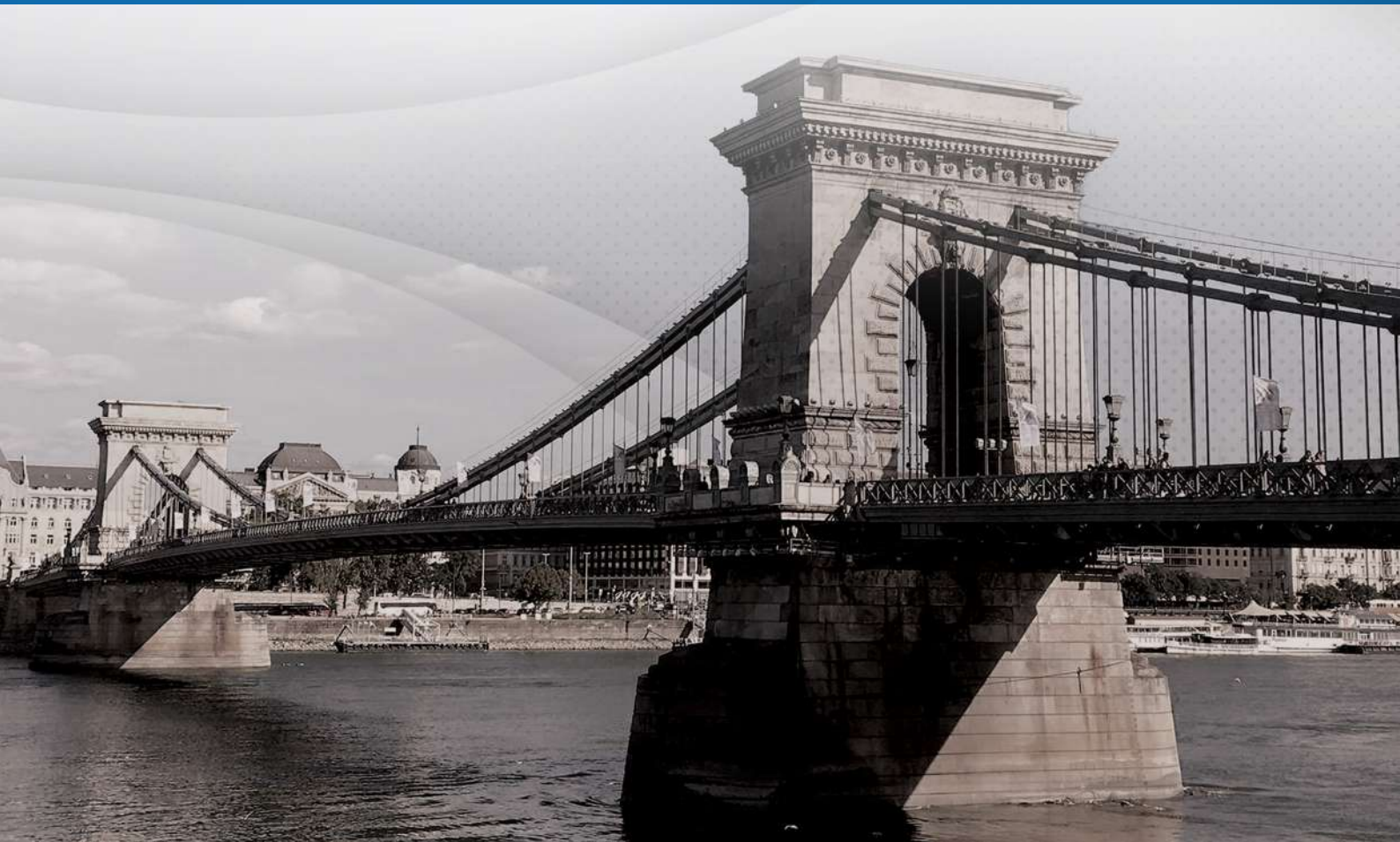


# Clinical Posters

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# Differential diagnosis of maxillary left central incisor presenting with periapical radiolucency – a case report

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## Aim

To showcase a differential diagnosis of a radiographic radiolucency present at the apex of a previously treated maxillary central incisor with the use of cone-beam computed tomography (CBCT).

## Introduction

Cleidocranial dysplasia is a rare autosomal dominant disorder with a prevalence of 1 in 1 million. Patients can present with skeletal manifestations which include clavicular hypoplasia and dental abnormalities such as supernumerary teeth.<sup>(1)</sup>

## Case Presentation

An 18-year-old female was referred to the endodontic department at Liverpool University Dental Hospital, due to a suspected failed root canal treatment on the maxillary left central incisor. The initial root canal treatment was completed two years prior. The periapical radiograph (Fig. 1) showed a presence of a radiolucency at the apex of the tooth, consistent with an appearance of a periapical infection. The patient's medical history includes cleidocranial dysplasia and history of extractions of multiple supernumerary teeth under general anaesthetic at the age of 10.

The patient reported no symptoms. Clinical examination revealed normal responses to sensibility tests of the adjacent teeth and no tenderness to palpation / percussion testing of all maxillary anterior teeth. There was no evidence of sinus, discolouration, deep periodontal pocketing or mobility. At this stage, periapical periodontitis was suspected as the main differential diagnosis.

Upon further assessment of historical CBCT records from 8 years prior, a presence of supernumerary tooth was noted in the right anterior maxillary region (Fig. 2). A new CBCT radiograph was taken (Fig. 3), which showcased a bony cleft extending through buccal and palatal cortices, adjacent to the root apex of the maxillary left central incisor. The position of the current observed radiographic radiolucency was closely related to the supernumerary tooth that was previously surgically extracted from the maxillary anterior area.

The patient was diagnosed with an apical scar located at the apex of the maxillary left central incisor. Due to absence of evidence of active disease, no treatment was deemed necessary.



Figure 1

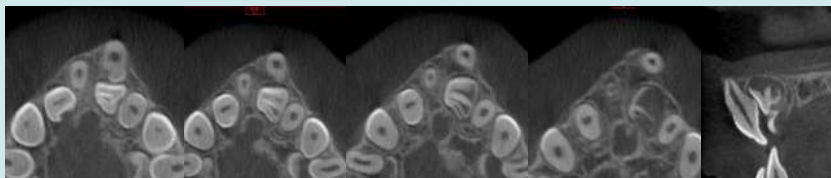


Figure 2

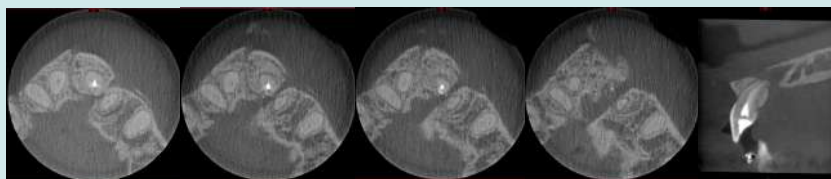


Figure 3

## Discussion

Bone resorption in the periapical region, which can be seen as radiographic radiolucency, is a vital diagnostic feature of apical periodontitis.<sup>(2)</sup> Following successful root canal treatment, evidence of osseous regeneration is manifested by radiographic reduction and resolution of the periapical lesion.<sup>(3)</sup> Relying solely on radiographic appearance to determine the success of endodontic treatment can be misleading. Historical radiographic examination and patient's medical and dental records can provide crucial information aiding the diagnosis.

## Conclusion & Clinical Relevance

This case report highlights the importance of thorough history taking and clinical and radiographic examination to aid with decision making regarding the diagnosis and required treatment. Despite previous evidence of treatment, it is imperative that each case history is well understood by the clinician to avoid misdiagnosis.

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# MANAGEMENT OF HIDDEN CURVATURES DURING ROOT CANAL TREATMENTS: THE HYBRID CRYSTALLOGRAPHIC PHASES APPROACH

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## Aim

To discuss the clinical approach and instrumentation strategy for root canal treatment of teeth with hidden curvatures.

## Introduction

Severe curvature are one of the most complex situation to treat, because of the increased likelihood of intracanal separation of endodontic instruments [1]. Moreover, bidimensional conventional RX are not always able to accurately detect anatomy variations, especially in the case in which they are on the buccal-palatal/oral aspects [2]. The aim of this study was to discuss a clinical approach for the management of hidden curvatures based on the alternating use of austenitic and martensitic rotary instruments.

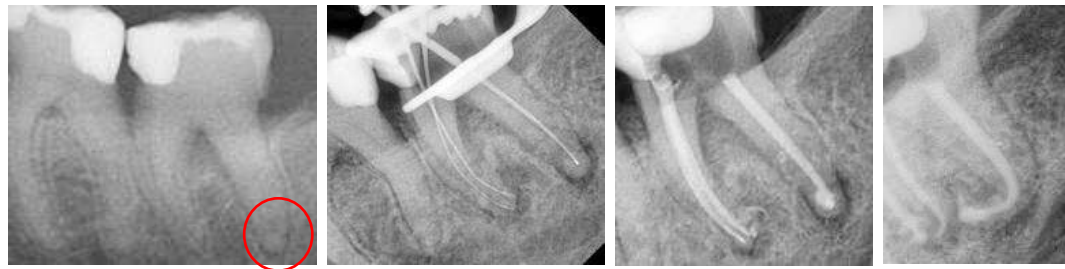
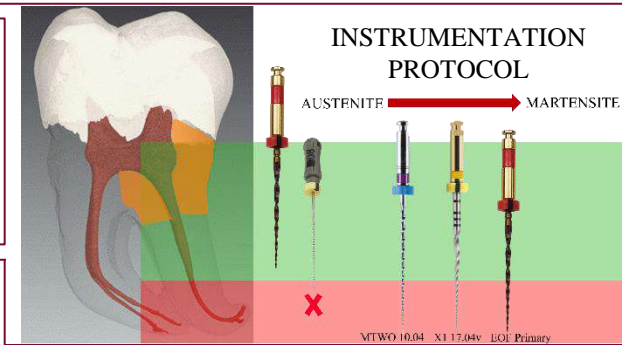
## Cases Presentation

*Case #1:*

A 65 years old woman was referred for continuing the RCT of a lower second molar (3.7) with symptomatic apical periodontitis After inferior alveolar nerve block, rubber dam was placed, the access cavity initially performed by the colleague was refined, orifices located and RCT performed.

*Case #2:*

A 54 years old woman came to our department for spontaneous pain and swelling in correspondence of the first upper right premolar (1.4). After RX examination, irreversible pulpitis with apical periodontitis was diagnosed. After local anesthesia and rubber dam isolation, the access cavity was performed, orifices located and RCT performed.



