed. In the second visit, $Ca(OH)_2$ was removed, final irrigation was performed, and due to the open apex, an apical plug was placed using MTA. The canal was then obturated with epoxy resin-based sealer and gutta-percha using the warm compaction technique (Figure 6,7).

Figure 5. Radiological determination of working length

Figure 6. Apical plug placement and warm vertical compaction of the root canal filling.

Figure 7. Intraoral photograph showing the healing of the sinus tract.

During the one-year follow-up period, the patient relocated, requiring periapical radiography at a local clinic. Despite suboptimal image quality, bone trabeculation indicated healing (Figure 8). Clinical and radiographic assessments over the year confirmed progressive recovery and a favorable prognosis, emphasizing the importance of long-term follow-up.

Figure 8. One-year follow-up periapical radiograph taken at a local clinic after the patient relocated.

Discussion

Dens invaginatus is defined as an enamel anomaly and is a developmental anomaly. Different types may require different treatment approaches. In Type II dens invaginatus, the invaginated structure can be completely removed and the canal can be treated as a single, wide canal. In our case, since the invagination had merged with the main canal, it was managed accordingly and obturated as a single canal. In cases like Type 3b (Figure 1), if there are vital areas in the pulp, these parts can be left untreated. Additionally, if external resorption is present, it may need to be combined with surgical treatment.There is no standardized treatment protocol for dens invaginatus, and treatment planning should be individualized based on similar cases.

Clinic Relevance

This case highlights the critical role of CBCT in evaluating the complex anatomy of dens invaginatus for accurate treatment planning. The use of an apical plug with MTA and thermoplastic gutta-percha obturation has proven to be an effective approach for achieving successful periapical healing.

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Changes in Tooth Vitality After Trauma: From Negative to Positive

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CP128

Aim:

Our aim to present a case with delayed returned of sensibility after traumatic dental injury.

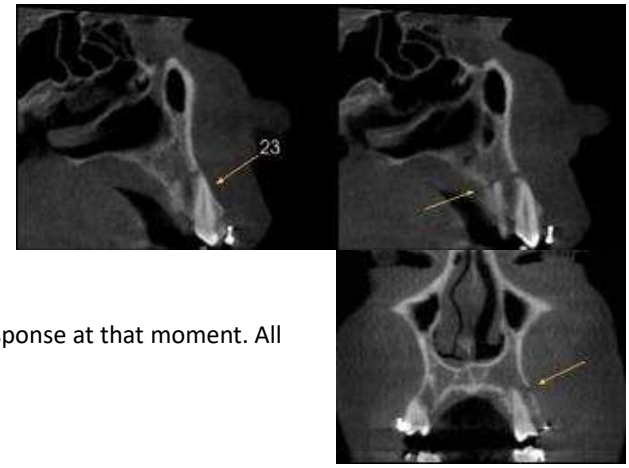
Introduction:

Endodontic diagnostics for teeth at the bone fracture line are similar to general trauma diagnostics, involving clinical, radiological, and endodontic assessments[1] .Accurate pulp assessment is crucial for follow-up, as current sensibility tests only measure neural response and may miss cases with intact vasculature[1,2] . Pulp outcomes may vary from necrosis to repair, depending on cellular and bacterial factors[3] .

Case Presentation:

Healthy 25 old man was admitted to our hospital after receiving a blow to the maxilla region during a political party rally. In the CBCT taken from our patient, who was currently using orthodontic wires, a dentoalveolar fracture line was detected near the apical region of teeth #22, #23, #24. And there was extrusiv luxation on the teeth #21, #22, #23.

The displaced segment was first repositioned to its original location and stabilization was achieved using a 17x25 stainless steel wire.



Pulp sensibility tests (cold, EPT) performed and the tooth #22 and #23 had no response at that moment. All the other teeth were sensitive to sensibility tests.

Pre-op panoramic xray

Orthodontic treatment with fixed braces to adjust occlusion with stainless steel 17x25

On 4th month recall appointment despite the fracture line apically and the luxation sensibility returned in both teeth.

Discussion:

Temporary loss of sensibility is common after trauma and does not indicate pulp necrosis[4] . A lack of response to sensibility testing should not be seen as definitive necrosis[4] .Extrusion luxation, while causing minimal periodontium damage, can sever the pulpal vascular supply, increasing the risk of necrosis[5] .

Clinical releveance:

Following traumatic dental injuries, initial negative response to sensibility test results may indicate temporary pulp damage with the potential for recovery. Therefore, long-term monitoring is crucial to avoid unnecessary root canal treatment and to preserve the tooth. Clinically, monitoring sensibility after trauma plays a significant role in treatment planning.

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CP129

TREATMENT OF MANDIBULAR PREMOLAR WHICH CAUSED SWELLING, NUMBNESS OF LOWER LIP

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AIM –The purpose of this case report is to describe the treatment and 6-month follow-up a patient presenting with facial swelling and lower lip numbness caused by infected mandibular premolar#35. The report highlights the clinical management, including endodontic therapy and the adjunctive use of vitamin B12, to address the symptoms and promote healing.

INTRODUCTION –Mandibular premolars, due to their anatomical proximity to the inferior alveolar nerve, can cause sensory disturbances such as numbness or paresthesia when infected. This condition often arises from periapical pathology or inflammation affecting the mandibular nerve canal. Endodontic treatment, combined with supportive therapies, has been shown to alleviate symptoms and promote healing. This report presents two cases where such an approach was successfully implemented.

CASE PRESENTATION – A 60-year-old female was referred to our clinic with complaints of facial swelling, pain, and numbness in the lower lip. Clinical examination revealed extensive caries and periapical lesions associated with the left mandibular second premolar. Radiographic evaluation confirmed the involvement of the mandibular nerve canal.

CBCT and periapical images showing the relationship between the root of tooth number 35 and the mandibular canal

Final radiograph #35

Endodontic treatment was initiated, and the root canals were dressed with calcium hydroxide for 4 weeks to disinfect the canal and reduce inflammation. After the resolution of acute symptoms, the root canals were obturated. Additionally, vitamin B12 was prescribed to support neural healing.

6 month follow up radiagraph shows periapical healing and patient declared the numbness almost disappeared

DISCUSSION -The resolution of symptoms and radiographic evidence of periapical healing at the 6-month follow-up demonstrated the effectiveness of the treatment protocol. Calcium hydroxide, known for its antimicrobial and anti-inflammatory properties, played a critical role in disinfection and tissue repair. The adjunctive use of vitamin B12 likely contributed to the recovery of neural function. These findings align with previous studies emphasizing the importance of thorough disinfection and supportive care in managing endodontic infections involving the mandibular nerve canal (1, 2).

CLINICAL RELEVANCE -This case report underscores the importance of a multidisciplinary approach in managing endodontic infections with neurological complications. The combination of endodontic therapy and vitamin B12 supplementation can be an effective strategy for treating mandibular premolars associated with sensory disturbances.

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SINGLE-VISIT ENDODONTIC AND RESTORATIVE TREATMENT WITH DIGITAL WORKFLOW ON PERMANENT MOLARS IN CHILDREN: A CASE SERIES

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CP130

Aim: The aim of this case series is to demonstrate the treatment of molars requiring root canal treatment in children in a single session using a computer-aided design/computer-aided manufacturing (CAD/CAM) system.

Introduction: The treatment of molars in pediatric patients with severe coronal destruction and the need for root-canal treatment requires modern techniques that allow for long-term survival. With the help of CAD/CAM technology and modern endodontics, it has become practicable to perform these treatments in a single session[1].

Case presentation:

In case 1, a 13-year-old boy had a deep cavity at #26 and a negative response to vital pulp testing (VPT), diagnosed as pulp necrosis. In case 2, a 12-year-old girl had presented with severe coronal destruction at #36 and a negative response to VPT, diagnosed as pulp necrosis. In case 3, a 12-year-old girl was admitted to the clinic with the complaint of nocturnal pain at #46. Radiographic examination identified a periapical lesion and a negative response to VPT. The final diagnosis was chronic apical periodontitis.

Access cavities were prepared by removing previous restorative fillings and caries under rubber dam isolation.

JIZAI rotary files (MANI, Japan) Orifice Opener (025 14), Glider (013 04), JIZAI I (025 04)/ JIZAI II (025 06)/ JIZAI III (035 04) were used respectively. Between each file change, root canals were irrigated with 2 ml of 5.25% sodium hypochlorite (NaOCl) solution for 1-2 minutes and the solution was activated with a passive ultrasonic activator (EndoArt Activator, Turkiye). Final irrigation was performed with 5 ml each of 5.25% NaOCl, saline, 17% ethylene diamine tetraacetic acid (EDTA) and 2% chlorhexidine (CHX) solutions. The root canal was filled with bioceramic root canal sealer (Totalfill BC Sealer, FKG, Switzerland) and gutta percha (FKG,Switzerland) using the lateral condensation method.

Immediately after root canal treatment, the overlay preparation completed by reducing 1-1.5 mm from the cusp of the tubercle. After the preparation, the patient's intraoral impressions were taken with the Cerec Omnicam (Dentsply Sirona Inc.), and after, the design is performed on the same device, the blocks to be used produced with the Cerec PrimeMill (Dentsply Sirona Inc.) milling device. All restorations cemented in the same session. Before cementation, the internal surfaces of crowns were abraded with 50 µm Al_2O_3 (Dento-Prep, RONVIG). All the bonding procedures were carried out using rubber dental dam. A two-step total etch technique (OptiBond FL, KERR) was used for onlay/overlay cementation. A dual cure universal composite based luting system (Bifix QM, VOCO) put on the cementation surface of each onlay/overlay and used as luting agent.

Discussion: Clinical and radiographic outcome measures were collected at baseline and then during the 12 month follow-ups. The use of indirect overlays after endodontic treatment with digital workflow was effective in maintaining colour stability, marginal integrity and preserving the damaged tooth structure in endodontically treated molars in children. These restorations demonstrated remarkable clinical, radiographic and patient-reported outcomes after 12 months of function. However, clinical trials of longer duration are required for further validation.

Clinical Relevance: In this case, a fully digital workflow incorporating intraoral scanner and CAD-CAM technology was used to fabricate restorations for a child with severely affected teeth. The approach proved efficient, improved patient cooperation, and facilitated accurate both endodontic and restorative treatment. Overall, digital impressions represent a valuable tool in managing complex pediatric dental cases, enhancing both clinical efficiency, patient comfort and minimizing treatment time.[2]

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CP132

One-Session Treatment of a Necrotic Upper Premolar with External Inflammatory Root Resorption: A Case Report

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Aim:

To describe the management of external inflammatory root resorption (EIRR) in a necrotic upper first premolar of a patient in one-session treatment.

Introduction:

EIRR is the progressive loss of root structure due to osteoclastic activity. Chronic infection of the tooth is one of the predisposing factors for EIRR.[1]

Case Presentation:

A 15-year-old female patient was referred to the Department of Endodontics at Gazi University Faculty of Dentistry. On initial panoramic radiography, tooth #14 exhibited extensive caries and a periapical radiolucency(Fig. 1). On clinical examination, the tooth showed no tenderness to percussion.

Under rubber-dam isolation, the deep carious lesion was removed and the necrosis of the tooth was confirmed. The working length was determined using an apex locator. Both canals were copiously irrigated with %2.5 Sodium hypochlorite (NaOCL) and instrumented up to #40 K-file, and a radiograph was taken with master-cone. The radiograph revealed extensive apical EIRR of the buccal root(Fig. 2). Filling with gutta-percha and resin-based cement was abandoned. To ensure three-dimensional apical seal, repair the root structure and halt the progression of EIRR , it was decided to obturate the canals entirely with mineral trioxide aggregate (MTA White, Angelus, Brazil). The Lawaty technique was used as an obturation technique. No Collagen membrane placed because intentionally overfilled in order to contact all affected root dentin with MTA. The root canal treatment was completed in one-session(Fig. 3), and the patient was then referred to the Restorative Dentistry Department of the same faculty. It concluded that tooth #14 was asymptomatic, the periapical lesion had healed, and there was no progression of EIRR at the 1-year follow-up(Fig. 4).