## Discussion

The presented clinical approach highlights the advantages of metallurgical and mechanical properties of nickel-titanium alloy, both for martensitic and austenitic phase, adapting the heat-treatment to the clinician's needs. Increasing the diameter and taper, the instruments are more susceptible to flexural stress, whilst the smallest ones have a lower torsional resistance [3]. For this reason, it is reasonable to exploit the stiffness of austenite in the first phases of RCT when smaller instruments are used, to prevent torsional failure. In this phase the flexibility and cyclic fatigue resistance are guaranteed by the reduced cross-sectional metal mass [4]. Progressively increasing the instruments' size, the increased quantity of martensite arising from stronger heat-treatments ensures high cyclic fatigue resistance and flexibility, despite the increased mass of the instruments. In this approach three different instruments have been selected increasing the amount of martensite contemporaneously with the increase of the metal mass : Mtwo 10.04 (conventional NiTi), X1 17.04v (M-Wire, slightly martensitic) and EOF Primary (FireWire, martensitic).



## Clinical relevance

The proposed protocol seems to enhance the properties of the NiTi alloy, overcoming the main limitation of endodontic instruments in the management of severe hidden curvatures and making difficult RCT easier and predictable.

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# Adhesive fragment reattachment via fibre-posts after deep crown-root-fracture

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## Aim

To explore the potential of reattaching tooth fragments via fibre-posts after crown-root-fractures as an alternative to orthodontic forced eruption or surgical extrusion.

## Introduction

Orthodontic forced eruption or surgical extrusion are established methods to enable restoration of teeth fractured beneath bone level. However, treatment success and aesthetic outcome is challenging, time-consuming and also depends on the compliance of the patient.

## Case Presentation

A 29-year old male patient presented with a deep crown-root fracture of the right central and lateral upper incisor after a fist-fight (Fig.1). The patient requested an aesthetic, permanent solution with low cost and little time expenditure. After conventional root canal treatment of both teeth, fibre-posts were inserted with a self-adhesive resin-cement. The access cavity of the tooth fragments were prepared extraorally, and then reattached along the fibre-post (Fig.2). A retainer was attached to increase stability. A gingivectomy and cervical fillings were performed to improve aesthetics (Fig.3) and to ensure a clean cervical finish on the palatal side (Fig.4).



Figure 1



Figure 2



Figure 4



Figure 3

## Discussion

To ensure a proper evidence-based treatment of deep crown-root fractures, well-established methods like orthodontic forced eruption and surgical extrusion should be the favourable first choice. The current case shows that reattaching tooth fragments stabilized with fibre-post support can result in an aesthetic and functional initial solution.

## Conclusion and Clinical Relevance

For patients with deep crown-root fractures that cannot afford cost-intensive and time-consuming extrusion procedures, reattaching a single-pieced tooth fragment stabilized by a fibre-post and retainer can be an option. Patients need to be informed about unpredictable long-term survival and the possible negative influence on the surrounding periodontal tissue.

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# Regenerative endodontic treatment through a retreatment of a tooth with external cervical resorption



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## Aim

To demonstrate the success of a regenerative endodontic treatment (RET) through a retreatment performed on tooth with an external cervical resorption (ECR).



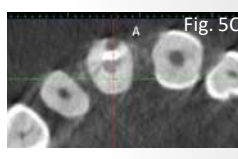
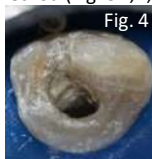
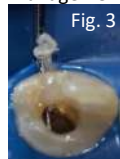
## Introduction

One of the aims of the regenerative endodontic treatment is to promote the development of immature teeth. If an immature apex shows chronic inflammation, healing can only occur in the absence of bacteria, which is even harder to achieve in retreatment cases. ECR is a progressive disease, which can perforate root canal causing a bacterial inflow into it. In the literature there is no previous finding for treating the combination of ECR with chronic periapical lesion with RET.

## Case presentation

A 13 year-old female patient was referred to our clinic due to moderate pain on biting associated with her maxillary right incisor which suffered trauma at age 7. Clinical and radiological examination revealed discoloration, fillings in the crown, incomplete root canal filling and chronic apical periodontitis around an immature apex (Fig. 1A,B).

**At the first session** during guttapercha removal (Fig. 2) a perforation was observed buccally at the level of CEJ and in the coronal one third of the root (Fig. 3). It was debrided and MTA was placed internally to seal the perforation (Fig. 4). CBCT was taken to evaluate the nature and extent of the perforation. CBCT sections confirmed a type 1Bp external cervical resorption. The perforation was supracrestal with limited circumferential spreading, so external approach was chosen as further management method (Fig. 5A,B,C).



**At the second session** the resorptive defect was cleaned externally and restored with sectional matrix and composite in absolute isolation (Fig. 6A,B). Mechanical preparation of the root canal wall was performed with a #40 Kerr-file with gentle brushing motions. Root canal was irrigated with copious amount of ultrasonically activated 1,25% NaOCl and 20 mL of 17% EDTA with saline between them. Ca(OH)<sub>2</sub> paste was placed in the root canal for 4 weeks and the tooth was temporalized with GIC (Fig. 7).

**At the third appointment** after tonogen free injection was given, ultrasonically activated 17% EDTA was used to remove Ca(OH)<sub>2</sub>. Bleeding was induced from the periapical tissues by a #35 H-file. Spongostan and 3 mm Biodentine was placed over the blood clot (Fig. 8A,B,C) [1]. As a long time temporary filling, a composite filling was made (Fig. 9).



**After one year** the tooth was asymptomatic and radiographic examination revealed signs of thickening of the walls in the apical third of the root, apical closure and complete healing of the periapical lesion (Fig. 10, 11).



## Discussion

In recent publications there has been case series in which the authors had also successfully applied RET in previously root canal treated teeth; although they used negative pressure to irrigation and SynOss Putty as a scaffold for the mineralization process [2]. However, our case presents a retreatment with perforated ECR, which makes communication between the canal and the pericervical tissues. Exclusion of bacteria is the key to success of RET procedures, so it is crucial to achieve a bacteria-tight seal around the perforation prior to regeneration.

## Conclusion & clinical relevance

Regenerative endodontic treatment could be an alternative solution for teeth with failed endodontic treatment even it is combined with perforated cervical resorption which makes the process more challenging due to root canal sealing difficulties.

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# A Rare Case Involving Development of Four Different Types of Root Resorptions Following Dental Traumatic Injury

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## Aim

To present different types of root resorptions in adjacent teeth following dental trauma

## Introduction

Root resorption is a common complication following dental trauma<sup>1</sup>. The type of resorption, timing and development of the damage of each tooth is unpredictable. Early identification is crucial<sup>2</sup> and may be challenging to clinicians.

## Case Presentation

A 19-year-old healthy man presented with dental trauma due to stock hit his upper jaw. Tooth #21, #22 suffered extrusive luxation. Tooth #23 suffered sub-luxation. A buccal splint was performed (Fig. 1). For the first 6 months follow up meetings clinical and radiograph evaluations (according to IADT guidelines<sup>3</sup>) were within normal limits. At the 6 months follow-up examination, teeth #21, #22, #23 responded negatively to sensibility tests and sensitivity to percussion and palpation was reveled. Pocket depth of 6 mm was evident at the mesial profile of tooth #21. A diagnostic periapical radiograph evaluation revealed irregularity of the internal and external outline of the roots in all three teeth (Fig 2a, 3a, 4a). CBCT was performed to diagnose the type of resorption. Tooth #21 - **External Cervical Resorption** (Fig. 2b), tooth #22 - **Internal Root Resorption** combined with **Inflammatory Apical Root Resorption** (Fig. 3b) and tooth #23 - **External Inflammatory Root Resorption** (Fig. 4b). Four weeks calcium hydroxide dressing follow chemo-mechanical preparation was made. The obturation was made using the combination technique with bioceramic sealer and gutta-percha (Fig. 5a, 5b)

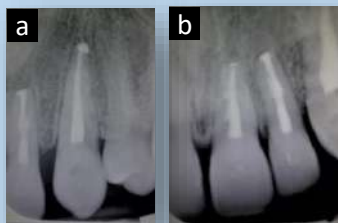


Fig. 5. Root canal treatment. (a) #23 (b) #21 and #22



Fig. 1. Buccal splint



Fig. 2. External cervical resorption #21. (a) Preoperative periapical radiography. (b) CBCT sections

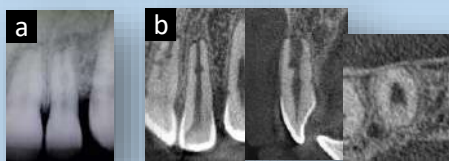


Fig. 3. Internal Root Resorption combined with Inflammatory Apical Root Resorption #22. (a) Preoperative periapical radiography. (b) CBCT sections



Fig. 4. External Inflammatory Root Resorption #23. (a) Preoperative periapical radiography. (b) CBCT sections

## Discussion

The present case introduces development of four different types of root resorptions following the same event of traumatic dental injury. Trauma is considered the most common cause for the initiation of root resorption<sup>1</sup> and the present case emphasize the unpredictability of the nature and verity of mechanisms of resorptions.

## Conclusion & Clinical Relevance

Dental trauma can induce different types of resorptions. Timing and type of resorption is unpredictable. Therefore, it is crucial to follow the IADT guidelines for the management of traumatic dental injuries<sup>3</sup>.

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# One accident - various dental injuries

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## Aim

To describe the endodontic and restorative treatment after dental trauma of four teeth in a 22-year-old patient.

## Introduction

Dental trauma affects upper incisors in most cases whereas an involvement of premolars and molars is rather unusual. A crown fracture with no pulp exposure is the most frequent tooth fracture, followed by crown-root fracture, fracture with pulp exposure and root fracture. Combination of crown and root fracture is the rarest incident amongst fractures. Concerning dislocation injuries concussion and subluxation are the most frequent dental traumas, followed by lateral luxation, avulsion, extrusion and at last intrusion.

## Case Presentation

A 22-year-old male patient suffered from a dental injury due to a bicycle accident. The emergency treatment was performed at the University Hospital in Basel. The patient had no general health problems, no allergies and was a non-smoker. The clinical and radiological examination revealed soft tissue injuries of the lower lip and chin, a palatal dislocation (tooth 14), an extrusion and a root fracture (tooth 13), a crown-root-fracture with pulp exposure (tooth 12) and a crown fracture (tooth 21). Reposition and splinting of the teeth 14 and 13 as well as the coverage of the exposed pulp of the tooth 12 with a calcium hydroxide liner were carried out the same day. (Fig. 1)

The patient was then referred to the University Center for Dental Medicine in Basel, where four days later the root canal treatment of the teeth 14 and 13 was initiated using calcium hydroxide as an intracanal medication. The removal of the liner on tooth 12 revealed a vital pulp, thus vital pulp therapy was carried out by a partial pulpotomy and coverage of the pulp with a hydraulic calcium silicate-based cement (Fig. 2).

The root canal filling of the teeth 14 and 13 by warm vertical obturation technique and the reconstruction of the teeth 12 and 21 using a composite resin material took place within the following month. The reconstruction of the tooth 12 required gingivectomy (Fig. 3, 4, 5). Removal of the trauma splint and polishing of the tooth sites took place 8 weeks after trauma due to an increased mobility of tooth 13 after initial splint removal 3 weeks after the trauma. The clinical and radiological follow-up 2 and 7 months after trauma was uneventful.

## Discussion

Permanent teeth with luxations and root fractures require reposition and splinting. In most cases the splint may be removed within 1-4 weeks but may last for up to 12 weeks in case of root fracture and increased tooth mobility.

Partial pulpotomy for vital pulp therapy is preferred in cases with treatment delay and large pulp exposures. A non-staining hydraulic silicate-based cement should be used as capping material.

A root canal treatment is recommended after a severe dislocation of teeth with fully formed apices to avoid root canal infection and infection-related root resorptions. Root canal treatment in teeth with root fractures are restricted to the coronal fragment, the apical fragment remains vital.

## Conclusion & Clinical Relevance

Minimally invasive therapy can preserve teeth even in complex trauma cases.

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Fig 1: Clinical and radiological findings and initial treatment



Fig 2: Initiation of root canal treatment (14, 13) and vital pulp therapy (12)



Fig 3: X-ray of vital pulp therapy (12) and root canal filling (14, 13)



Fig 4: Reconstruction of tooth 12



Fig 5: Reconstruction of tooth 12 and 21



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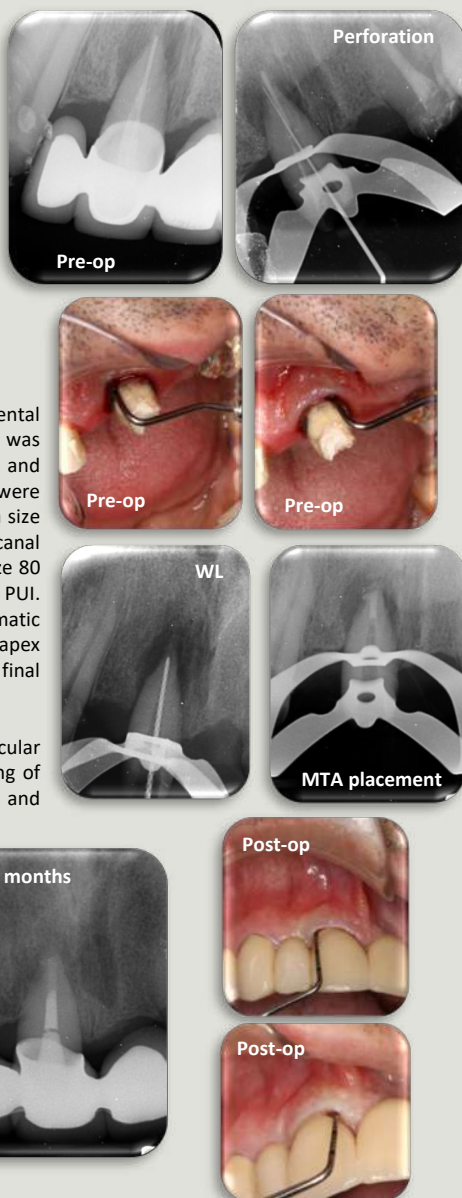
**Aim:** To address the management of a previously endodontically treated maxillary central incisor with iatrogenic lateral perforation in the apical root third and external apical inflammatory resorption.

**Introduction:** Perforation is a common iatrogenic complication that can occur during root canal preparation. External apical inflammatory resorption affects teeth diagnosed with apical periodontitis. Prognosis depends on the prevention or treatment of bacterial infection.

**Case Presentation:** A 57 years old male was referred to the Department of Endodontics, for the retreatment of tooth #11 after being laterally perforated during gutta-percha removal, 7 days before. The tooth was symptomatic to percussion and palpation and presented probing pocket depths up to 14mm and mobility grade 1. Radiographically, it demonstrated a periradicular radiolucency and external apical inflammatory resorption. A diagnosis of symptomatic apical periodontitis was made.

Root canal retreatment was carried out with the aid of a dental operating microscope. After access cavity preparation,  $\text{Ca(OH)}_2$  was identified inside the root canal. The medicament was removed and then, the remaining root filling material as well as the perforation were identified. The remaining gutta-percha was easily removed with a size 40 Hedstrom file and working length was established. Root canal cleaning and shaping was done by circumferential filing with a size 80 K-file and copious irrigation with 2,5% NaOCl, 17% EDTA and PUI.  $\text{Ca(OH)}_2$  was placed. In the second visit, the patient was asymptomatic and the MTA apical plug technique was selected to seal the open apex as well as the perforation. Finally, the patient was referred for the final coronal restoration.

After five months, the patient was asymptomatic and the periradicular radiolucency was significantly reduced. At ten months, the healing of the periapical lesion is even more profound radiographically and probing pocket depths are up to 5mm.



**Discussion:** The most important prognostic factors for the treatment of perforations are: time between occurrence and treatment, size and location of the perforation. In this case, location is probably of the greatest importance because close proximity to the gingival sulcus would have led to contamination by bacteria from the oral cavity. Moreover, effective control of the root canal infection is fundamental to the cessation of external apical inflammatory resorption.

**Conclusion & Clinical Relevance:** Using a dental operating microscope and modern endodontic techniques, such cases that would have previously required a surgical approach or extraction can be treated non-surgically with favorable outcomes.

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# Facial atrophy after root canal irrigation with chlorhexidine: a case report

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**Aim** To report permanent facial atrophy after the accidental extrusion of chlorhexidine (CHX) during root canal treatment (RCT).

## Case Presentation

*11/11/2021 (private clinic):*

A 55-year-old female patient suffered an irrigation accident during the first appointment of an RCT in the maxillary first right molar.

*01/2022:* Patient was referred to the postgraduate program in Endodontology.



*02/2022 (Dental School):*

Anamnesis revealed sudden pain and burning sensation in the right cheek during irrigation and intense swelling of the area in the following minutes.



Patient described gradual resolution of swelling in the following days, followed by a progressive loss of facial fat tissue starting 17/12/2021.

Referring dentist was contacted and reported the use of 0.2% CHX as single irrigant. A local corticosteroid injection was also administered when swelling started.



Limited field of view cone-beam computed tomography (CBCT) showed apical lesions in MB and palatal roots with absence of cortical plate in the apical third and revealed a deviation of the original trajectory in MB root canal.

TAC-TC images show fat tissue atrophy.



## Discussion

Complications following accidental extrusion of sodium hypochlorite (NaOCl) solutions has been thoroughly reported in the literature, being a permeable foramen in contact with mucosal tissue described as a risk factor. CHX has been suggested as an alternative antimicrobial irrigant with a scarce number of complications reported.

## Conclusion & Clinical Relevance

This case report shows persistent severe tissue damage after irrigation with CHX, instead of NaOCl. CBCTs might help predicting irrigation accidents.

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# Partial pulpotomy in caries-exposed permanent immature molars with symptoms of irreversible pulpitis. A case series

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**Aim:** The present clinical presentation will describe the partial pulpotomy of 4 permanent carious immature molars with symptoms of irreversible pulpitis by using MTA as a pulp capping material.

**Introduction:** Clinical management of permanent teeth with deep caries, incomplete root development and compromised pulpal integrity presents a unique challenge in everyday clinical practice. The preservation of pulp vitality is of the utmost importance for continued dentin formation and completion of root development. Therefore, every attempt should be made to preserve the vitality of immature teeth until maturation has occurred.

## Cases presentation:

Partial pulpotomy is a universally accepted treatment modality for pulp exposures in immature permanent teeth to preserve the vitality of the remaining pulp tissue and to ensure continued root development. The procedure includes the complete removal of the carious dentin (Figure 1C), followed by partial removal of the exposed pulp to a depth of one to three mm or even deeper in order to reach healthy pulp tissue. (Figures 1D, 1E) Complete pulpal hemostasis should be obtained (Figures 1F, 2C) before the pulp wound is covered with a pulpotomy agent, which in these cases is MTA. (Figures 1G, 2D) The major advantage of the approach is the maintenance of a sufficient amount of healthy coronal pulp, thus preserving the healing potential of the tissue in high level.

### Case 1



Figure 1A



Figure 1B (pre-op X-ray)



Figure 1C

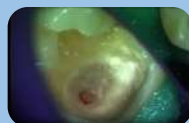


Figure 1D



Figure 1E

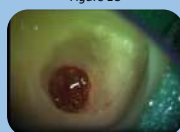


Figure 1F



Figure 1G



Figure 1H (post-op X-ray)



Figure 1I (6 months)

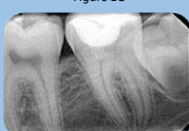


Figure 1J (14 months)



Figure 1K (20 months)



Figure 2A



Figure 2B (pre-op X-ray)

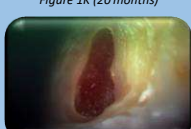


Figure 2C



Figure 2D

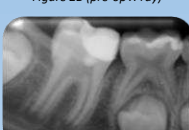


Figure 2E (post-op X-ray)

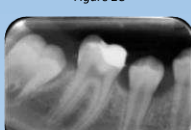


Figure 2F (3 months)



Figure 2G (48 months)

### Case 3



Figure 3A (pre-op X-ray)



Figure 3B (post-op X-ray)



Figure 3C (3 months)



Figure 3D (36 months)

### Case 4

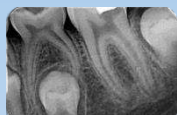


Figure 4A (pre-op X-ray)

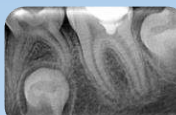


Figure 4B (post-op X-ray)



Figure 4C (3 months)



Figure 4D (12 months)



Figure 4E (18 months)

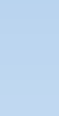


Figure 4F (36 months)

**Discussion:** In the present partial pulpotomy cases, the preservation of pulp vitality and the continuation of root development was feasible. (Figures 1K, 2G, 3D, 4F) An adequate permanent coronal restoration and a sufficient follow-up examination is required to document a favourable treatment outcome.

**Conclusion and Clinical Relevance:** Vital pulp therapies establish a biologically acceptable environment for the pulp tissue and prevent future bacterial contamination by using an appropriate pulp-capping agent and an adequate permanent restoration. Partial pulpotomy is a viable treatment option when managing exposed permanent teeth even in cases with signs and symptoms of irreversible pulpitis.

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# AUTOTRANSPLANTATION AND DELAYED REPLANTATION: A CASE REPORT



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## Aim

To describe the clinical management of an autotransplantation and delayed replantation on the upper incisors area.

## Introduction

Dental trauma on permanent teeth are mostly observed in pediatric patients between 8-12 years old, with avulsion having the lowest incidence, representing 0.5-16% of the total, mainly affecting the upper incisors.

Dental transplantation and replantation can be performed in young patients who have suffered dental trauma, offering high success rates (82-90%) and providing good results for the subsequent hard and soft tissues development in the injured area.

## Case Presentation

A 9-year-old male patient attended with a history of dental trauma, without pathological history. Clinical and radiographic examination revealed avulsion of teeth 12, 21 and 22 (Img. 1, 2). The patient had OD 22 with him, which was placed in 20% citric acid. It was decided to carry out the late replantation. Under local anesthesia, the clot in the alveolus corresponding to 22 tooth was removed with a curette. The tooth was re-placed in its alveolus, and when in position an X-ray was taken. Then fixed to a splint (Img. 3, 4).