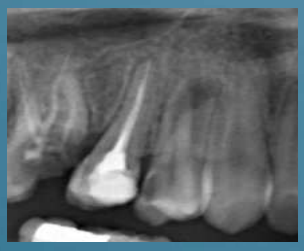

Fig. 1: Panoramic Radiograph

Fig. 2: Periapical radiograph shows EIRR

Fig. 3: End of the treatment in one-session

Fig. 4: 1- year follow-up radiograph

Discussion:

The general treatment approach for EIRR typically consists of multiple sessions with long intervals, often involving dressing the canals with $Ca(OH)_2$[1]. Effective removal of $Ca(OH)_2$ especially in resorption defects is difficult[2]. Due to its biocompatibility, antimicrobial and hydrophilic properties, and its ability to promote cementogenesis and osteogenesis MTA is an alternative over multiple sessions with $Ca(OH)_2$ dressing[3]. In this case, collagen membrane not used because intentionally overfilled in order to contact all affected root dentin with MTA. According to Terauchi *et al*., flush and minimally overextended obturations with MTA tend to yield favorable healing, while insufficiently filled cases significantly increase the likelihood of treatment failure and apical surgery[4].

Clinical Revelance:

In this case, one-session treatment with MTA obturation offers advantages such as shorter overall treatment time and ruling out possible outcome of apical leakage depending unremoved $Ca(OH)_2$ residuals in the long term. MTA can be used as a successful treatment option for extensive apical EIRR in an infected tooth, in one session.

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CASES OF UNFAVORABLE OUTCOMES IN SELECTIVE ENDODONTIC RETREATMENT

CP133

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AIM: To present cases of selective endodontic retreatment, when periapical pathology developed in non-retreated roots.

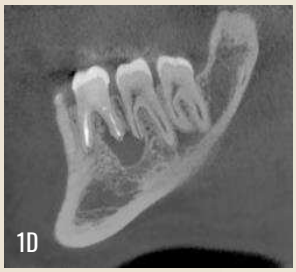
INTRODUCTION: Selective root canal retreatment focuses on the specific root(s) exhibiting clear radiographic evidence of periapical pathology in multirooted teeth [1]. Published studies suggest that this approach can be a reliable treatment option, potentially reducing treatment costs while achieving outcomes comparable to those of full endodontic retreatment [2,3,4]. Although the reported probability of disease development in non-retreated roots is low (3.5%) [2], the risk of developing new periapical lesions remains.

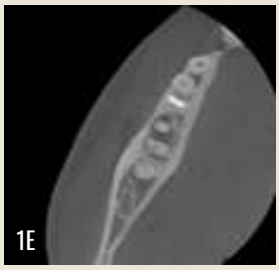
CASE 1: A 22-year-old male patient underwent selective retreatment of the mesial root of tooth #46 in 2017 due to asymptomatic apical periodontitis (Fig. 1A, 1B). Following the procedure, the tooth was restored with a zirconia-based prosthetic crown. In 2024, radiographic evaluation (orthopantomography (OPG) and cone-beam computed tomography) revealed periapical changes associated with the non-retreated distal root (Fig. 1C, 1D, 1E).


1A


1B


1C


1D


1E

CASE 2: A 35-year-old female patient underwent selective retreatment of the distal root of tooth #36 in 2020, as part of a planned restoration with a zirconia-based prosthetic crown (Fig. 2A, 2B). The roots of the tooth had previously been treated with resorcin paste, as confirmed clinically during the retreatment procedure. Following a 4 year follow-up, radiographic evaluation (OPG and dental radiogram) indicated periapical changes associated with the non-retreated mesial root (Fig. 2C, 2D).


2A


2B

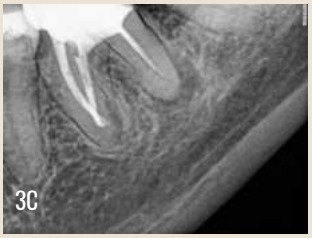

2C


2D

CASE 3: A 48-year-old female patient presented with asymptomatic apical periodontitis of tooth #36. The mesial root was selectively retreated due to a potentially unfavorable long-term prognosis, as small cracks were clinically observed near the distal root (Fig. 3A, 3B). Following the procedure, the tooth was restored directly with composite. Radiographic evaluation revealed periapical changes associated with the non-retreated distal root after 2 years of follow-up (Fig. C).


3A


3B


3C

DISCUSSION: The factors contributing to unfavorable outcomes in selective root canal retreatment, particularly the development of periapical changes in non-retreated roots, are supposed to be similar to those affecting traditional endodontic retreatment. These factors include pre-existing periapical pathology, the effectiveness of root canal infection eradication, coronal leakage, and occlusal stress, all of which may lead to periapical pathology [5, 6]. A minimally invasive approach to access cavity preparation, which preserves the existing restoration, is typically employed in selective endodontic retreatment [1, 2]. Although selective endodontic retreatment prior to the restoration of the tooth crown has been reported to yield positive outcomes [4], the analyzed cases indicate that periapical lesions in non-retreated roots developed following the placement of new restorations, suggesting that altered occlusal loading may have impacted treatment results. Furthermore, these cases demonstrate that root canal infections can remain asymptomatic, both clinically and radiographically, for extended periods, potentially reactivating after 2 to 7 years. Based on the presented cases, it is advisable to clinically assess the density of root filling material and the sealing of all root canals in multirooted teeth if their orifices are not covered by posts, particularly when selective retreatment involves the replacement of the restoration.

CLINICAL RELEVANCE: When considering selective root canal retreatment, it is essential to evaluate the density of the obturation material in roots that do not exhibit radiological signs of periapical pathology, particularly when a new tooth crown restoration is required.

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Root and Root Canal Morphology in Mandibular Premolars: A Case Series.

CP134

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Aim

To discuss the root and root canal morphology and report the endodontic therapy for the uncommon occurrence of multiple canals in mandibular premolars in Lebanese patients.

Introduction

Accurate comprehension and interpretation of root canal morphology are fundamental for optimal endodontic outcomes, as anatomical variations significantly impact treatment prognosis (Yu et al., 2012). Mandibular premolars, particularly the first premolar, exhibit diverse canal configurations, while the second premolar typically has fewer variations, with only 0.2%-0.4% showing three canals (Xu et al., 2024). A common cause of endodontic failure is the inability to accurately locate and treat all canals, particularly in mandibular premolars which are presumed to have a single canal morphology (Mirza et al., 2022; Wolf et al., 2021). Advanced diagnostic tools like cone-beam computed tomography (CBCT) enhance the visualization of intricate root canal systems, improving diagnostic precision and treatment outcomes (Yu et al., 2012).

Case Presentations

Case 1: Mandibular Left Premolars with 2 Canals

A 34-year-old, Lebanese systemically healthy male was referred to the endodontic clinics at Beirut Arab University by the periodontist following a failed root canal treatment on tooth #35. The patient was asymptomatic and had pervious CBCT scans concordance to his periodontics consultation. The slices showed widening of the PDL space, a previously treated canal that is sealed with a plastic restoration, and a missed 2nd buccal canal (figure 1). The root canal morphology at the middle and apical 3rd showed Tome's configuration for both lower left premolars (figure 2a and 2b). Each premolar has 2 canals that join at the apex with a single root configuration (figure 2a & 2b).

The non-surgical root canal retreatment for the lower right premolar was explained to the patient and his consent was obtained. Local anesthesia (Articaine, Septodont, France) and a single rubber dam isolation were administered. Access cavity was initiated using a dental operating microscope (DOM) (Leica, Germany) under high magnification. The previous RC filling was removed followed by proper biomechanical preparation for both canals. Finally, the root canals were obturated hermetically and a permanent plastic restoration was applied (3M, USA) (figure 3).

Figure 1: Preoperative CBCT scan showing coronal slice.

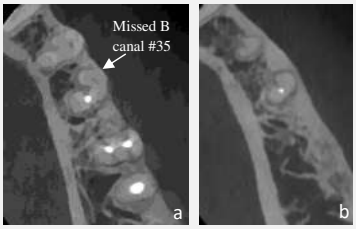

Figure 2 (a-b): Preoperative CBCT scan showing axial slices of the lower left premolars at the middle 3rd (a) and apical 3rd (b).

Figure 3: Postoperative periapical radiograph.

Case 2: Mandibular Right Premolars with 2 Canals

Upon a routine diagnostic check-up, a 32-year-old Lebanese male presented to the BAU endodontics clinic with a CBCT scan of the mandibular right quadrant, without any chief complaint. During clinical diagnosis a large carious lesion was detected on #45. Radiographically the external root morphology of the lower right premolars, at the middle root, displayed Tome's configuration in the axial slice of the CBCT scan (figure 1). Two canals were detected in both premolars with variant canal distribution: #44 exhibited 1-2-1 while #45 showed 2 separate roots with canal distribution of 1-2 (figure 2 and 3). The patient was advised for a RCT but deferred the treatment for another time.

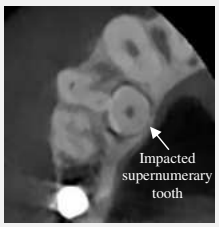

Figure 1: Axial slice of the lower premolars at the middle 3rd showing Tome's configuration.

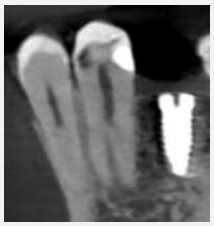

Figure 2: Sagittal slice of the lower right premolars showing the canal distribution.

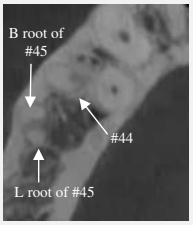

Figure 3: Axial view of the CBCT showing the apical 3rd of #44 and #45.

Case 3: Mandibular Second Premolar with 3 Canals

A 13-year-old Lebanese Syrian medically clear, female patient was admitted to the endodontics clinic at BAU, reporting a chief complaint of intermittent localized severe sharp shooting pain on the lower left quadrant. Clinically tooth #35 exhibited severe pain on percussion and a large carious lesion. Pulp sensibility tests elicited a lingering response. A preoperative radiograph (SOPIX, Acteon, France) revealed deep caries near the pulp, PDL space widening, slight lamina dura thickening, and a second root (figure 1). Based on these findings, the diagnosis was symptomatic irreversible pulpitis with symptomatic apical periodontitis. The treatment plan was explained, and parental consent was obtained.

Figure 1: Preoperative periapical radiograph.

After administration of local anesthesia (Articaine, Septodont, France) and rubber dam isolation, the tooth was accessed using a DOM (Leica, Germany). Three canals were identified, 2 buccal canal orifices were located beneath their respective mesial and distal buccal slopes and 1 lingual orifice was positioned below the lingual cusp tip (Figure 2).

Figure 2: Intra-operative DOM photograph.

A CBCT scan (CareStream CS9300, USA) of the lower left quadrant was made for enhanced identification of the present anatomical complexity. At the middle and apical 3rd of the root, the external root morphology of the buccal roots of both premolars exhibited Tome's configuration, while the lingual roots were globular (figures 3a and 3b). Coronal slices of the lower left premolars demonstrated an atypical canal morphology: 3 root canals and 2 separate roots. The buccal canals of #34 join at the apex of the buccal root (figure 3c). The MB canal of #35 shows an abrupt curvature before joining with the distobuccal canal apically (figure 3d).

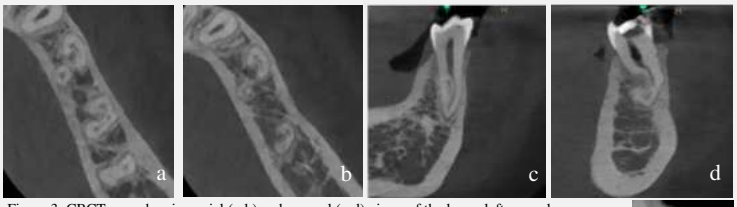

Figure 3: CBCT scan showing axial (a-b) and coronal (c-d) views of the lower left premolars.

After chemo-mechanical preparation, the canals were obturated hermetically. A final plastic restoration was placed (3M, USA) (figure 4).

Figure 4: Post-operative radiograph.

Discussion

Anatomical variations in mandibular second premolars are infrequent, with multiple canals being rare (Cleghorn et al., 2007; Xu et al., 2024). Such variations are often missed due to the assumption of a single canal, leading to poor endodontic treatment outcomes (Cleghorn et al., 2007). CBCT is crucial for detecting complex canal morphology & has been shown to identify additional canals in 40% of cases (Matherne et al., 2008). Ethnicity and gender are key determinants in root canal variations with distinct patterns observed across different populations and sexes (Cleghorn et al., 2007; Xu et al., 2024). CBCT imaging combined with a thorough understanding of root canal anatomy, is essential for successful treatment

rcf

Clinical Relevance

A comprehensive multifactorial approach, from proper knowledge of the original root canal anatomy, anatomical variation together with the use of the proper diagnostic tools and adequate application of the chemomechanical protocol, are critical for identification and management of teeth with morphological variations.

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CP135

Double dens invaginatus and pulp stone in maxillary central incisor

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AIM –To present diagnosis and treatment of permanent maxillary right central incisor with double dens invaginatus and a pulp stone in 11-year-old patent.

INTRODUCTION – Dens invaginatus (DI) is anatomical variation with prevalence from 0,3% to 10%, with permanent maxillary central incisor as the second most affected tooth (1). However, there are only a few cases described in literature with double DI (2). It is crucial to diagnose it as soon as possible, to implement the necessary preventive measures and avoid more invasive treatment options (1). Pulp stones are much more common in population with prevalence around 37% (3) and they are usually not associated with DI. The presence is not an indication for any treatment. However, their presence can complicate access to root canal during endodontic treatment (4).

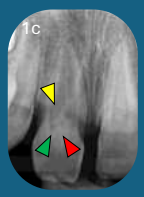
LEGEND: Pulp stone | Central palatal invagination | Distal palatal invagination

CASE PRESENTATION – The patient was referred to department of pediatric dentistry because of pain. A periapical x-ray was made (Figure 1c). Mild swelling and buccal fistulation 4 mm from gingival margin were found (Figure 1a-b). The tooth was sensitive to percussion, and mobility was increased. There were no signs of caries or history of dental trauma. Patient's parents reported hypermobility of his joints. Emergency endodontic treatment was performed, and patient was referred to endodontist and CBCT imaging .

Initial situation

Frontal view

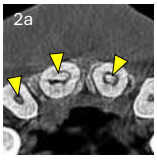
Occlusal view



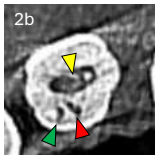
Periapical x-ray

CBCT

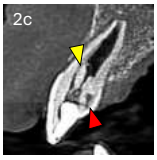
In tooth 11, CBCT (Figure 2a-d) revealed a large pulp stone in size 4 mm x 6 mm and two palatal invaginations, one centrally and one distally, classified as type I and type IIIa, respectively. Additionally, aplasia of both lateral maxillary incisors and pulp stones in teeth 13 and 21 were found.



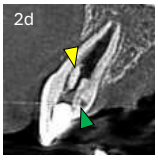
Coronal view – pulp stones in teeth 13, 11 and 21, aplasia of teeth 12 and 22



Coronal view – central palatal and distal palatal invagination in tooth 11



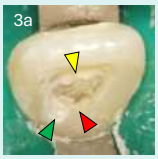
Sagittal view – central palatal invagination in tooth 11



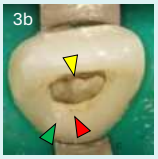
Sagittal view – distal palatal invagination in tooth 11

1st session

1st session: There was no pain or fistulation. Under the rubber dam, access cavity was modified according to CBCT. Two invaginations were confirmed under the endodontic microscope. A large pulp stone was demarcated using long neck endodontic bur (Figure 3a) and released from root canal walls distally and palatally using ultrasonic files (Figure 3b-c). The pulp chamber and main canal were minimally shaped and thoroughly irrigated. The central palatal invagination was located (Figure 3d) and merged with the main canal by removal of central wall (Figure 3e). CaOH was placed and access cavity was temporarily sealed (Cavit).

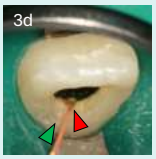


Pulp stone demarcated, dentine shavings are present

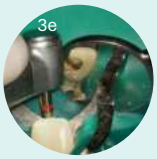


After removal od dentin shavings and dentine connections to pulp stone distally and palatally

Pulp stone after removal



Central palatal invagination visualisation

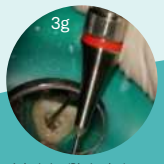


Central palatal invagination after central wall removal

2nd session

2nd session: The distal palatal invagination (Figure 3f) was instrumented separately to size #30 with stainless steel instruments. Apical plug (Biodentine) was placed (Figure 3g) in the main canal.

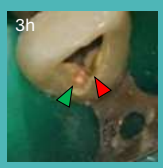
Distal palatal invagination prepared



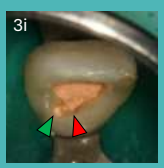
Apical plug (Biodentine) application with map system

3rd session

3rd session: The distal palatal invagination was filled conventionally with ISO 30 master point and epoxy sealer (Figure 3h). The rest of the pulp chamber was back-filled with warm gutta-percha (Figure 3i). Central palatal invagination was filled together with the main pulp chamber paying attention to careful condensation. Orifice of the distal invagination was enlarged with a diamond round bur and definite composite filling was made (Figure 4a-b).



Filling of distal palatal invagination with gutta-percha



Rest of the pulp chamber back-filled with gutta-percha

Final situation

Composite restoration

Periapical x-ray

DISCUSSION – Discovery of a double DI was coincidental due to pain and fistulation. It could not be predicted as it was not visible in examination or periapical x-ray due to presence of pulp stones. There is also a question concerning the etiology of dental stones in a patient. Hypermobility of his joints might indicate connective tissue disorder, that could be associated with pulp calcifications and pulp chamber shape modifications. It might be found in Ehlers-Danlos Syndromes (5). However, due of the absence of significant systemic manifestation, we decided to monitor the patient and postpone genetic testing.

CLINICAL RELEVANCE – It is important to consider DI in young patient, when the origin of dental pain in unclear. CBCT is a crucial tool for diagnosis and treatment of double invagination with pulp stone.

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Root canal treatment of maxillary second molar with 5 canals including 2 palatal roots.

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CP136

I. Introduction

Maxillary second molars typically have three roots with a single palatal canal, but the presence of two palatal canals is rare, occurring in 1.82% of Asians and 1.7% of Caucasians.(Table1.) Unexplained persistent pain may suggest missed canals, underscoring the need for awareness of such anatomical variations.

II. Aim

This case report aims to present the endodontic management of tooth #27 with a rare anatomical configuration of two palatal canals, emphasizing how accurate identification and treatment led to effective pain relief.

III. Case presentation

1. Sex / Age : M / 23

2.Chief Complaint : Following a motor vehicle accident in 2023, during which the patient was an occupant in the car, masticatory discomfort and spontaneous throbbing pain were reported in both maxillary molar regions

3. Past Medical History : None / Past Dental History : #16 RCT performed one year ago due to an in-car accident.

4. Present illness : #27 Per(++) Bite test(+) Cold(-) Mob(-) Sinus tract(-) normal PD

5. Impression : #27 Subluxation, Pulp necrosis, Symptomatic apical periodontitis

6. Tx plan : #27 RCT

Figure 1. (A) The radiograph on first visit. (B) Two H files were inserted into the Mesiopalatal and Distopalatal canals, respectively. (C) The Radiograph with MAF insertion. (D) The Radiograph After root canal filling. (E) 6 months after obturation, radiographic image

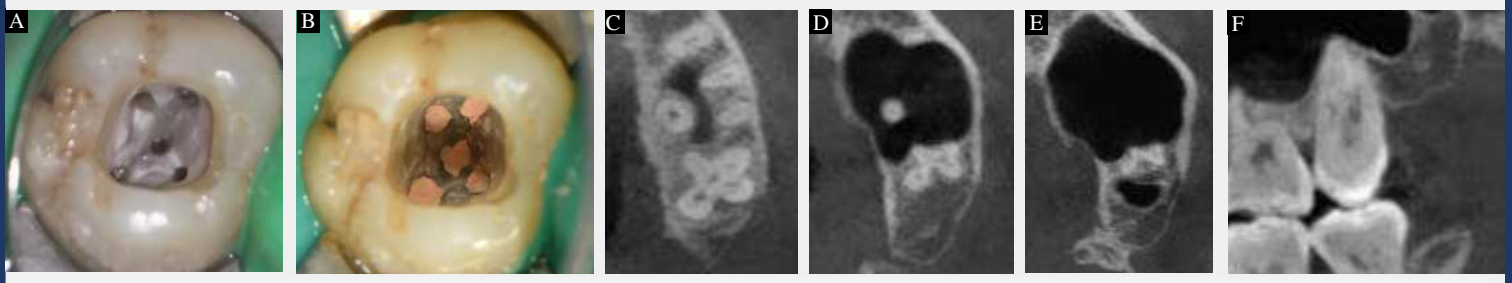

Figure 2. (A) The clinical photo after access opening. (B) The clinical photo after canal filling. (C,D,E) 5 canals, including two palatal canals, as seen in the CBCT coronal view. (F) Two palatal canals as seen in the CBCT sagittal view.

Study	N	Race(Country)	>1 canal (%)
Kim et al	775	Asian(Rebulic of Korea)	1.82%
Martins et al	567	Caucasian(Portugal)	1.70%

Table 1. CBCT studies investigating the percentage of additional palatal canals in Maxillary second molars by race.

References : Ali N, Prashant V, Lamar Hicks M, et al. Variations of Palatal Canal Morphology in Maxillary Molars: A Case Series and Literature Review. J Endod 2017;43:1888-96. /Yemi K,Seung-Jong L,Jein W. Morphology of Maxillary First and Second Molars Analyzed by Cone-Beam Computed Tomography in a Korean Population: Variations in the Number of Roots and Canals and the Incidence of Fusion. J Endod 2012;38:1063-8.

IV. Discussion

Maxillary second molars typically present with three root canals: mesiobuccal, distobuccal, and a single palatal canal. However, in this case, five canals were identified in tooth #27, including two palatal canals—a rare anatomical variation. The use of cone-beam computed tomography (CBCT) and an operating microscope facilitated the accurate identification, cleaning, shaping, and obturation of all canals, minimizing the risk of missed anatomy. Postoperatively, the patient reported symptomatic improvement, with mastication-related pain significantly reduced and only minor residual discomfort. The 6-month follow-up further supports the clinical success of this comprehensive endodontic approach in managing complex root canal morphology and alleviating trauma-induced symptoms.

V. Clinical relevance

Although anatomical variations have a low incidence, understanding them is essential for improving the clinical success rate of root canal treatment. The use of a dental operating microscope and CBCT improves precision, facilitates canal identification, and reduces missed canals, ensuring more predictable outcomes.

Non-Surgical Retreatment of a Maxillary Central Incisor with Unusual Canal Anatomy: A Case Report

CP137

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Aim

The aim of this case report is to present the successful retreatment of a maxillary central incisor with incomplete root canal therapy, highlighting the importance of thorough canal exploration, modern endodontic techniques, and the use of bioceramic sealers in achieving favorable clinical and radiographic outcomes.

Introduction

Successful endodontic treatment relies on the thorough identification, cleaning, and obturation of all root canals; however, missed canals can lead to persistent infection and necessitate retreatment.