In consultation with the orthodontist, it was decided to do the autotransplantation of teeth 34 and 44 to the corresponding alveolar areas of teeth 12 and 21. The extractions of teeth 34 and 44 were performed, they were placed in the alveoli of OD 12 and 21, positioning them according to patient's occlusion, an X-ray was taken and they were fixed to the splint (Img. 5, 6). Final radiographs were taken, the patient was prescribed analgesic and antibiotic therapy.

After 14 days, the splint was removed and endodontic treatment of tooth 22 was started. The canal was shaped with Protaper Next® and irrigated with 2.5% NaOCl. Calcium hydroxide was placed as intracanal medication and the access cavity sealed. 30 days after the initial appointment, the canal was filled, and the patient scheduled for follow-up appointment at 3, 6, and 12 months. (Img. 7, 8).

## Discussion

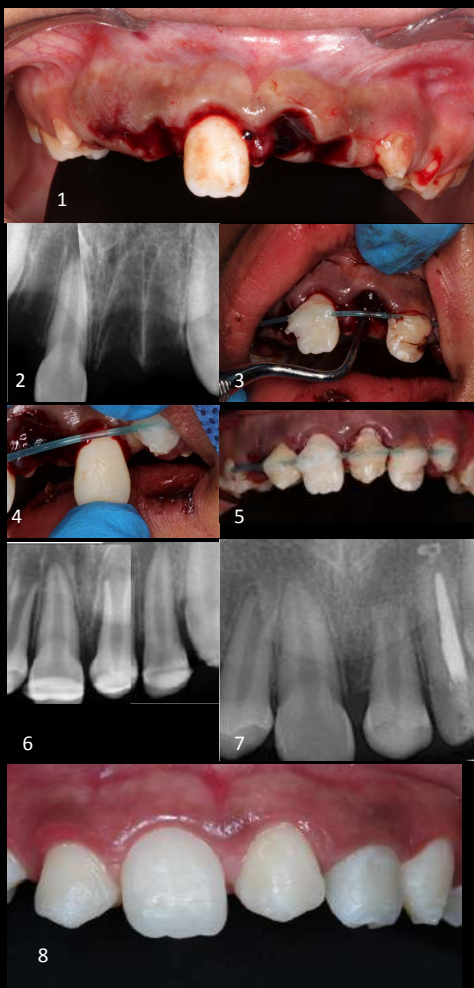
The ideal treatment for an avulsed permanent tooth is immediate replantation in its alveolus within the first 5 minutes. Several studies indicate that there is a period of time between 15 and 60 minutes after the avulsion in which the PDL cells die. The increased time the avulsed tooth spends out of the mouth, possible damage to the root surface, and damage to the cementum and PDL lead to pulpal necrosis and external root resorption. On the other hand, there are aqueous solutions that prolong the life of root cells for up to 6 hours, such as HBSS, Emdogain, low-fat milk and Pedialyte. Dental autotransplantation, on the other hand, is a viable measure as a treatment for lost young pieces, ideally transplanting teeth that present a root development of  $\frac{3}{4}$  of the total root length.

## Conclusion & Clinical Relevance

Given the incidence with which dental trauma occurs, it is our duty as oral health professionals to return functionality and aesthetics to the patient after trauma, especially after a dental avulsion. In this situation we have various treatment options. Including immediate and late replantation and autotransplantation. Likewise, it is extremely important to alert the community about the protocols to follow in the event of an incident of this type in order to achieve, together with the patient, the success of the treatment.

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# Virtual reality during root canal treatment: improving patients' Quality of Life

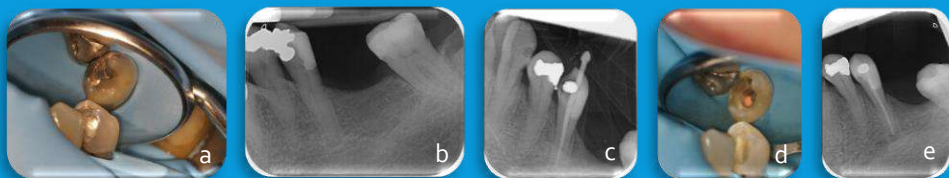
Kelly Mooens, Seppe Bleyen, Nastaran Meschi, Simon Pedano, Paul Lambrechts

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**Aim:** To investigate the influence of the use of virtual reality (VR) on the well-being of patients during root canal treatment.

**Introduction:** VR is on the fast track to widespread use in medicine, though the use of it during a root canal treatment is yet to be investigated.

**Case presentation:** A root canal treatment<sup>d,e</sup> of a mandibular left second premolar<sup>a</sup> was performed while using immersive, computer-generated technology by means of a VR device<sup>f,g,h</sup> (SyncVR\*). A preoperative<sup>b</sup> control<sup>c</sup> and postoperative<sup>e</sup> periapical radiograph were obtained during the treatment session. The amount of pain and fear was measured by a Visual Analogue Scale<sup>3</sup> (graph 1). Heart rate data were obtained by pulse oximetry (graph 2). Patients' perception of time was 45% less than the actual duration of our treatment visit.

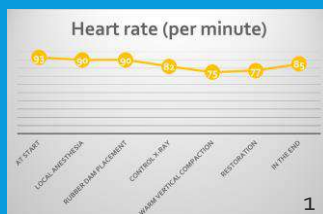


**Discussion:** Several studies have emphasized the significant effect of VR on reduction of pain and fear/anxiety amongst patients receiving a medical and dental treatment<sup>1</sup>. Also the impact of the VR device on dental ergonomics during microscopic endodontics is a point of interest. However further research is necessary to measure the effect of VR during endodontic treatments<sup>2</sup>.



## Conclusion & Clinical relevance:

VR might enhance the patients' Quality of Life during root canal treatment.



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**Aim:** To discuss the treatment methods for teeth with various presentations of internal resorptive defects.

## Introduction:

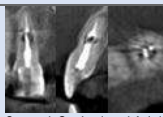

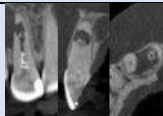



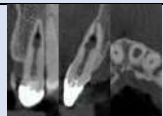



Internal resorption results from chronic inflammation due to trauma or more rarely caries (Ne, Witherspoon et al. 1999). Resorption can result in unusually shaped root canals and if left can result in perforation. This can make endodontic treatment complicated.

## Methodology:

5 cases of internal root resorption treated at Cardiff University Dental Hospital between 2020 and 2021 are illustrated. Treatment techniques varied.

## Discussion:

- CBCT is a useful tool to assess resorptive defects. CBCT is justified in these cases as it helps the clinician to determine the best treatment option (Patel, Brown et al. 2019).
- A CBCT can determine the presence of perforation better than an IOPA alone (Shokri, Eskandarloo et al. 2015).
- In cases where perforation into the periodontium was detected, a biosilicate cement was used (Cervino, Laino et al. 2020).
- However, when perforation was not present, the apical root canal system was filled using warm vertical condensation (Schilder 1967).
- MTA density in resorptive area can be improved by ultrasonic vibration. Alternatively, injectable biosilicate root repair materials can be used (e.g. Totalfill).
- When perforation was so extensive that instrumentation and obturation beyond the defect was impossible, periapical surgery was performed to remove the inaccessible portion of the root.

Pre-operative Images	Post-operative Images	Diagnosis & Treatment
 Coronal, Sagittal and Axial CBCT images of UR1	 IOPA UR1	<b>Diagnosis:</b> UR1, previously treated, symptomatic apical periodontitis. Resorptive defect mid-root with no signs of perforation <b>Treatment:</b> Gutta Percha (GP) removed, canal shaped and cleaned. Apical root system filled using warm vertical condensation (Schilder's technique) (Schilder 1967). Resorptive defect filled with injectable thermoplasticized Gutta Percha (ITGP) to complete root filling.
 Coronal, Sagittal & Axial CBCT images of UR1	 IOPA UR1	<b>Diagnosis:</b> UR1, Previously initiated therapy, Chronic Apical Abscess. Resorptive defect apical root, large buccal perforation. <b>Treatment:</b> Canal shaped and cleaned. Mineral Trioxide Aggregate (MTA) plug placed, root filling completed with ITGP. Double sealed coronal restoration placed. Orthograde Treatment followed by apical surgery to remove unfilled resorbed root-end.
 Coronal, Sagittal & Axial CBCT images of UL1	 IOPA UL1	<b>Diagnosis:</b> UL1, Necrotic Pulp, Symptomatic Apical Periodontitis. Resorptive defect apical third of the root, Perforation on buccal side of defect. <b>Treatment:</b> Shaping and cleaning of canal followed by MTA plug. Root filling completed with ITGP, cotton pledget placed tooth sealed with Resin Modified Glass Ionomer Cement (RMGIC), awaiting final restoration. <b>Critique:</b> Lack of dense MTA, MTA failed to reach the root end.
 Coronal, Sagittal & Axial CBCT images of UL1	 IOPA UL1	<b>Diagnosis:</b> UL1, Necrotic Pulp, Symptomatic Apical Periodontitis. Resorptive defect Mid-Apical third of the root with no signs of perforation <b>Treatment:</b> GP removed and canals shaped and cleaned. Apical Root system filled using warm vertical condensation, resorption defect filled with ITGP to complete the root filling. Double sealed coronal restoration placed.
 Coronal, Sagittal & Axial CBCT images of LR6 taken intra-operatively	 IOPA UL1	<b>Diagnosis:</b> LR6, Irreversible pulpitis Symptomatic Apical Periodontitis. Resorptive defect mid third of Mesio-Buccal canal, No signs of perforation <b>Treatment:</b> Canals shaped and cleaned. Apical root system filled using warm vertical condensation, resorptive defect filled with ITGP to complete obturation. Lithium disilicate (e.max) onlay placed with deep margin elevation distally.

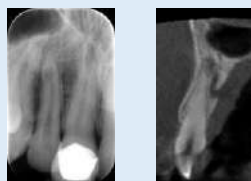
## Conclusion & Clinical Relevance:

- If an internal resorption defect is suspected, consider use of CBCT
- When there is perforation of the root canal, a biocompatible and bioactive root canal filling material should be used.
- If there is no perforation, use of the Schilder's technique followed by backfill with ITGP may help produce predictable results.
- Consider periradicular surgery for large perforation defects

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Initial IOPA suggested a resorptive defect UR2. However CBCT revealed that the radiolucency was not a resorptive defect but a palatal neurovascular channel.