Case report

A 48-year-old female patient was referred by her general dentist for the retreatment of a previously endodontically treated maxillary central incisor. The patient's complaints were spontaneous pain and discoloration. Her medical history was unremarkable. Clinical examination revealed buccal swelling at the level of the left central incisor, accompanied by tenderness to palpation and percussion. Radiographic evaluation confirmed prior root canal treatment. Cone beam computed tomography (CBCT) imaging revealed a previously untreated second canal in tooth #21.

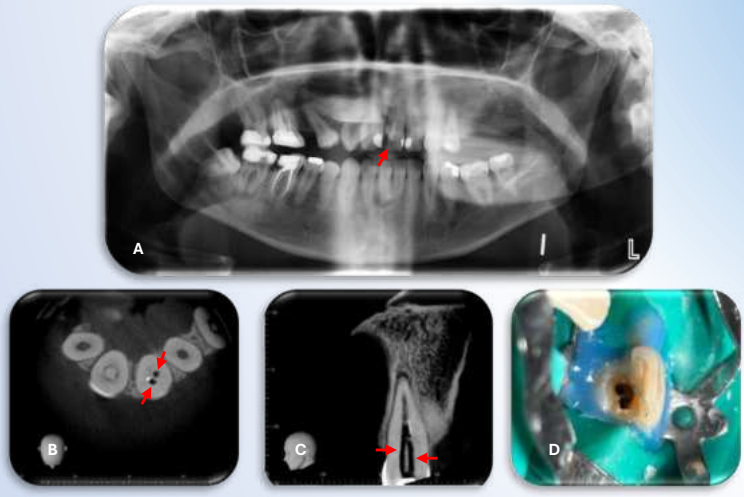

Fig. 1: Initial panoramic radiograph (A) of the patient. The red arrow points to tooth #21. In the horizontal CBCT section (B), red arrows indicate root canals. The axial CBCT section (C) red arrows indicate root canals and reveals that the two canals converge at the mid-third level, continuing as a single canal. The intraoral image (D) illustrates the canal orifices.

Following informed consent, the tooth was isolated using a rubber dam at the first appointment. Access cavity preparation and old restoration removal were performed using a high-speed round diamond bur. The previous root canal filling material was sequentially removed using ProTaper Universal Retreatment (Dentsply Maillefer, Ballaigues, Switzerland) D1, D2, and D3 retreatment files. Upon removal of the obturation material, an unfilled canal was identified in the palato-distal region of the main canal. The apical region was negotiated with a C-pilot file, and working length determination was performed using an electronic apex locator (Propex Pixi, Dentsply Maillefer, Switzerland). Mechanical preparation was carried out with ProTaper Next (Dentsply Maillefer, Ballaigues, Switzerland) X1, X2, and X3 files, with irrigation using 5.25% sodium hypochlorite after each instrument. Upon completion of canal preparation, calcium hydroxide was placed as an intracanal medicament. The canal orifices were sealed with sterile teflon tape, and a resin-modified glass ionomer cement (Riva Light Cure, SDI, Australia) was used for temporary coronal sealing. The patient was scheduled for a follow-up visit after one week.

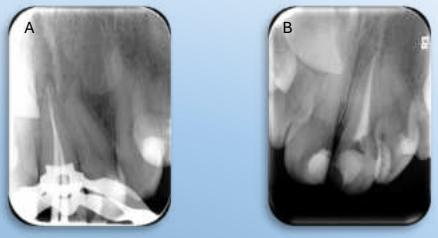

Fig. 2: (A) Periapical radiograph illustrating the gutta-percha cone fit. (B) Postoperative periapical radiograph.

At the second appointment, the patient reported significant symptomatic relief. After rubber dam isolation, the temporary restoration was removed. The intracanal calcium hydroxide dressing was removed using 17% EDTA irrigation, enhanced by EndoActivator (Dentsply, Tulsa OK) agitation. Final instrumentation with a ProTaper Next X3 file was followed by irrigation with 5.25% sodium hypochlorite (5 cc, EDDY-activated), sterile saline, and 17% EDTA (2 cc). After drying with sterile paper points, Root canal obturation was performed using a bioceramic sealer (Ceraseal, MetaBiomed, Cheongju, Republic of Korea) and gutta-percha. The canal orifices were sealed with resin-modified glass ionomer cement. The patient was referred to the restorative dentistry department for definitive esthetic rehabilitation.

At the 12-month follow-up, the tooth remained clinically asymptomatic, and radiographic evaluation confirmed periapical healing, with no signs of pathology.

Fig. 3: (A) Intraoral view obtained after root canal obturation. (B) Periapical radiograph captured at the 12-month follow-up appointment.

Discussion

The presence of untreated root canals is a major cause of endodontic failure, often resulting in persistent infection and clinical symptoms. In the present case, the failure of the initial treatment was attributed to a missed additional canal, which was identified during retreatment. CBCT imaging played a crucial role in detecting the anatomical variation, emphasizing the importance of advanced imaging in complex cases.

Clinical Relevance

This case highlights the necessity of thorough canal exploration and the integration of advanced techniques, including CBCT imaging, bioceramic sealers, and sonic activation. Missed canals remain a common cause of retreatment, and their detection is essential for long-term endodontic success.

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CP138

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Endodontic Treatment of Branching Root Mandibular Premolars- A Case Report

RA Melike Kahramanlar, RA İlke Mentes, Prof. Dr Ertugrul Karatas

AIM - The aim of this study is to present the endodontic management of mandibular premolars exhibiting root branching.

INTRODUCTION - Successful endodontic treatment requires a comprehensive understanding of root canal anatomy and morphology. The root canal system exhibits wide morphological variation. Typically, clinicians possess thorough knowledge of normal anatomy and common variations. It is essential for them to identify teeth with atypical morphologies, such as mandibular premolars. Despite their low prevalence, clinicians should remain aware of these anatomical variations, including their clinical and radiographic presentations, and the location of canal orifices. The aim of this case series is to discuss treatment recommendations for the rare occurrence of more than one canal in mandibular premolars, based on two clinical cases.

CASE REPORT 1- A healthy 23-year-old male patient complained of pain in the mandibular posterior region. Deep caries were observed in teeth 34 and 35. Percussion examination was performed on both teeth and was more pronounced on tooth number 35, leading to a diagnosis of irreversible pulpitis and an indication for root canal treatment. Radiographic examination revealed that the root of tooth 35 branched into three canals. A non-surgical endodontic treatment was planned in a single visit. Following the administration of a local anesthetic agent (2% lidocaine with 1:100,000 epinephrine), access to the canals was achieved under rubber dam isolation.
Due to the complex root morphology, a relatively large access cavity was created to ensure proper visualization and instrumentation. Despite the use of a dental operating microscope (OPMI pico, Zeiss, Germany), the identification and negotiation of all three canals presented significant challenges.
The presence of three canals was confirmed using the microscope. Working length was determined using an apex locator and confirmed radiographically. The canals of tooth 35 were cleaned and shaped using NiTi rotary instruments up to a #0.06/25 final canal size in the lingual, mesio-buccal, and disto-buccal canals. The canals were irrigated with 2.5% sodium hypochlorite during instrumentation and with 17% EDTA at the end of preparation. After the final irrigation with saline, the canals were dried and obturated using gutta-percha and AH26 sealer (Dentsply, De Trey, Konstanz, Germany) with the lateral condensation technique.

CASE 1

CASE REPORT 2 - A 37-year-old healthy female patient presented to our clinic with pain localized to the mandibular first premolar. The dental anamnesis revealed that the pain predominantly occurred during mastication, particularly in the affected region. Upon clinical examination, a deep carious lesion was observed in tooth number 34. The tooth exhibited vertical percussion sensitivity, though no pain was elicited upon palpation. The tooth responded negatively to both the electric pulp test and the cold test. The periodontal tissues appeared healthy, with no evidence of swelling or fistula. Radiographic evaluation demonstrated a bifurcated canal structure in the middle third of the root. Based on the clinical and radiographic findings, the diagnosis of acute apical periodontitis was established for the affected tooth.
Following the complete removal of the carious tissue from the crown, cavity preparation was completed. The tooth was isolated using a rubber dam. Within the pulp chamber, a canal orifice was observed, located centrally and directed toward the lingual aspect. A #10 K-type file was introduced apically from the canal orifice, and a periapical radiograph was taken, confirming the bifurcation of the root canal system. The working length of the canals was determined using an apex locator and confirmed radiographically. Canal preparation was conducted using NiTi rotary instruments under magnification provided by a surgical operating microscope (OPMI pico Dental Microscope, Zeiss, Oberkochen, Germany). Irrigation during instrumentation was performed with 2.5% sodium hypochlorite. After completion of canal preparation, the canals were dried using sterile paper points, followed by obturation with AH Plus sealer (Dentsply, De Trey, Weybridge, Surrey, UK) and gutta-percha cones via the lateral condensation technique. The tooth was subsequently restored with a permanent restoration.
Lateral condensation was selected for obturation because it provides adequate adaptation to complex canal systems when performed carefully. Given the bifurcated anatomy and the presence of narrow canals, this technique was considered appropriate for achieving a dense and hermetic seal.

CASE 2

DISCUSSION - Mandibular premolars are among the most challenging teeth for endodontic treatment . This difficulty can be attributed to variations in the internal morphology of the pulp cavity, including differences in the number of root canals, the presence of apical deltas, and lateral canals. Additionally, the relatively small size of access cavities in these teeth limits visibility, making the identification of canal orifices more difficult. A wider endodontic access is often necessary to locate additional root canals.

Preoperative radiographic evaluation plays a crucial role in identifying anatomical variations in the root canal system. Furthermore, analyzing the anatomical features of the pulp chamber roof can aid in detecting internal variations, thereby facilitating the accurate identification of all root canals.

Moreover, the integration of surgical microscopes into endodontics has significantly enhanced clinicians' ability to manage complex access cavities. In this case report, the role of the surgical microscope in identifying root canal orifices is particularly noteworthy. Its use has not only improved treatment success but also reduced procedure time and expanded the clinician's field of vision.

CONCLUSION- The success of endodontic treatment is fundamentally dependent on a precise understanding of the root canal anatomy. While radiographic images are commonly utilized to assess the root canal structure, there are instances where these images may not provide adequate information. Variations in the root canal system, particularly anatomical variations, can pose significant challenges to the treatment process.

Magnification devices play a crucial role in endodontic procedures by enabling clinicians to visualize finer details, thereby facilitating more accurate diagnoses and interventions.

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CP139

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Supernumerary fused tooth with apical periodontitis, a conservative treatment approach

Aim

This clinical presentation will describe a conservative treatment approach of a maxillary lateral incisor fused to a supernumerary tooth on the palatal side.

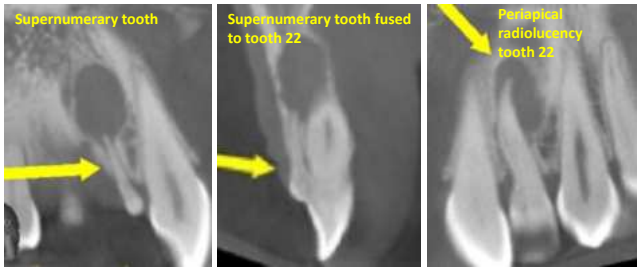
Introduction

A supernumerary tooth fused to a normal tooth often leads to malocclusion, carious lesions, or esthetic concerns due to its abnormal shape and increased plaque accumulation. For these reasons, treatment is often required, which may include sectioning and extracting the supernumerary tooth, extraction of both teeth, orthodontic intervention, or root canal treatment (Akitomo et al., 2024). The incidence of fused supernumerary teeth in the permanent dentition is reported to be 0.1% (Duncan et al., 1987).

Case presentation

A healthy 23-year-old female, presented with sensitivity upon buccal palpation of tooth 22. Clinical examination revealed a constriction at the palatal side of tooth 22, an additional cusp and plaque accumulation. The tooth tested positive to percussion and palpation, while the sensitivity test was negative. Periodontal probing showed a maximum pocket depth of 3 mm and the tooth exhibited grade I mobility. No sinus tracts were present, and occlusion and articulation analysis confirmed that the tooth was free from any occlusal or articulation contacts.

Radiographic examination revealed a periapical radiolucency associated with tooth 22. CBCT analysis confirmed the fusion of a supernumerary tooth.



Diagnosis

- Pulpal diagnosis: pulp necrosis
- Periapical diagnosis: symptomatic apical periodontitis

The chosen treatment approach was non-surgical endodontic treatment of both; tooth 22 and the supernumerary tooth.

Treatment

Canal shaping was performed using ProtaperGold F4 40.06. The supernumerary tooth was shaped with Hyflex CM 20.04. Irrigation included 2.5% NaOCl and 17% EDTA for both, with additional passive ultrasonic irrigation (PUI) for tooth 22 and manual dynamic activation (MDA) for the supernumerary tooth. Obturation was completed using warm vertical condensation (WVC) and bioceramic sealer. A single cone technique with bioceramic sealer was chosen for the supernumerary tooth. In both, the intra-coronal seal was achieved with SDR flow+ (Dentsply), and the final coronal restoration was completed with Clearfil APX A2.

A 6-monhts clinical follow-up and radiographic examination was performed. Clinically, the tooth showed a negative response to percussion, no tenderness on palpation. Periodontal probing depths were with a maximum of 3 mm and mobility remained within normal limits. No sinustracts were observed.
Radiographic evaluation demonstrated a reduction in size of the periapical radiolucency. In combination with absence of symptoms, indicates a tendency toward healing.

Discussion & Clinical relevance

This case demonstrates that non-surgical endodontic treatment can be a viable alternative to extraction in similar cases preventing more invasive procedures.

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INTENTIONAL REIMPLANTATION TREATMENT FOR A TOOTH WITH A FRACTURED INSTRUMENT IN THE ROOT CANAL: 6-MONTH FOLLOW-UP

CP140

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1Cukurova University Faculty of Dentistry, Department of Endodontics

AIM:

This case report aims to evaluate the application of intentional reimplantation treatment and its clinical outcomes over a 6-month follow- up period for a tooth in which a fractured instrument was detected in the root canal during a root canal treatment performed one year ago.

INTRODUCTION:

Intentional replantation involves deliberate tooth extraction, extraoral endodontic treatment, and replantation, preserving natural dentition and minimizing procedural complications (1,2)

CASE PRESENTATION:

A 16-year-old male patient with no systemic diseases presented to the student clinic of our hospital one year ago. Root canal treatment was performed on tooth number 46. During the procedure, a fractured instrument was detected in the apical third of the distal canal through radiographic examination. Since the patient's symptoms did not resolve during the follow-up period, intentional reimplantation treatment was considered appropriate for the affected tooth.

Since no mobility was observed, splinting was not deemed necessary, and sutures were placed to approximate the papillary tissues. The patient was scheduled for a follow-up appointment two weeks later.At the follow-up visit, sutures were removed, and the restorations of both the affected tooth and tooth number 45, which had complaints of pain related to thermal stimuli, were completed.

Clinical examination revealed a positive response to percussion, and the patient reported pain. In accordance with the intentional reimplantation protocol, the affected tooth was extracted in our clinic.

A Class 1 retrograde cavity was prepared at the root apex using saline irrigation. Mineral Trioxide Aggregate (MTA) was applied to the retrograde cavities. The apical portion of the socket was curetted and cleaned. During the procedure, the root surface was also irrigated with saline. The operation lasted approximately 5–7 minutes, and the tooth was repositioned into the socket. After confirming the tooth's position radiographically, mobility was assessed.

3rd-Month Follow-Up

6th-Month Follow-Up

DISCUSSION:

Clinical evaluations performed over the 6-month period following the procedure revealed progressive clinical improvement, and the tooth transitioned from a symptomatic to an asymptomatic state. Radiographs showed significant healing of the periapical lesion and regeneration of the periodontal ligament. These findings are consistent with those reported in the existing literature.

CLINICAL REVELANCE:

Intentional replantation is a valuable treatment option as an alternative to tooth extraction, offering effective control of periapical infection, preservation of bone tissue, and maintenance of the natural tooth structure.

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CP141 Surgical therapy of severe external cervical resorption in the aesthetic zone - a four years follow up

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Aim To show successfull clinical management of external root resorption four years after treatment.

Introduction Root resorption is the loss of dental hard tissue as a result of odontoclastic action. Root resorption can lead to irreversible damage, which may necessitate dental treatment, or even extraction. External cervical resorption (ECR) is a dynamic process that involves periodontal, dental and in later stages pulpal tissues. Patients commonly are asymptomatic and diagnosed by incidental radiographic finding. Treatment options for ECR include external repair of the resorptive defect with or without endodontic treatment/retreatment.

Case presentation Female patient, age 21 was referred to our clinic in 2021. with predominant symptom of swelling and pain in projection of upper left central incisor. Clinical examination showed purulent secretion from periodontal space. Probing depths were 8 mm isolated to area of swelling (Figure 1.). Tooth mobility was not detected. CBCT (Figure 2.) showed large cervical resorption under the CEJ with communication with endodontic space. Management included mucoperiosteal flap, cleaning of the resorptive lesion and complete closure using bioactive material Biodentine (Septodont, Lancaster, PA, USA). In the second visit endodontic retreatment was done using R-Endo instruments (Micro-Mega, 12 Rue du Tunnel, 25,000 Besançon, France) and for the aesthetic reasons superficial part of Biodentine was replaced with composite filling. (Clearfill Majesty ES –2, Kuraray Noritake Dental Inc, Tokyo, Japan) (Figures 2.-8.).

Discussion Four years follow up showed complete healing, probing depths within physiologic limits without signs of tooth mobility and with minimal retraction in the distal area (Figure 9.).

Clinical relevance Effective and predictable management of ECR depends on the accurate assessment of the true nature and size of the lesion. CBCT analysis means great progress in that direction. Complete removal of granulation tissue and repair of the defect with bioactive material increases chances for complete success of therapy.

Figure 1. Patological probing depth of tooth 21

Figure 2. Large ECR of tooth 21

Figure 3. Tooth after cleaning of the defect

Figure 4. Complete closure with BioDentine

Figure 5. Flap closure and sutures

Figure 6. Endodontic retreatment

Figure 7. Postoperative radiograph

Figure 8. Baseline with composite filling

Figure 9. Four years follow up

Patel S, Krastl G, Weiger R, Lambrechts P, Tjäderhane L, Gambarini G, Teng PH. ESE position statement on root resorption. Int Endod J. 2023;56(7):792-801.

Successful treatment of a complex case of external inflammatory root resorption and chronic periapical periodontitis

CP142

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ese

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Aim

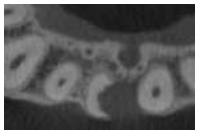
To present a combined non-surgical and surgical endodontic approach for treating a tooth with severe external inflammatory root resorption and apical periodontitis.

Introduction

External inflammatory root resorption is one of the possible outcomes of dental trauma. It occurs when the external surface of the tooth root is damaged, resulting in cementum loss, along with bacterial infection of the root canal system[1]. The absence of cementum facilitates the passage of intracanal bacteria and/or their endotoxins to the periodontal ligament, potentially triggering the inflammatory resorptive process[2].

Case Presentation



A man (27 y.) was referred for the treatment of 11. He reported pain complains for years, and now they were intensified. The patient had a trauma when he was 11 years old. Clinical examination revealed that 11 was sensitive to palpation, percussion, sinus track and no reaction to cold test.

Radiographic evaluation (CBCT): Apical radiolucency in combination with radiolucency in the mid-third of the root in combination with radiolucency at the bone around it.

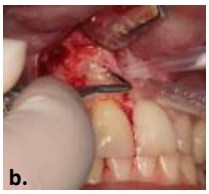
Diagnosis: apical and lateral periodontitis in combination with inflammatory root resorption

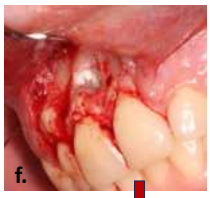
First, a non-surgical endodontic treatment (4-9-2023) was performed under microscope magnification after isolating the tooth with a rubber dam. The canal was cleaned up to the resorption defect using 2% NaOCl and EDTA irrigation and filled with NeoPUTTY (Avalon Biomed).

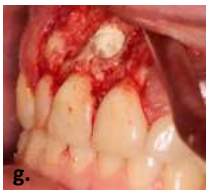

During surgical endodontic treatment (5-9-2023), a full triangular flap (12-11-21) was made **(a)**. No osteotomy was needed. The resorptive tissue was removed with a curette and long-neck burs **(b-c)** under magnification. The apical canal was prepared with ultrasound tips **(d)** and filled using the lid-technique with NeoPUTTY and Neosealer (Avalon Biomed) **(e)**. The missing root surface was restored with Biodentine (Septodont) **(g)**, covered with a Symbios membrane **(h)**, and the flap was repositioned.

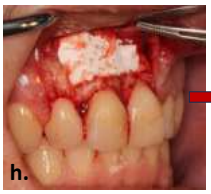
Case Presentation

Surgical approach










17-months follow-up




All relevant clinical tests were normal. The CBCT revealed bone growth in the previous radiolucent areas and cortical bone growth on the Biodentine.

Discussion

A conservative approach was used to treat the resorptive defect, while preserving the apical third of the root. No irrigation was applied to the apical canal, relying on mechanical debridement and the sealer's antibacterial properties[3] for apical periodontitis healing. Biodentine was selected to restore the missing root surface due to its initial stability and osteoinductive capacity[4], confirmed by cortical bone formation during healing.

Conclusion and Clinical relevance

In this case, a severe external inflammatory resorption defect was successfully managed using a combination of non-surgical and surgical treatments, with the goal of preserving as much tooth structure as possible. Hydraulic calcium silicate cements like NeoPUTTY and Biodentine promote healing through their antibacterial and osteoinductive properties. Minimally invasive techniques, supported by CBCT imaging, enhance diagnosis, treatment planning, and monitoring of bone regeneration.

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University of Amsterdam

VU Vrije Universiteit Amsterdam

Apexification and Devital Bleaching After Failed Regenerative Endodontic Treatment: A Case Report

CP144

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AIM

This case report aims to present the success of the apexification treatment after a failed endodontic regenerative treatment.

INTRODUCTION

Regenerative endodontic treatment (RET) is an approach used to support root development in necrotic immature permanent teeth.(Wang X & Thibodeau B. *et al.* 2010) However, the side effects of biomaterials used in RET and long-term failures can pose significant challenges in clinical management. (Lee C, Song M. 2022) This case report presents the management of a patient who underwent regenerative endodontic treatment due to a complicated crown fracture caused by trauma but later developed long-term failure and material-induced discoloration.

CASE PRESENTATION:

A 15-year-old male patient experienced a complicated crown fracture in his maxillary right central incisor (tooth #11) due to trauma during childhood. In 2018, regenerative endodontic treatment was performed due to pulp necrosis. In 2024, the patient referred to our clinic with aesthetic concerns. The clinical examination revealed a significant discoloration of the tooth caused by the material used in regenerative treatment. the tooth #11 did not respond to the electrical pulp test. The radiographic evaluation confirmed the failure of the regenerative procedure and incomplete root development in tooth #11. The apex of the tooth was open, and a radiolucent area was observed in the periapical region.


The X-ray image post-op regeneration, July 2018


The X-ray image after 5 years follow-up of regenerative treatment , 2023


Intra-oral view of discoloration of #11

Under rubber dam isolation, after removing the composite filling, MTA placed in the coronal region during regenerative treatment was removed using ultrasonic tips and copious saline irrigation and there was no pulp-like tissue in the root canal.The working length was determined radiographically using a #60 K-file and electronic apex locator (Root-ZX Mini, J Morita Corp. , Kyoto, Japan). H files were used to clean the root canal walls, 1.25% NaOCl was used for irrigation during the root canal preparation. After the final irrigation with 17%EDTA, 1.25 % NaOCl and distilled water, the canal was dried with paper-points and filled with calcium hydroxide. The access cavity was sealed with the zinch phosphate cement and a follow-up appointment was scheduled one month later.