CBCT HELPS ACCURATE DIAGNOSIS

1 - DDS Dedicated to Endodontics on Private Clinic – Braga; 2 - Student of the Doctoral Programme in Biomedical Sciences IUCS-CESPU; 3 - DDS, PhD Specialist on paediatric dentistry on Private Clinic - Braga

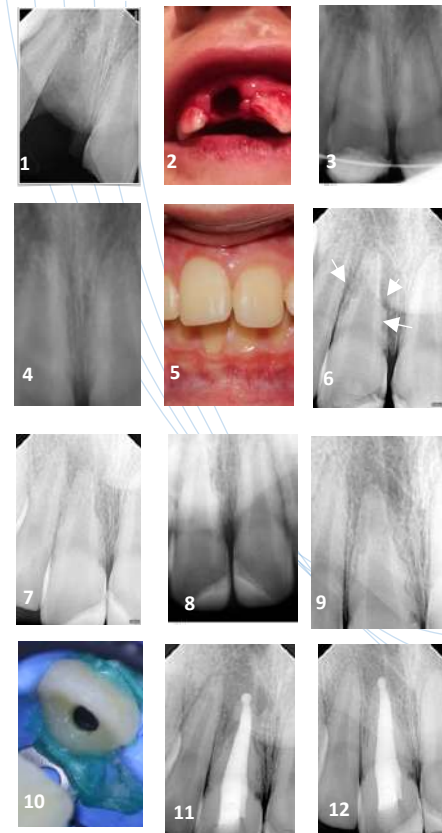
## AIM

An avulsion injury of permanent teeth is a serious trauma to pulp and periodontal tissues with possible long term aesthetics and functional complications. Immediate clinical management affect treatment outcome and survival rate.

## INTRODUCTION

Traumatic dental lesions represent 5% of all trauma injuries in young adults and children. Avulsion of permanent teeth is one of the most serious, (0,5-16% prevalence) An emergency protocol is mandatory in long term prognosis<sup>1</sup> It is most common in children between 7 and 9 years of age and the upper central incisors are the most affected teeth.<sup>2</sup> The International Association of Dental Traumatology (IADT) has developed guidelines as a consensus statement to provide clinicians with the most widely accepted and scientifically plausible approaches. Immediate replantation of the avulsed tooth is the best emergency treatment. Clinical approach depends on the root maturity (open or closed apex) and the condition of the periodontal ligament (PDL) cells.

## CASE PRESENTATION



A ten-year-old male patient with no relevant medical history attended a private clinic, one day after having suffered a dental trauma (**Figs.1&2**). His mother reported that tooth 11 was replanted (saline as storage medium), about 50 minutes after the trauma, with subsequent splinting of the avulsed tooth with metallic wire and composite on the emergency appointment. (**Fig.3**). Clinical examination revealed gingival inflammation, as well as pain on vertical and horizontal percussion. Sensitivity tests were negative on teeth 12, 11 and 21. Radiographic examination revealed, uncomplicated fractures and incomplete root formation of teeth 11 and 21 (**Fig.4**). The patient was medicated with amoxicillin 875 mg + clavulanic acid 125 mg and ibuprofen 400 mg and had been instructed to avoid physical contact sports, follow a soft diet and topical application of 0.12% chlorhexidine digluconate twice daily for 15 days. An endodontic evaluation consultation was requested and it was decided not to intervene endodontically on teeth 11 and 21 based on the immature state of root formation. After one month, the patient was clinically and radiographically stable. At three months, teeth 11 and 21 were aesthetically rehabilitated with composite resin (**Fig.5**). Tooth 21 responded positively to sensitivity tests. Tooth 11 remained negative to cold testing while electric testing show positive response. No color change and no increased mobility, although radiographically it showed signs of external root resorption (**Fig.6**). It was decided to maintain the six-monthly clinical and radiographic control, in which there were no complications. At 12 months (**Fig.7**) the signs of external root resorption (tooth 11) were stable without associated symptoms and with a positive response to sensitivity tests. Clinical and radiographic control was maintained every six months until 24 months after tooth avulsion. The patient was always asymptomatic, response to sensitivity tests was positive and radicular resorption maintained stable. (**Fig.8**) At 27 months, patient complains of swelling on buccal of tooth 11, and sensitive tests stop responding to cold and electric stimulus. Radiographic analysis reveal a apical lesion without any aggravation on radicular resorptions: (**Fig.9**). Patient did not refer any secondary trauma or incident that lead to this new situation. It was decided to intervene endodontically and perform root disinfection and sealing under microscope (**Fig.10**). Due to the incomplete formation of the apex, a apical barrier with mineral trioxide aggregate (MTA) was the chosen obturation technique. (**Fig.11**) The treatment was performed in one single visit and the 12 months control (39 months after trauma), show a complete remission of apical lesion without any symptoms: (**Fig.12**)

## DISCUSSION

Avulsion of permanent teeth is one of the most serious trauma injuries and the prognosis depends on the measures taken immediately<sup>3-5</sup>. The decision of subsequent treatment is related to the degree of root formation and the condition of the periodontal ligament cells. These cells, dependent on the storage medium and the time the tooth has been outside the oral cavity. After 60 minutes, all periodontal ligament cells will be nonviable<sup>3,4,5</sup>. The ideal transport medium should have a low bacterial content, neutral pH, physiological osmolality and contain nutrients. First choice transport and storage medium of are the so-called physiological mediums such as Viaspan or Hank's Solution. Regarding non-physiological mediums, milk or saliva could be appropriate, being easily available at the accident site. Relating to the degree of root formation, permanent teeth with incomplete root formation show considerable repair capacity. The objective of reimplantation of immature teeth is to allow a possible revascularization of the pulp space. In teeth where pulp revascularization seems possible, endodontic treatment should be postponed until there is clinical or radiological evidence of pulp necrosis<sup>3,4,5</sup>. At the time of the accident, sensitivity tests often generate no response, indicating a transient absence of pulpal response. Regular postoperative consultations are mandatory to diagnose the pulp condition.<sup>3,4</sup> Root resorption is a common complication after tooth replantation (prevalence 8-50%).<sup>3,4</sup>

## CONCLUSION & CLINICAL RELEVANCE

The avulsion of permanent teeth in children is a serious public health problem due to his possible negative impact (aesthetic, functional and psychological). Appropriate treatment measures and compliance with postoperative care are key factors in prognosis. Although treatment of traumatic injuries often requires secondary interventions involving multidisciplinary teams, it is essential that the dentist is trained for diagnosis and prompt intervention, which are crucial conditions for success.

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Magnetic resonance imaging could be used to detect supernumerary roots, the shape of its pulp, and root canals: A case report

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## Aim

This case report aims to present a rare morphological variation of radix paramolaris (RP) diagnosed using Magnetic Resonance Imaging (MRI), to discuss its morphological associations and possible implications on dental treatment.

## Introduction

Radix paramolaris is a buccally located supernumerary root of permanent mandibular molars. It is very rare in European populations, with a prevalence below 4%.

## Case Presentation

A 7-year-old boy with severe orthodontic malocclusion is presented. Before the second phase of treatment with premolar extractions and fixed appliance, unilateral radix paramolaris on the second right permanent mandibular molar was discovered. During follow-ups, MRI scans were repeated several times during orthodontic space closure.

Supernumerary root was diagnosed using a 3T whole-body MRI system. This case confirmed the association between the supernumerary roots with an increased number of buccal crown cusps in a mandibular molar. Furthermore, it demonstrated the effectiveness of noninvasive MRI as a complementary diagnostic tool, offering clear advantages in diagnosing rare morphological variations such as supernumerary roots.

## Discussion

Unlike conventional radiography, MRI can distinguish the soft tissues including the dental pulp, and does not emit ionizing radiation. MRI showed changes in the dental pulp of teeth undergoing orthodontic tooth movement. MRI images exhibited a changed effect pattern on dental pulp, likely due to the increased posterior anchorage. Orthodontic space closure speed was notably lower on the side with molar with RP, compared to the contralateral.

## Conclusion & Clinical Relevance

To diagnose a supernumerary root and the state of its pulpal tissue, a precise radiographic and clinical examination is required since awareness of the exact root morphology can be of paramount importance in clinical decision-making for several dental procedures.

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# Clinical management of external root resorption on mandibular canine : 5 years follow-up

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## I. Aim

This case report presents the management of external root resorption on the mandibular canine using root canal treatment and repair with MTA, and demonstrates the outcome for 5 years.

## II. INTRODUCTION

- External root resorption is the loss of dental hard tissues due to clastic activities within the pulp or periodontal tissue.
- Three goals have to be achieved to arrest resorptive lesion (1)disinfection of the defect to eliminate the original bacterial stimulus, (2) complete seal of the defect to avoid bacterial repopulation, and (3) epithelial attachment to the filling material to avoid contact between the cervical periodontal ligament and bacteria from the gingival sulcus.

## III. Case Presentation

### 1. Patient Information

Sex/age	F/63
Chief Complaint	I have pain when I press on #33 gingiva
PMH/PDH	Osteoporosis/ N-S
Present Illness	#33 external root resorption, sinus tract formation

### 2. Clinical Examinations

#33	
EPT	(-)
Cold	(-)
Mobility	(-)
Percussion	(+)
Palpation	(+)



Fig 1. preoperative intraoral photo. Sinus tract can be seen.

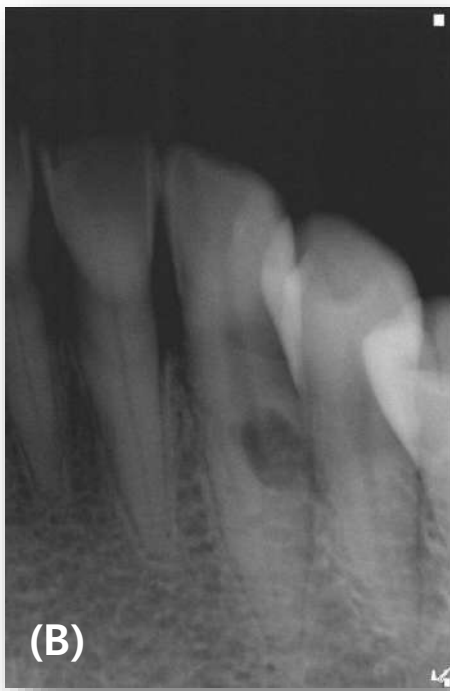


Fig 2. Preoperative periapical radiography taken with different angle(A),(B) for detecting internal or external resorption

### 3. Impression

External root resorption and pulp necrosis on #33

### 4. Treatment plan

Root canal treatment and repair with MTA on #33

### 5. Treatment Procedure

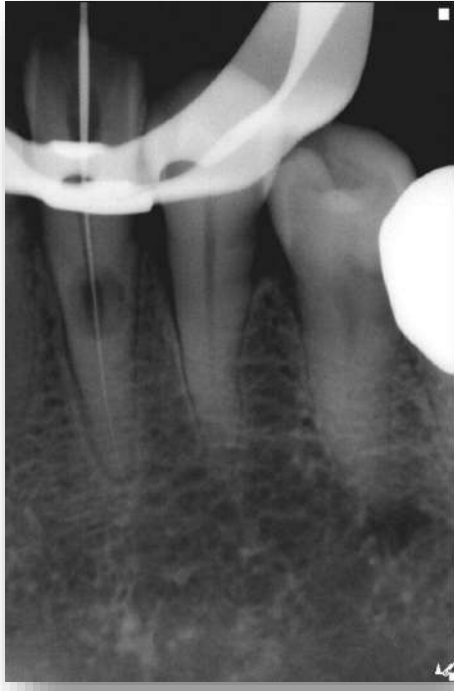


Fig 3. . Under local anesthesia with 1:100,000 epinephrine lidocaine 1 ample, access cavity was preped and took periapical radiograph with Initial apical file. After pulp extirpation using NiTi file(ProTaper NEXT X1, X2, Dentsply©) and NaOCl, inserting gutta-percha cone temporarily for restoration on external resorptin cavity.