X-ray image determinin of working length


X-ray image after apexification treatment

The calcium hydroxide dressing was removed by irrigation and mechanical instrumentation at second visit. A final irrigation protocol was applied, and the root canal was filled with Biodentine (Septodont,France). A temporary filling was placed, and the patient was called for devital bleaching two weeks later. Devital bleaching was performed successfully. After devital bleaching, a composite lamina procedure was performed in the restorative clinic.


X-ray image at 3 months follow up


Intra-oral picture after devital bleaching


Intra-oral picture after composite laminate veneer

CLINICAL RELEVANCE

Bioceramic cements are advantageous for both regenerative endodontic treatment and one-visit apexification treatment for non-vital immature teeth.
Clinicians should carefully assess the long-term prognosis of RET cases and consider material selection to minimize potential complications.

DISCUSSION:

Long-term failures can occur in teeth treated with regenerative endodontic procedures following traumatic complicated crown fractures.
As demonstrated in this case, apexification treatment might be an alternative treatment option in cases of failed RET.
Biodentine offers favorable sealing properties, biocompatibility, and does not induce discoloration.

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Revascularization of Immature Permanent Tooth Using Putty-type Calcium Silicate Cements: Cases Report of Dens Evaginatus

CP145

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Aim

The purpose of this case report is to present successful revascularization cases using putty-type calcium silicate cement in immature teeth with dens evaginatus and pulp necrosis.

Introduction

Dens evaginatus is a developmental anomaly commonly found in mandibular premolars. The protruding cusp is vulnerable to fracture, which can lead to pulp necrosis due to bacterial infection. When pulp necrosis occurs before the permanent tooth has fully matured, conventional root canal treatment becomes unfavorable. In this case report, successful root development was achieved through revascularization using calcium silicate cement in an immature tooth with dens evaginatus and pulp necrosis.

<Case 1>

A 12-year-old male patient presented with swelling and pain in tooth #44. A fractured dens evaginatus was observed on the occlusal surface, and a radiolucent apical lesion was confirmed (Fig. 1*E*). After access cavity preparation (Fig. 1*A*), irrigation was performed with saline and 1.25% NaOCl, without mechanical instrumentation at the apical portion. The working length was determined via X-ray, and calcium hydroxide paste was placed before temporarily sealing the cavity (Fig. 1*F*). At the second visit, canal irrigation with 1.25% NaOCl was repeated. During the third visit, local anesthesia (ATO Mepivacaine 3%; Atoz Pharmaceutical, Buena Park, USA) without epinephrine was administered. Canal irrigation with saline and 17% EDTA was performed, and the tip of a #15 K-file was bent and extended 3–4 mm beyond the working length. The file was then used inside the canal to induce bleeding. After confirming that the blood clot had formed up to 3 mm below the CEJ (Fig. 1*B*), calcium silicate cement (Biodentine; Septodont, Saint-Maur-des-Fossés, France) was applied to the upper portion and allowed to set initially (Fig. 1*C*). The final restoration was then completed using RMGI (Fuji II LC; GC Corporation, Tokyo, Japan) (Fig. 1*D*). Follow-up X-rays at 3 months (Fig. 1*G*) and 6 months (Fig. 1*H)* confirmed the disappearance of the radiolucent lesion and the result of root obstruction.

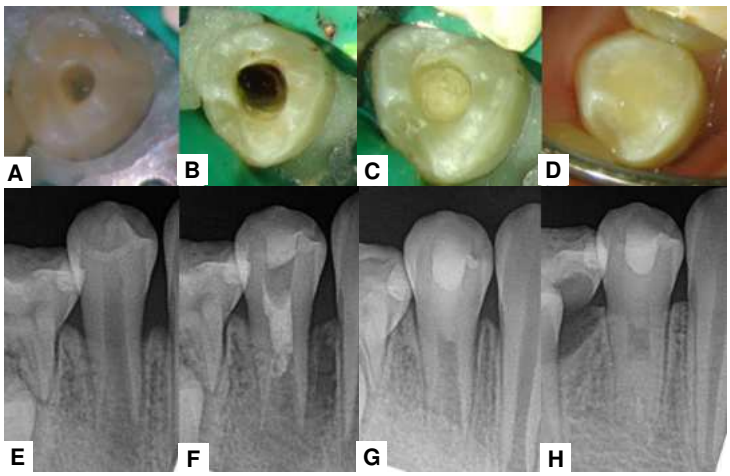

Figure 1.
(*A*) Access cavity opening. (*B*) A blood clot had formed up to 3 mm below the CEJ. (*C*) Calcium silicate cement was applied to the upper portion. (*D*) The final restoration was completed using RMGI (Fuji II LC). (*E*) Preoperative radiograph showing an apical lesion associated with a fractured dens evaginatus. (*F*) Temporary sealing after the application of calcium hydroxide paste. (*G*) Follow-up radiograph at 3 months showing lesion resolution. (*H*) Follow-up radiograph at 6 months showing apical obstruction.

<Case 2>

An 11-year-old male patient presented with swelling and pain in tooth #45. A fractured dens evaginatus was observed on the occlusal surface, and a radiolucent apical lesion was confirmed (Fig. 2*A*). After access cavity preparation, irrigation was performed using saline and 1.25% NaOCl without mechanical instrumentation at the apical portion. The working length was determined via X-ray, and calcium hydroxide paste was placed before temporary sealing of the cavity (Fig. 2*B*). At the second visit, canal irrigation with 1.25% NaOCl was repeated. During the third visit, local anesthesia (ATO Mepivacaine 3%; Atoz Pharmaceutical, Buena Park, USA) without epinephrine was administered. Canal irrigation with saline and 17% EDTA was performed, and the tip of a #15 K-file was bent and extended 3–4 mm beyond the working length. The file was then used inside the canal to induce bleeding. After confirming that the blood clot had formed up to 3 mm below the CEJ, calcium silicate cement (One-Fil Putty; Mediclus, Cheongju, South Korea) was applied to the upper portion and allowed to set. A resin-modified glass ionomer (Fuji II LC; GC Corporation, Tokyo, Japan) base was then placed, followed by a resin restoration (Filtek Z250; 3M, St. Paul, USA). Follow-up X-rays at 3 months (Fig. 2*C*) and 6 months (Fig. 2*D*) confirmed the disappearance of the radiolucent lesion and continued root development.

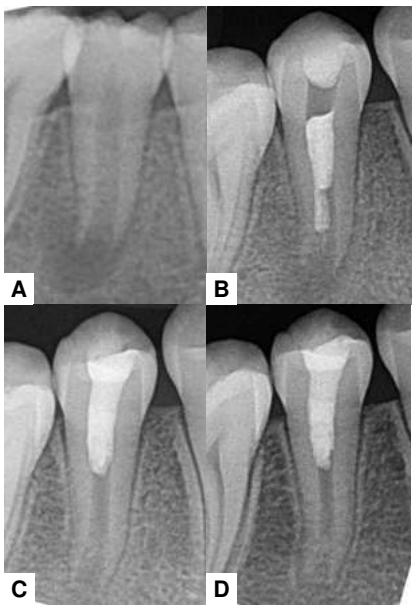

Figure 2.
(*A*) Preoperative radiograph showing an apical lesion associated with a fractured dens evaginatus. (*B*) Temporary sealing after the application of calcium hydroxide paste. (*C*) Follow-up radiograph at 3 months showing lesion resolution and increased root length. (*D*) Follow-up radiograph at 6 months showing continued root development.

Discussion

Revascularization is indicated for teeth with necrotic pulp and an immature apex, as seen in these cases. The key factors for successful pulp revascularization include preserving stem cells in the apical region, suppressing bacterial growth, and controlling inflammation. In these cases, the use of calcium silicate cement, which has a fast setting time, enabled the completion of the final restoration on the same day, likely reducing the risk of bacterial contamination due to microleakage. Additionally, calcium silicate cement offers high biocompatibility, making it well-suited for tissue regeneration[1-2]. The success of revascularization should be assessed through clinical and radiographic follow-up for at least two years. In cases of treatment failure, alternative approaches such as apexification should be considered.

Clinical relevance

Pulp necrosis in immature permanent teeth is often caused by a dens evaginatus fracture. In such cases, revascularization using putty-type calcium silicate cement can be an appropriate treatment option to promote root development.

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RAMBAM Health Care Campus

CP146

European Society of Endodontology

Combined Regenerative Endodontics and Vital Pulp Therapy in an Immature Mandibular First Molar with Taurodontism: A Case Report

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Aim:

To present the management of an immature, partially necrotic, molar tooth with taurodontism using a combined approach of endodontic regeneration and vital pulp treatment.

Introduction:

Regenerative endodontics is a biologically based approach aimed at restoring the vitality of necrotic dental pulp and promoting the continued development of immature teeth. This technique involves the use of stem cells, scaffolds, and bioactive molecules to regenerate the pulp-dentin complex, thereby enhancing root development and thickening the dentin walls (1,2). Vital pulp therapy (VPT) selectively removes inflamed pulp tissue and caps the remaining pulp with bioactive materials, aiming to preserve pulp vitality and function (3) and promote continued root development, especially in immature teeth with open apices (4).

Taurodontism is an anomaly characterized by an enlarged pulp chamber and apically displaced furcation, resulting in short roots and complex root canal anatomy. This condition poses significant challenges for endodontic treatment due to the abnormal root canal morphology (5). This case report details the treatment of a partially necrotic taurodontic mandibular first molar utilizing a combined approach of regeneration and vital pulp therapy.

Case Presentation:

A 9-year-old male patient was referred due to sensitivity to percussion in tooth #46 one-month after an initial first-aid treatment. Radiographic evaluation confirmed the presence of taurodontism, dressing material in the pulp cavity, and signs of periapical radiolucency near open apices (Fig. 1). The tooth was diagnosed as previously initiated therapy with symptomatic apical periodontitis. Following access cavity preparation, the pulp was diagnosed as vital in the distal canal and necrotic in the mesial canals. Given the patient's age, early tooth developmental stage and the potential for tooth retention, a combined revascularization and vital pulp therapy was performed.

Methodology:

Treatment involved two visits. In the first visit, the tooth was anesthetized. The tooth was accessed following rubber dam isolation. The dressing material (Metapex) was removed using ultrasonics. The pulp chamber and canals were inspected using an operating microscope. Calcium silicate-based cement (NeoPUTTY; NuSmile, Houston, TX, USA) was applied over the remaining vital pulp in the distal canal to facilitate dentin bridge formation, continued root maturation and protect the pulp from bacterial infiltration. In the mesial canals working length was established followed by irrigation with 3% NaOCl, saline solution and 17% EDTA. The canals were dried and dressed with calcium hydroxide. A temporary filling was placed in the access cavity. In the second visit, 4 weeks later, symptoms were resolved. The tooth was anesthetized, isolated with a rubber dam and calcium silicate-based cement setting in the distal canal was confirmed. The mesial canals were irrigated with17% EDTA and saline, then dried using paper points. Bleeding was induced and blood clot confirmed. NeoPUTTY was placed over the blood clot. The access cavity was sealed with a composite resin after the material had set (Fig. 2). A crown was placed by the referring dentist. Patient was followed up for 1 year. The 1-year post-op radiographic evaluation showed reduction of the periapical lesion size, continued root development and apical closure (Fig. 3).

Discussion and Conclusion:

This case report illustrates the successful management of an immature, partially necrotic, taurodontic molar tooth using a combined approach of regeneration and vital pulp therapy. The approach not only resolved signs and symptoms but also facilitated continued root development and maturation. The outcome suggests that such integrative strategies can effectively preserve pulp vitality and promote healing in affected immature teeth with complex dental anatomy, thus preventing the need for traditional root canal treatment.