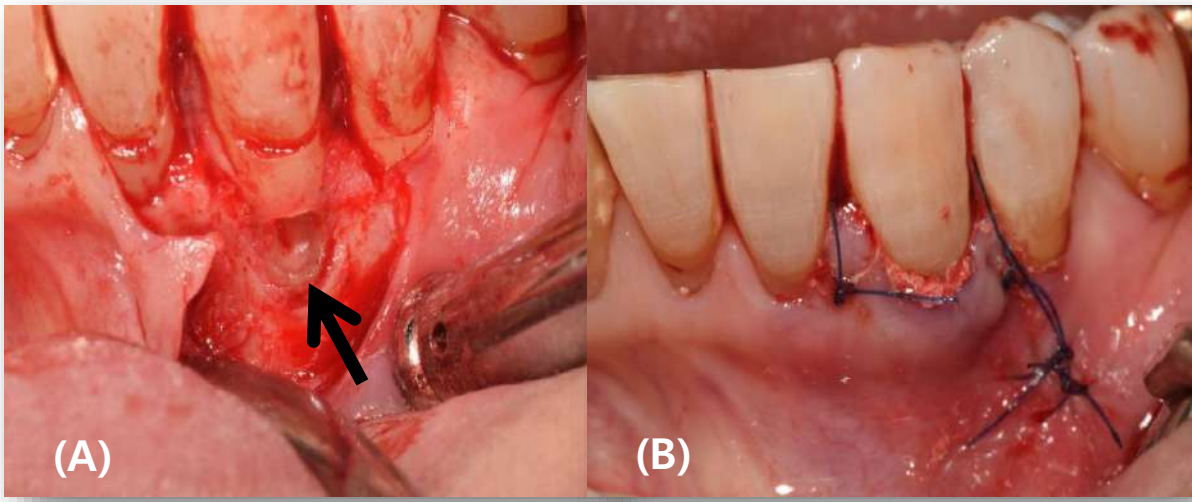


Fig 4. Flap elavation. Black arrow indicates the lesion.(A) MTA was filled on the resorptive lesion. Suture(B)



Fig 5. Postoperative periapical radiograph after canal filling with continous wave technique(AH plus, Dentsply sirona© (A), peiriapical radiograph with 6 month follow up (B), 5 years follow up(c)

## IV. Discussion

### 1. Etiology of external root resorption and CBCT for more accurate diagnostic approach

- External root resorption occurs when the periodontal ligament or cementum on the root surface are either damaged or removed.
- In the CBCT view, the lesion was not directly connected with canal but pulp was on necrosis state. Therefore, we cannot exactly know the cause of the lesion whether pulpal infection or periodontal ligament infection.
- This case could be concluded that the resorption was resulted from pulpal infection or periodontal ligament infection which was caused by unknown injury to protective tissue.
- The lesion on the root surface was stimulated by osteoclast activity which was taken place with the response of inflammation.

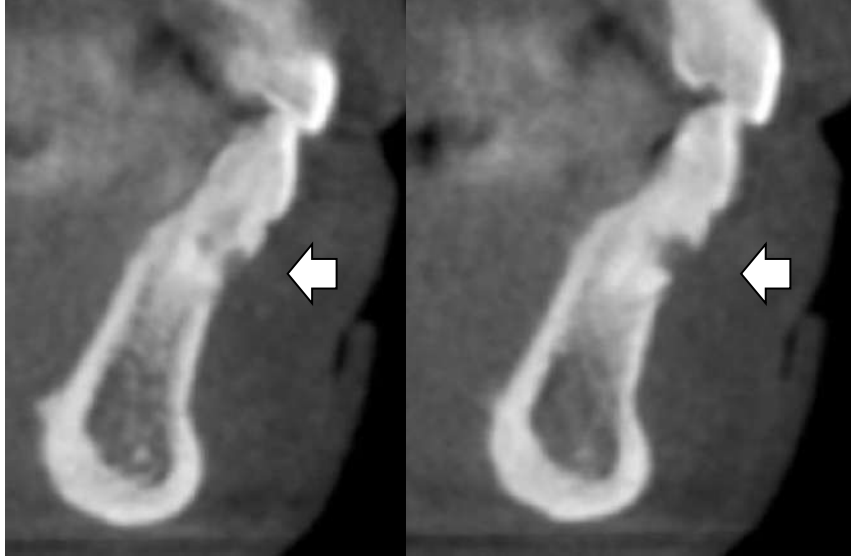


Fig 6. Sagittal section view of CBCT image: external resorption area in buccal mid-third root of tooth #33 (pointed by white arrow). CBCT provided more details to facilitate the diagnosis, and to educate the patient and manage the defect.

### 2. MTA for resorption repair materials

- For repairing the root resorption, various materials including Super EBA, IRM, and glass ionomer cements have been used. Among these materials, MTA was superior with compressive strength, and has lesser cytotoxicity.
- Although, MTA has a drawback such as tooth discoloration, long setting time, MTA was suitable material in this case, because the lesion was located on mid third of root which might not cause esthetic problem.

### 3. Treatment outcome

- At the 5 years follow-up, the radiographic image showed no pathological changes and good adaptation of the MTA to root surface. The patient have no symptom.
- In the IRINAKIS et al., the failure rate was a 50.0% for 8 years. The determinants of failure rate was associated with tooth location, and the presence of RCT. In this case, the factors that external root resorption occurred on the anterior area and the management of resorption site using MTA repair with RCT cause favorable outcomes.

## V. Conclusion

- This case presents an external root resorption of tooth #33, which is treated by conventional root canal therapy and repaired with a ProRoot MTA(Dentsply Tulsa) on resorption lesion. This case maintains favorable outcome as being located in the anterior area and repaired by MTA with RCT.
- For evaluating the location and severity of absorption lesion, CBCT could be very useful.
- MTA can be superior material for its excellent property such as biocompatibility, good sealing ability, and the ability to inhibit bacteria. Also, it has a capacity to promote hard tissue formation and to inhibit osteoclastic bone resorption.

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# Retrieval of separated instruments: a minimal invasive approach

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## Aim

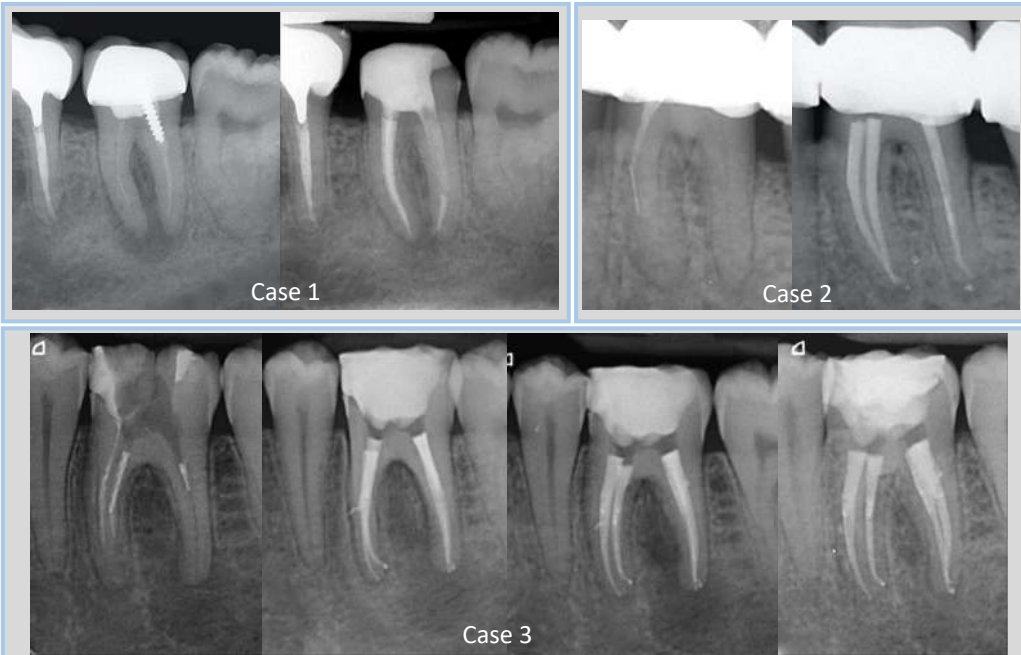
To present the possibilities of conserving dentine and removing minimum amount of healthy tissue within the management of separated instruments.

## Introduction

Regardless of the complications and the difficult clinical situations provided by root canal retreatments, one of the major concerns alongside with outreaching the case challenge is respecting the anatomy by wisely conserving the healthy dental tissue. Retrieving separated instruments increases the risk of intra-operative iatrogenic errors, alters the endodontic morphology, weakens the root and threatens the outcome. Many times the post-operative radiograph highlights the approach drawback.

## Case Presentation

The cases were referred to the office for endodontic retreatment.



## Methodology

All cases were approached using the same protocol: no platform was created to expose the separated instrument inside the root canal, moreover no gates glidden burs were used. ISO 10 Micro Opener and ISO 15 U-file were carefully manipulated along with EDTA to expose the fractured files. After exposing the tip of the separated instrument, an ultrasonic-driven internal curvature bypassing was performed using the ISO 15 U-file. In some cases there was no need for gaining complete bypass hence EDTA and ultrasonic motion have sent the files out before.



## Discussion

The creation of a platform to expose the separated instrument alters the anatomy. Bypassing is known to be the most conservative management but in most cases it also allows the clinician to retrieve the fragment with a modest effort only by using ultrasonic k-files. Testing different mirror positions can avoid excessive preflaring, moreover a stainless steel U-file can take any form so that it operates effectively preserving unwanted tissue damage. Endodontic ultrasonic module is mandatory and constant intensity adjustment is advised considering each particular clinical situation.

## Conclusion & Clinical Relevance

If the extraction maneuvers do not interfere with the final shaping and no unnecessary tissue removal is performed, the canal orifice dimension and the root canal space design should be presented as if nothing was removed from inside. Although easily described, the proposed method needs no expensive tools but patience and skills that lead to appreciable results.

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# Clinical Application of Vitality Tests in Decision Making of Endodontic Treatment - a Case Report

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**Aim:** To clinically applicate the advances of research regarding laser-Doppler fluxmetry (LDF) and pulse oximetry (PO) as dental pulp vitality tests in decision making of endodontic treatment (Figure 1).

**Introduction:** The gold standard for clinical diagnosis of dental pulp status are various sensitivity tests as they assess the presence or absence of pulpal nociceptive response to externally applied stimuli. It has been demonstrated that sensitivity tests are frequently unreliable and subjective and that the true indicator of tooth vitality is the presence of pulpal blood supply. In this presentation, LDF and PO were used as additional tests to directly determine pulpal vitality in order to select the correct treatment modality for the clinical case presented.