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CP148

REGENERATIVE ENDODONTIC TREATMENT IN A CASE STUDY: SINGLE OR MULTIPLE VISITS

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Objective

The aim of this case report is to present single-visit and multi-visit regenerative endodontic treatments applied to mature teeth with chronic apical periodontitis through two cases.

Introduction

Regenerative endodontic procedures (REPs) are biologically based treatments that have shown highly successful outcomes in the management of immature teeth with necrotic pulp[1]. Recent studies suggest that REP may also be a viable alternative for the treatment of mature teeth with necrotic pulp[2,3]. Performing REPs in a single visit may be preferable as it can reduce the risk of canal contamination, improve patient compliance, shorten the treatment duration, save time, and be more cost-effective[4].

Case Presentation

A 20-year-old systemically healthy female patient presented to the clinic for a routine check-up. Radiographic examination revealed periapical lesions in teeth #12 and #22. Clinical examination showed that the affected teeth were asymptomatic and non-responsive to vitality testing.

Multi-Visit RET for #22; In the first session, the root canal of tooth #22 was shaped using #45-#80 K files, (EndoArt, Istanbul, Turkey) and Protaper Ultimate rotary files (Dentsply, USA), enlarging the canal by 5 to 6 file sizes beyond the first file that engaged at the working length. Between each file, the canals were irrigated with 2 mL of 1.5% sodium hypochlorite (NaOCl). After preparation, a final irrigation sequence was performed using 5 mL of 1.5% NaOCl followed by 5 mL of 5% ethylenediaminetetraacetic acid (EDTA). Calcium hydroxide paste ($Ca(OH)_2$) (Kalsin, Turkey) was then placed inside the canal. After 21 days, during the second session, the $Ca(OH)_2$ was removed using 5 mL of 1.5% NaOCl with passive ultrasonic activation (Endo 3 Ultrasonic Endo Activator Device, Woodpecker). The final rinse was performed using distilled water followed by 5 mL of 5% EDTA solution. A #25 K-file was used to go beyond the apex to induce bleeding inside the root canal. Once the blood clot was formed, Mineral Trioxide Aggregate (MTA) (Cerkamed, Wojciech, Nisko, Poland) was placed over the clot, approximately 3 mm below the cemento-enamel junction. A moist cotton pellet was placed over the MTA, and the cavity was temporarily sealed with Cavit G (3M ESPE, Neuss, Germany). The permanent restoration was completed the following day (Figure-1)

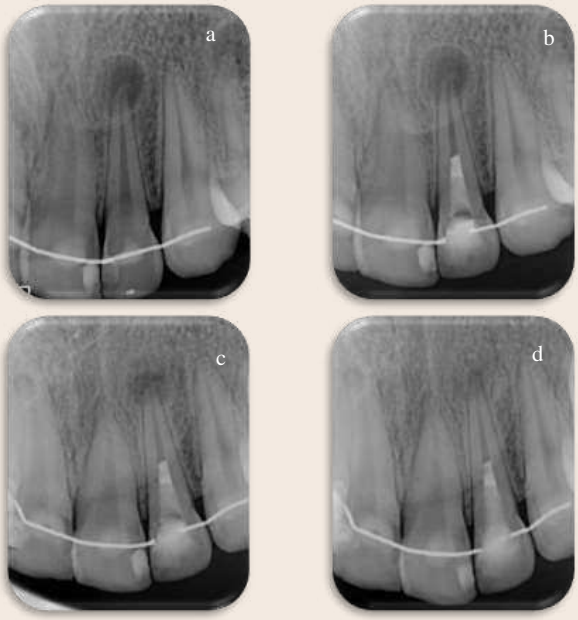

Figure 1: a.The initial radiography b.Post-treatment c.6-month follow-up d.12-month follow-up radiographs of tooth #22

Single-Visit RET for #12; The clinical procedures applied in Case 1 were performed in a single session for Case 2. Differently, in this case, the root canals were irrigated with 2 mL of 2.5% NaOCl between each file. The final rinse, blood clot induction, MTA placement, and final restoration steps were completed as described in Group 1 (Figure-2).

At the 6 and 12-month follow-ups, periapical healing was observed in both treated teeth, and their functional continuity was maintained; however, both teeth remained unresponsive to vitality testing.

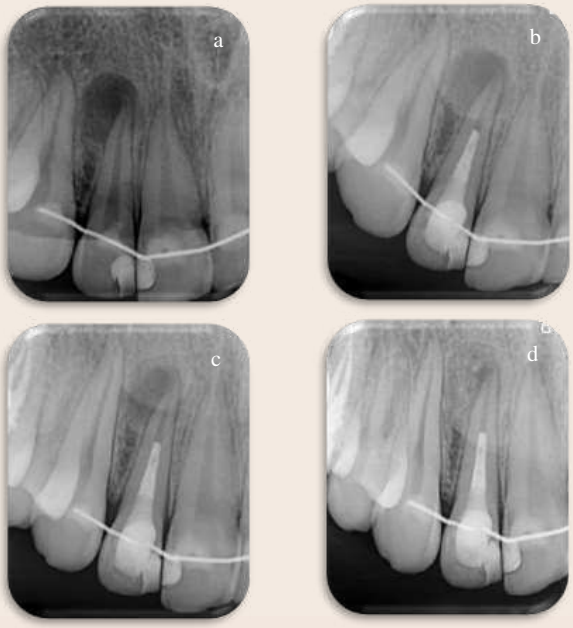

Figure 2: a.The initial radiography b.Post-treatment c.6-month follow-up d.12-month follow-up radiographs of tooth #12

Discussion

Cerqueira-Neto et al. compared single-visit and multi-visit regenerative endodontic procedures in immature permanent teeth with necrotic pulp and reported that single-visit REP yielded similar clinical and radiographic success compared to multi-visit protocols[5]. Their study concluded that both approaches resulted in apical closure and root development. In agreement with these studies, our case report compared single-visit and multi-visit REPs in mature teeth with chronic apical periodontitis, showing that both protocols provided similar periapical healing and functional continuity. This finding suggests that the number of treatment sessions may not be a determining factor in treatment success.

Clinical Relevance

The RET approach can be planned as either a single-visit or multi-visit procedure based on patient and clinical conditions.

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REGENERATIVE ENDODONTIC TREATMENT IN A MATURE TOOTH WITH A WIDE APEX:A CASE REPORT

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CP149

AIM

This case presents the regenerative endodontic treatment (RET) of a permanent maxillary incisor with an asymptomatic apical periodontitis.

INTRODUCTION

Regenerative endodontic treatment (RET) aims to restore pulp-like tissue and promote periapical healing. While commonly used in immature teeth, its role in mature teeth is gaining interest. This case presents RET in a permanent maxillary incisor with an apical lesion, emphasizing its clinical approach and benefits.

CASE PRESENTATION

A patient presented to our clinic with a lesion in tooth #11(FDI). The medical history revealed no systemic diseases. Clinical examination showed no sensitivity to percussion or palpation and the cold test yielded a negative response. Radiographic evaluation revealed a wide apical foramen and a periapical lesion. Based on these findings, a diagnosis of **Asymptomatic Apical Periodontitis** was established.First session, under rubber dam isolation an access cavity was prepared and the working length was determined. The root canal was irrigated with 20 mL of 1.5% sodium hypochlorite (NaOCl), followed by 10 mL of saline solution. Calcium hydroxide was then placed in the canal and the cavity was temporarily restored with glass ionomer cement. The patient was scheduled for a follow-up in four weeks. Second session, after administering **3% mepivacaine** for local anesthesia, the temporary restoration was removed. The root canal was irrigated with 20 mL of 17% EDTA, followed by 10 mL of saline solution. A controlled over-instrumentation technique was used to induce bleeding from the periapical tissues into the root canal. A **3 mm thick layer of Mineral Trioxide Aggregate (MTA)** was placed at the canal orifice. The final restoration was completed using glass ionomer cement and composite resin. At the 6-month and 12-month follow-ups, the tooth remained clinically asymptomatic and radiographic assessment demonstrated satisfactory periapical tissue healing.

DISCUSSION

Regenerative endodontic treatment (RET) offers a biological alternative for necrotic teeth with wide apices. In this case, controlled over-instrumentation and MTA application facilitated periapical healing. At 6- and 12-month follow-ups, the tooth remained asymptomatic with radiographic evidence of healing. RET may be a viable option for mature teeth, though further studies are needed.(1)

CLINICAL RELEVANCE

This case demonstrates the potential of regenerative endodontic treatment (RET) in a mature tooth with a wide apex, highlighting its role in periapical healing and biological tissue regeneration.

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CP150

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Regenerative **Endodontic Treatment in a** Tooth **with** External Root **Resorption:** A Case Report

RA Esmanur Yurt, Prof. Dr K.Meltem Colak

AIM - Stopping the resorption and ensuring the continuity of the function of the tooth with regenerative endodontic treatment of the tooth with external root resorption caused by periapical infection

INTRODUCTION - Resorption is a condition associated with either a physiologic or a pathologic process resulting in a loss of dentine, cementum, or bone. Unlike primary teeth, permanent teeth seldom undergo root resorption. This may be attributed to the fact that in a healthy tooth, the cementum and predentine deter the attachment of the osteoclasts. However, a prolonged inflammatory response in the pulp or periodontal tissue due to various causes like trauma, periodontal infections, caries-induced pulpitis, orthodontic treatment, calcium hydroxide (CH) capping, etc., may damage or alter these tissues. This may, in turn, trigger a destructive phase in which active root resorption occurs due to the activation of the RANK-RANKL-OPG system (RANK: receptor activator of nuclear factor; RANKL: receptor activator of nuclear factor ligand; OPG: osteoprotegerin), which results in osteoclastogenesis .

CASE PRESENTATION - In the routine dental examination of a 23-year-old patient, severe root resorption was observed in tooth number 26(FDI). Regenerative endodontic treatment was planned for the patient to stop the resorption and to maintain the function of the tooth. After the necessary information was given to the patient, consent was obtained and treatment was started.

After local anesthesia was administered, the procedure was initiated (lidocaine 2% 1:100.000 epinephrine; Safco, Buffalo Grove, IL).After tooth isolation and access opening, all cases were treated with an REP according to the American Association of Endodontists' protocol. Each tooth was irrigated with 20 mL 1.5% hypochlorite; dried with paper points .Root canal medicament with calcium hydroxide was placed into the canal.The tooth was then restored using a temporary restorative material

After administering anesthesia without vasoconstrictors in the second session, the procedure was initiated under rubber dam isolation (Mepivacaine 3%; Septodont, Saint-Maur-des-Fosses, France). The teeth were thoroughly irrigated with 20 ml of EDTA 17% activated ultrasonically and subsequently with 10 mL sterile saline solution.

The canals were dried using paper points. A K-file number 25 was then carefully inserted 2 mm beyond the apical foramen, introducing blood into the canal.

Triple sealing of the root canal was performed with a mineral trioxide aggregate placed just above the blood clot. Finally, the access cavity was sealed using glass-ionomer cement.

At follow-up appointments, external root resorption was found to have ceased, with a noticeable reduction in periapical radiolucency. Additionally, evidence of hard tissue deposition was observed in the resorptive defect areas after 8 months.

The treated tooth remained asymptomatic, retained normal physiological mobility, and preserved its function

FIG.1: PREOPERATIVE

FİG. 2: POSTOPERATIVE

FİG. 3: CONTROL AFTER 8 MONTHS

DISCUSSION - RET techniques may offer a chance to replace the damaged pulp and tooth structure with vital tissues that serve as a defensive mechanism during tissue injury or microbial assault and reduce the probability of tooth fracture.Studies investigating the histologic nature of the tissues growing into the root canal space after RET in mature and immature have documented the presence of connective tissue with structures resembling bone and cementum. The cementum-like tissues formed in the root canal space after RET may contain an inhibitor of osteoclastogenesis resulting in the arrest of root resorption. Also, it has been speculated that the vital tissue in the canal may prevent progressive replacement resorption .