**Case Presentation:** A 16-year-old patient came asymptomatic and with the mandibular radiolucency around the apex of the lower left first premolar extending from the lower left canine to the lower left second premolar. The lower left first premolar was treated endodontically in the past (Figure 2). The sensitivity of the lower left second premolar was assessed with thermal-cold and electric tests, but the results varied from session to session: in the first session, it was recorded negative, in the following two sessions, after one and two weeks, it was recorded positive. The tooth had no excessive mobility and the probing depths varied from 1 to 3 mm. There was no sensitivity to percussion or palpation. In addition, we decided to use vitality tests LDF and PO to accurately determine the vitality of the lower left second premolar. Recorded LDF for its pulp was 8.8 perfusion units (PU), and PO showed 85% saturation of O<sub>2</sub> (SpO<sub>2</sub>), which both represent normal tooth vitality. Because of these results, we decided to postpone the endodontic treatment for the lower left second premolar.

The lower left first premolar was endodontically retreated. Later there was an apical surgery with retrograde filling performed and the cyst surgically removed. During the surgery, no epithelium or granulations were found and the diagnosis was a solitary bone cyst. Follow-up after surgery was performed after 6 months, and after two, and three years (Figure 3). The panoramic radiograph showed bone healing at the site of the lesion, no pathology on the lower left second premolar, and normal sensitivity with the cold and electric test was measured.

**Discussion:** PO and LDF are newer, non-invasive, and objective methods that measure pulpal blood perfusion and provide information about its vitality. However, the possible differences between tooth perfusion, sensitivity, and tooth vitality need further clarification.

**Conclusion & Clinical Relevance:** Testing of tooth vitality with pulse oximetry and laser-Doppler fluxmetry might provide useful information to consider when making treatment decisions in addition to standard clinical diagnostic protocols.

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Figure 1. Laser-Doppler fluxmetry (a) and pulse oximetry (b).

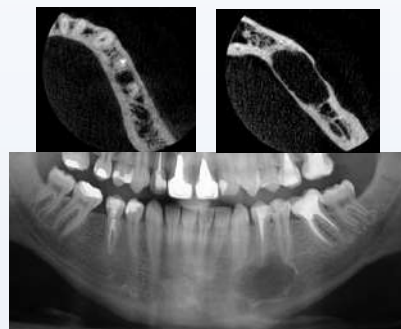


Figure 2. Before the therapy.



Figure 3. Three years after the therapy.

Dimitrios G. Giannakoulas<sup>1</sup>, Spyros Gasparatos<sup>2</sup>, Maria Georgopoulou<sup>3</sup>

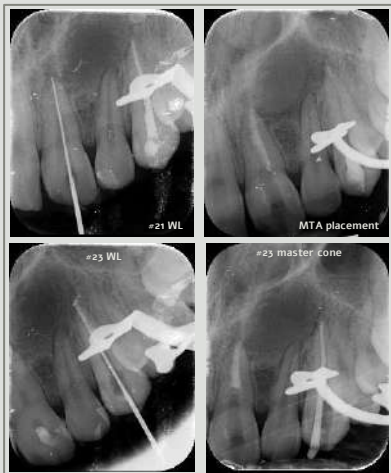
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**Aim:** To present the management of a case with an immature necrotic incisor and a discoloured canine.

**Introduction:** Necrotic teeth with an open apex pose several challenges for the clinician. Thin dentinal walls do not permit proper cleaning and shaping, whereas the obturation is also challenging. Tooth discolouration of endodontically treated teeth pose another challenge, especially when anterior teeth of young patients are concerned.

**Case Presentation:** A 19-year-old female patient presented at the postgraduate clinic with pain located on tooth #21. She recalled that 4 months ago she had similar symptoms and her dentist endodontically treated tooth #23 and prescribed antibiotics. She also stated that she had traumatised her front teeth approximately seven years ago. A big radiolucent lesion was evident in the periapical radiograph extending from tooth #21 to #23. Moreover, the apex of #21 was not completely formed. Sensitivity tests were negative for #21 and positive for #22, while tooth #21 was tender to percussion. Diagnosis was symptomatic apical periodontitis for #21. Tooth #23 had an evident discoloration as a result of the previous endodontic treatment. Endodontic treatment was decided for tooth #21 and the MTA apical plug technique was applied for the management



of the open apex. Endodontic retreatment was also performed for #23. Both teeth were treated in two visits with intermediate placement of  $\text{Ca(OH)}_2$ . All endodontic procedures were performed using dental operating microscope. Tooth #23 was then internally bleached with 10% carbamide peroxide. After the internal bleaching, external home bleaching of all teeth was applied for 4 weeks, using 10% carbamide peroxide. Finally, the two central incisors were restored with direct composite veneers.

After treatment, clinical symptoms subsided and at the 12-month recall radiographic healing is evident.

← Post-op 12month recall →



**Discussion:** Misdiagnosis can sometimes lead to unnecessary procedures that can be harmful for the patient. Every clinician has to follow a strict diagnostic protocol consisting of medical and dental history, clinical examination including all necessary procedures, such as sensitivity tests, and radiographs. In this case, apart from not treating the right tooth an aesthetic problem was also created.

## Conclusion & Clinical Relevance:

- A strict diagnostic protocol leads to the right treatment planning.
- A multidisciplinary approach of cases in clinical practice is of great importance to overcome several challenges.



Pre-op

Post-op

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# MANAGEMENT OF A THREE CANAL UPPER PREMOLAR WITH A O.R.E TECHNIQUE

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## AIM

The aim of the present poster is to present and clinically evaluate a new operative technique for Nickel Titanium Rotary instruments.

## INTRODUCTION

The introduction of NiTi Rotary instruments completely revolutionized the root canal treatment (RCT), increasing cleaning effectiveness and predictability. However, in most of cases general practitioners and endodontist specialist still prefer establishing a manual glide path or, at least, check apical patency using manual stainless steel (SS) files. If this behavior was justified at the beginning of the NiTi Era, nowadays the improvement in design, cutting efficiency and manufacturing (Heat treatment with softer alloys) could eliminate the needs for SS Files even in challenging cases. This poster aims at presenting a not common anatomy performed using only rotary NiTi instruments, with different files system and different motion for different situation.

## CASE DESCRIPTION

A female 45 years old woman was referred for the RCT of an upper right premolar (1.4), for a disruptive decay. After Anesthesia with articaine 1:100.000, rubber dam was placed, decay mechanical removed, pulp chamber opened and RCT performed in a single appointment as follow:

- 1) Mechanical scouting using OneReci (Micro-Mega SA, Besancon, France) 25.06 in CCW continuous motion at 300 rpm and 2.0 Ncm
- 2) Coronal Preflaring of the coronal third was performed using OneReci 25.06 in reciprocating motion (CW 60° - CCW 170°)
- 3) Glide path establishment was performed using Coltene EDM Glide path file 15.03 (Coltene/Whaledent, Altstätten, Switzerland) at 300 rpm and 1.5 Ncm, the apical split of the buccal canal was performed manually with the same instrument
- 4) Palatal canal and Disto-buccal were shaped using OneReci 25.06 in reciprocating motion, Mesio-buccal canal was shaped using Coltene Hyflex EDM 10.05 and 20.05 at 300 rpm with 2.0 Ncm
- 5) The final irrigation was performed, two minutes for each canal, with Sodium Hypochlorite 5% with ultrasonic activation using EndoUltra
- 6) The case was filled using Guttaflow Bioseal and Therafill in the two main canal



## DISCUSSION

The showed case and the proposed technique allowed instruments to reach working length with no deformation or fracture. The use of NiTi Rotary files according to their peculiar properties allows to enhance their performances avoiding the disadvantages of SS.

## CLINICAL RELEVANCE

The proposed technique seems incredibly promising with the clinical advantage to exploit the peculiar properties of each different instruments, highlighting the boundless possibilities of the NiTi Rotary files in their different NiTi alloy phases.

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## Aim

Describe the clinical management of an incisor with horizontal root fracture and incomplete root development, with conservative treatment.

## Introduction

The teeth that suffer trauma more frequently are the maxillary central incisors (1). Root fracture can be consequence of these and represents an average between 0.5% and 7%, of all dental traumas occurring in individuals aged 11 to 20 years. Horizontal root fractures are usually caused by direct physical impact on the tooth, sport activities, traffic accidents and falls (2).

## Case Presentation

Male patient, 7 years old, who fell 4 days earlier. Presented slight bleeding at the gingival margin in tooth 21, extrusion and displacement to palatal direction, with mobility and discomfort on palpation (Fig. 1). Radiographically, it presented an intact dental crown and root with thin dentin walls. Incomplete root development, grade III (Cvek). A horizontal/transverse root fracture line was observed in root middle third, with no pathological changes in the periapical area. Test with cold responded positive in both upper incisors. Normal pulp and healthy periapical tissues and root fracture were diagnosed with a reserved prognosis (Fig. 2).



Under local anesthesia, the coronal fragment was gently reduced (Fig. 3). A splint was placed (Fig. 4), verifying adequate occlusion.

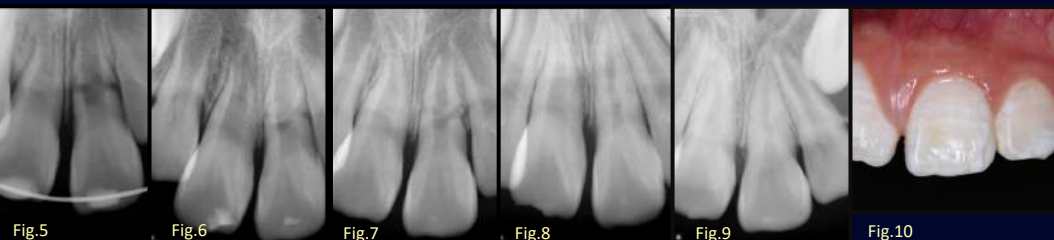
**1st Control** after fifteen days was asymptomatic. Both incisors responded positive to cold sensitivity test (Fig. 5).

**2nd control** at 2 months, asymptomatic and positive response to cold. The splint fell off at 5 weeks. Radiographically, there was apparent formation of mineralized tissue between the root and coronal fragments (Fig. 6).

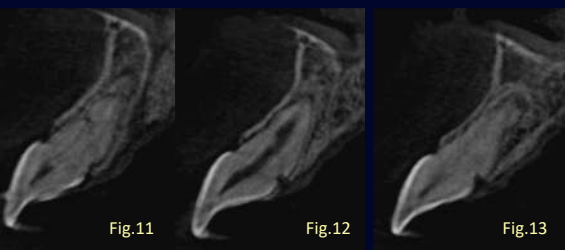
**3rd Control** 6 months, asymptomatic, positive response to cold. The union of both segments and Cvek grade IV root development are observed (Fig. 7).

**4th Control** at 14 months, asymptomatic, positive response to cold. Cvek grade V root development without pathological periapical changes (PAI I) (Fig. 8).