CONCLUSION- Traditional root canal treatment cleans and shapes the roots, while regenerative treatment offers a more natural healing process. This allows the tooth to be treated in a less invasive way. Regenerative endodontic treatment can be an important option in the treatment of external root resorption. This treatment halts root resorption, contributes to the healing process, and stands out as an effective method to prevent tooth loss.

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CP151

Regenerative Endodontic Treatment of Immature Central Tooth Using PRF: Case Report

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Aim:

This case report aims to demonstrate the closure of the apex and the formation of root dentin in a traumatized tooth with an open apex using regenerative endodontic procedures (REPs).

Introduction

Regenerative endodontic treatment is defined as a procedure that restores physiologic functions to the pulp-dentin complex in immature necrotic teeth, allowing root development to continue [1].

Case Presentation:

14-year-old female was referred to our clinic with complaints of her upper anterior tooth. An intraoral examination revealed pain on percussion and palpation in tooth #21. Periapical radiography showed a large lesion and an open apex. The first session of REPs was performed according to ESE guidelines. The cavity was sealed with temporary filling material. At the second session, blood was drawn from the patient to obtain PRF. PRF was condensed into the canal using a plugger. Coronal section of the tooth was filled with Mineral Trioxide Aggregate. Restoration was completed using resin-modified glass ionomer cement followed by composite resin. Patient recalled after first, 10th and 22nd months and the tooth was asymptomatic. Periapical radiography showed a reduction in the size of the lesion and the closure of the root apex.

Discussion:

Revacularization is a regenerative treatment and biologically based alternative current approach in the treatment of necrotic immatür permanent teeth that allows root development to continue [2]. In this case, it was demonstrated that regenerative therapy is a viable treatment option that can promote apex closure and increase the chances of success.

Clinical Relevance:

Preserving the vitality of teeth is the preferred condition. Regular follow-up of patient is crucial for early intervention in case of potential complications. Closure at the apex of the tooth could have potentially increased the fracture resistance of the tooth.

Figure1:An open apex and lesion at the apical area

Figure2:10 month follow up:Closure of the apex started to begin.

Figure3: 22 month follow up:Reduction of the lesion and closure of the apex

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Vital Pulp Therapy of a Mature Tooth with Deep Caries in an Elderly Patient

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CP153

Aim

This case report aims to demonstrate the successful outcome of vital pulp therapy of a mature tooth with deep carious lesions on distal and cervical surfaces in an elderly patient.

Introduction

Vital pulp therapy (VPT) preserves pulp vitality, minimizes tooth structure loss, and maintains the tooth's natural defense mechanisms (3). According to position statements by ESE and AAE, patient age is no longer considered a limiting factor in performing VPT (3,4). However, recent studies suggest that patient age over 40 years should be considered a risk factor associated with lower success rates of direct pulp capping(1), a procedure used to cover healthy or reversibly inflamed pulps exposed mechanically or during caries removal(2). This clinical report demonstrates the successful outcome of vital pulp therapy performed on a mature tooth with deep carious lesions on distal and cervical surfaces in an elderly patient.

Case Presentation

A 68-year-old male patient presented to the Department of Conservative Dentistry at National Health Insurance Service Ilsan Hospital, Ilsan, Republic of Korea, complaining of "a cavity in my lower right tooth." He reported no history of dental pain and had a medical history of hypertension, angina pectoris,and penicillin allergy. Clinical examination revealed deep carious lesions on the distal and cervical surfaces of tooth #44) (Figure 1), which responded positively to both cold (Endo-Ice; Coltene, Altstätten SG, Switzerland) and electric pulp testing (EPT: 5/64). Percussion, periodontal probing, and mobility were within normal limits. Adjacent teeth also showed normal responses. Periapical radiographs revealed deep caries penetrating the pulp (Figure 2). Tooth #44 was diagnosed with dental caries with normal pulp and periapical tissues. Vital pulp therapy with subsequent indirect restoration was planned.

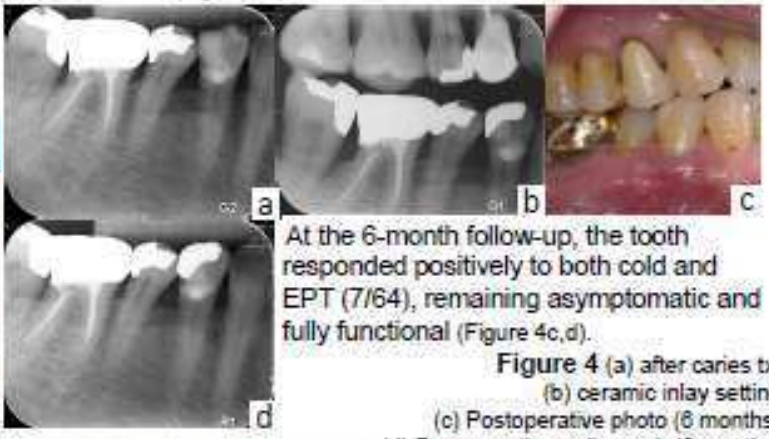
Figure 1 Preoperative photo

Figure 2 Preoperative radiograph

Figure 3 (a) Preoperative photo (b) Hemostasis (c) CSC appl. (d) GI filling

Under local anesthesia (2% lidocaine and 1:100,000 epinephrine; Huons, Sungnam, Republic of Korea), rubber dam isolation was placed, and all procedural steps were performed under a dental microscope (Figure 3a). Soft carious dentin was removed using a round carbide bur on a low-speed handpiece. A Tofflemire matrix band was applied to aid in material placement and contouring. Upon pulp exposure the cavity was thoroughly irrigated with 2.5% NaOCl. Hemostasis was achieved within 1 minute by applying gentle pressure using a sterile cotton pellet soaked in NaOCl (Figure 3b). Calcium silicate-based cement (Endocem Premixed MTA Regular; Maruchi, Wonju, Republic of Korea) was applied onto the pulp exposure sites to approximately 3mm thickness (Figure 3c). A sterile cotton pellet soaked in saline was placed for 5 minutes to facilitate initial setting. The distal cavity was restored with light-cured glass ionomer (Fuji II LC; GC America Inc., Alsip, IL, USA) (Figure 3d). The cervical cavity was restored with composite resin (Tetric N-Ceram Cavifil; Ivoclar Vivadent, Schaan, Liech-tenstein) and flowable resin (G-aenial Universal Flo; GC America, Alsip, IL, USA). A long bevel was prepared at the cervical margin to minimize microleakage. A postoperative radiograph was taken (Figure 4a).

Because early failure typically occurs within 6 weeks (5), a follow-up was scheduled at 6 weeks. The tooth remained vital (cold(+), EPT (6/64)) and asymptomatic. A ceramic inlay was cemented using adhesive resin cement (RelyX Ultimate Clicker; 3M, St. Paul, MN, USA), with margins placed on sound tooth structure to minimize microleakage. A postoperative radiograph was obtained (Figure 4b).



At the 6-month follow-up, the tooth responded positively to both cold and EPT (7/64), remaining asymptomatic and fully functional (Figure 4c,d).

Figure 4 (a) after caries tx. (b) ceramic inlay setting (c) Postoperative photo (6 months) (d) Postoperative radiograph (6 months)

Discussion

Patient age over 40 years is a risk predictor for lower success rates in direct pulp capping due to reduced pulpal blood supply, decreased cellularity, limited assessment of pulp exposure sites, and compromised pulpal defense mechanisms (1).

Despite the patient's age (60s) deep carious lesions on more than one surface, VPT was chosen to avoid potential complications associated with RCT, such as discomfort from loss of vitality and excessive tooth structure removal from crown restoration. The tooth remained vital at the 3 month follow-up. However, since late failure of direct pulp capping is more frequent in patients over 40 years old (1) and pulp canal calcification is a potential complication, periodic follow-up is required.

Clinical Relevance

Vital pulp therapy under a strict protocol (3,4) can be a viable and conservative treatment option for managing deep carious lesions in elderly patients. The protocol includes careful caries removal, adequate hemostasis with NaOCl, microscope-assisted precision, and the application of calcium-silicate-based cement.

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CP154

Combination Of Vital Pulp Therapy and Non-Surgical Root Canal Treatment In A Permanent Molar

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AIM - To determine the clinical outcome of combination of non-surgical root canal treatment and vital pulp therapy in case of symptomatic irreversible pulpitis and apical periodontitis in a single mature permanent multirooted tooth.

INTRODUCTION - Conventionally root canal treatment is the goal standard of treatment in tooth diagnosed with irreversible pulpitis and necrose pulp with or without periapical pathosis. However, root canal therapy tends to be expensive and time-consuming. Several studies showed that the reversible or irreversible condition of the pulp cannot be decided solely on clinical signs and symptoms because there is known variation in the degree of inflammation. It is also said that inflammation of the the pulp confine only at the coronal and does not extend at the apical portion in case of irreversible pulpitis.

CASE PRESENTATION – A 23 years old healthy female presented to Endodontic Postgraduate Clinic with a complain of spontaneous throbbing pain in the lower right quadrant. The clinical examination revealed a carious lesion on the disto-occlusal surface of lower right first molar. Patient claim to have pain/tender on palpation and percussion with no sign of swelling, sinus tract or pus discharge. Pulp sensibility test (electric pulp test) on tooth #46 was positive with a reading of 25/60, and the thermal test (cold) by using ROEKO Endo-Frost, Coltene resulted in lingering pain for about 20 second upon removal of stimulus. The periapical radiograph showed a coronal radiolucency involving enamel, dentin and close proximity to the pulp chamber and apical radiolucency over the mesial root. Based on the findings, tooth #46 had been diagnosed with irreversible pulpitis, symptomatic apical periodontitis. Local anaesthesia was achieved with lidocaine 2% with adrenaline 1:100,000 (Scandonest) followed by rubber-dam isolation and disinfection of the dental dam with 5% sodium hypochlorite. Caries was removed with a round bur using a low speed handpiece and pre-endo build up was done using composite restoration. The treatment was done with the aid of microscope.

On access opening, the mesial orifices remained necrotic while bleeding persisted in the distal canal orifices A high-speed diamond bur was used to remove the exposed pulpal tissue to the level of the distal canal orifice. By using diluted 5% NaOCl moistened cotton for 2 minutes, followed by a pressure pack with dry cotton the haemostasis was established. Once the bleeding was controlled, Biodentine (Septodont, Lancaster PA, USA) of, 2-3 mm thickness was packed with a condenser above the orifices. Over the set Biodentine, a layer of light-cure RMGIC was applied and 20 seconds light curing was done. Non-surgical endodontic procedure was performed in the mesial canals after completion of pulpotomy in the distal canal. Healing noted on radiograph on both roots after 1 year review.

Fig. 1: Preoperative, Postoperative, 1 year review

DISCUSSION - The success of a treatment modality depends on the pulpal status which cannot be decided clinically alone. Histologically, in irreversible pulpitis, inflammation is confined within 2 mm out from the carious exposure. Consequently, the radicular pulp can be preserved following the removal of a pulp that has suffered irreversible damages. Achieving haemostasis within 10minutes indicate the radicular pulp are mildly irritated and higher chances of healing. While Koli 2020, revealed 93.3% of success rate using the same method as combination of non-surgical root canal treatment and vital pulp therapy in a single mature permanent molar.

CLINICAL RELEVANCE - Combining non-surgical root canal therapy and vital pulp therapy address both infection and inflammation in a single permanent tooth. This procedure are useful for teeth with mixed pulp health status, offering a conservative yet effective solution that can lead to better long-term outcomes, improved healing, and enhanced patient satisfaction. However, it requires careful case selection and skilled execution to ensure success.

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CHALLENGES, OPPORTUNITIES AND NEW PERSPECTIVES IN ENDODONTOLOGY

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