**5th. Control** at 25 months, asymptomatic and positive to cold both incisors; observed in the correct position, without gum inflammation, or changes in the crowns color (Fig. 10). Radiographically, union of the root and coronal fragments is observed with hard tissue-type repair, pulp space slightly smaller than right central incisor and normal periapical area (Fig. 9).



25 months CBCT, in the sagittal cuts we can see the union of both fragments. The pulp space can be seen with continuity from apical to coronal. The fracture line can be seen on the palatal side of the middle-cervical third. No other pathology is observed in the periapical tissues. (Figs. 11, 12 and 13).



## Discussion

It is difficult to determine the pulpal status immediately after trauma. If the pulpal vitality of the coronal fragment is maintained, root canal treatment is not necessary (4,5). Teeth with horizontal root fracture are more likely to preserve the pulp than those with luxation without root fracture.

In root fractures, the percentage of healing with adequate management can be between 78% and 80% (1,2). With reduction and splinting we can improve the prognosis of an horizontal root fracture (3,5).

## Conclusion & Clinical Relevance

It is possible to get favourable results with the reduction and immobilization of the coronal fragment and monitoring pulp vitality, without performing root canal treatment in cases of horizontal root fracture.

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# Dens invaginatus in patient with Axenfeld-Rieger Syndrome: a case report



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## Aim:

To present appropriate management of dens invaginatus with apical periodontitis in patient with Axenfeld-Rieger Syndrome (ARS).

## Introduction:

Dens invaginatus (dens in dente) is a developmental abnormality observed as infolding of the enamel epithelium into the dental papilla before the calcification of the dental tissues. The malformation presents different types and clinical complexity which may result in difficulties in diagnosis and treatment procedures. Axenfeld-Rieger Syndrome (ARS) is inherited in an autosomal dominant fashion a clinically and genetically heterogeneous group of disorders mainly affecting the anterior segment of the eye (polycoria – fig. 1) and craniofacial developmental disturbances: mild craniofacial dysmorphism, including wide nasal bridge, telecanthus, ocular hypertelorism (fig. 2) and systemic changes such periumbilical abnormalities.

Moreover, patients with ARS may present numerous dental developmental abnormalities: hypodontia, microdontia, hypoplasia of the maxilla and mandible (fig. 3-4).



Fig. 1



Fig. 2



Fig. 3



Fig. 4

## Case Presentation:

A 19-year-old female patient with ARS visited Department of Conservative Dentistry with Endodontics for regular dental examination. Patient suffering from hypodontia, microdontia and ankylosis of the temporomandibular joints presented no symptoms of #22. Radiographic exam showed periapical radiolucency (fig. 5). Further investigation (fig. 6) revealed a typical appearance of dens invaginatus. Endodontic treatment including chemo-mechanical preparation, passive ultrasonic irrigation and warm vertical condensation was performed (fig. 7).

At 6 months recall clinical and radiographic examination showed periapical lesion healing (fig. 8).



Fig. 5

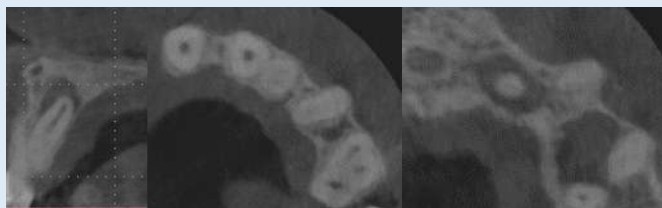


Fig. 6



Fig. 7

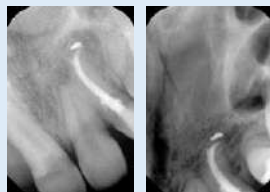


Fig. 8

**Conclusion & Clinical Relevance:** Tooth developmental abnormalities as hypodontia and microdontia with simultaneous hypoplasia of the maxilla and mandible as well as facial dimorphism are present by Axenfeld-Rieger syndrome patient. So far, no case of dens invaginatus was reported.

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## Aim

To present a clinical case report of a root canal treatment (RCT) and posterior intentional reimplantation of a lower premolar with a radicular cyst in a patient with type I diabetes.

## Introduction

Clinical/radiographic examinations are not able to preoperatively determine whether a periapical lesion is a cyst or a granuloma. Therefore, RCT is often the first treatment of choice in teeth with periapical lesions suspected of being a cyst (1).

Intentional reimplantation involves the deliberate extraction of a tooth, evaluation of its root surfaces, repair of any existing lesions or defects, root-end resection and filling, and the placement of the tooth back into its original alveolar socket (2).

## Case Presentation

**Patient data:** 47-year-old Caucasian female. **Relevant medical history:** insulin pump-dependent type I diabetes; smoker (>10 cigarettes/day). **Chief complaint:** slight discomfort in the posterior region of the third quadrant. **Clinical inspection:** no pathological signs other than generalized grade I-II mobility. **Periapical X-ray:** periapical radiolucent lesion surrounding tooth 3.4. **Percussion and bite tests:** positive, **cold sensitivity test:** negative.

**Presumptive diagnosis:** apical periodontitis. **Treatment plan:** RCT (tooth 3.4) under magnification and rubber dam isolation. **Instrumentation:** Reciproc Blue (VDW, Germany) up to R25 file. **Intracanal irrigation:** 5.25% NaOCl solution between each file. **Final irrigation:** 5.25% NaOCl and 17% EDTA applications (sonic activation), separated by saline solution. **Root canal filling:** continuous wave technique. **Coronal restoration:** micro-hybrid composite.

Clinical and radiographic follow-up visits were carried out up to 1 year: absence of symptoms and radiographic changes. A CBCT was performed to assess the lesion's extension. The patient was informed about the suspicion of a cyst. Proposed treatment alternatives: endodontic microsurgery, intentional reimplantation. The latter was selected by the patient.



**Fig. 1.** Radiographic images. (A) initial; (B) intraoperative; (C) final; (D) 6-month follow-up; (E) 1-year follow-up; (F) CBCT, sagittal; (G) CBCT, coronal; (H) CBCT, axial.

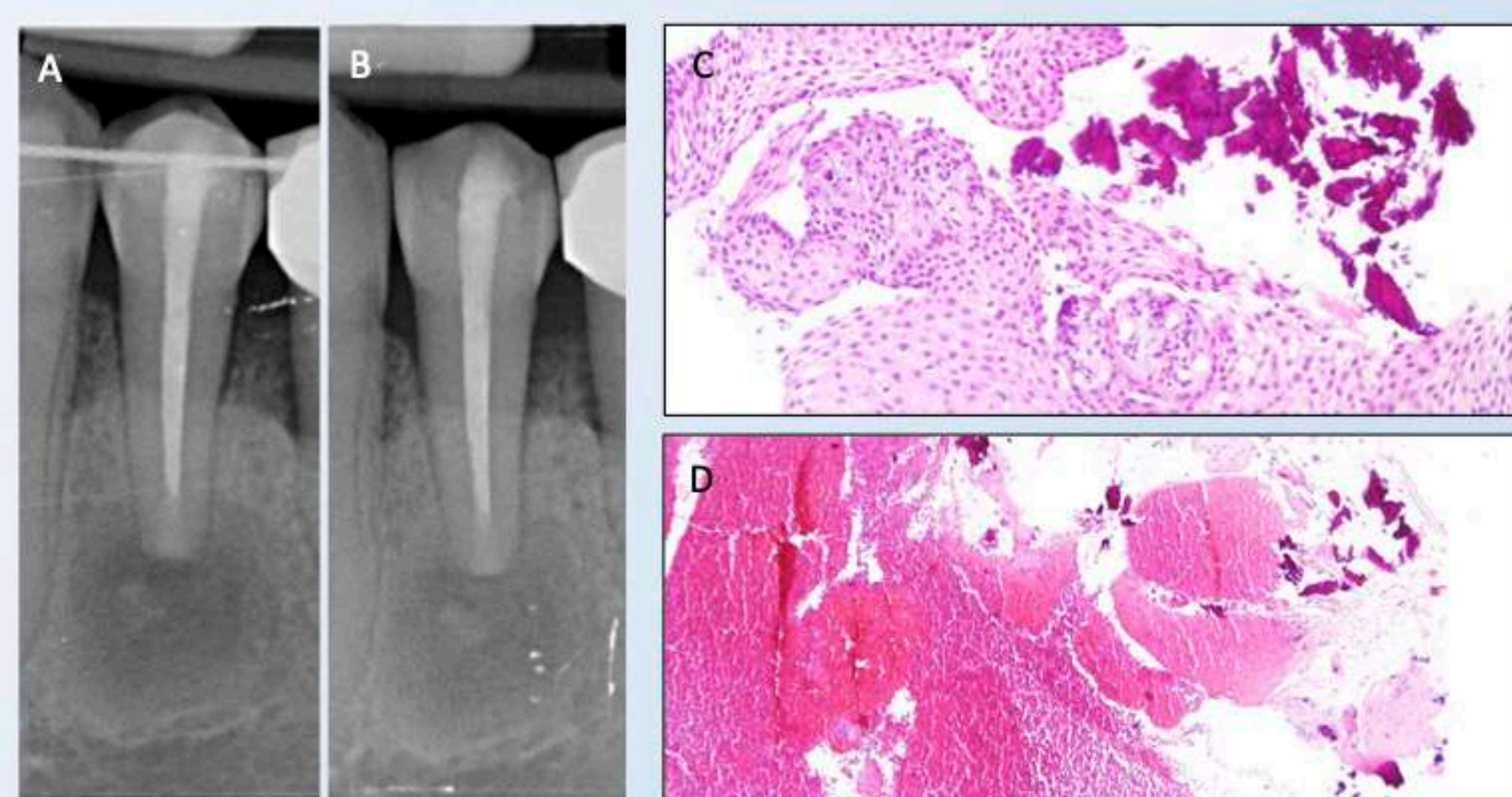


**Fig. 2.** Intentional reimplantation process. From left to right: atraumatic extraction, socket curettage, root-end resection, root-end filling, splinting.

### Intentional reimplantation procedure:

- 1) Atraumatic extraction of tooth 3.4 (premolar forceps).
- 2) Curettage of the apical region of the tooth's socket. A sample of the lesion was collected for histological analysis.
- 3) 3-mm root-end resection of the tooth (sterile diamond bur), held in place by a sterile gauze.
- 4) Preparation of the root-end cavity (3-mm depth; sterile diamond bur).
- 5) Root-end filling with Biodentine (Septodont, France).
- 6) Placement of the tooth in its socket.
- 7) Placement of a passive flexible splint (0.4 mm wire bonded to the buccal surface of teeth 3.3, 3.4 and 3.5) for 4 weeks.

The histological analysis confirmed the presence of an **odontogenic inflammatory cyst (radicular cyst)**. Follow-up visits were performed up to 6 months: absence of symptoms, reduced mobility, minor radiographic healing.



**Fig. 3.** (A) Follow-up 1 month. (B) Follow-up 6 months. Histological images showing non-keratinized polystratified epithelium with dyskeratosis (C) and fibrocellular connective tissue with scattered inflammatory cells (D).

## Discussion

Several studies report that the prognosis of root-filled teeth is worse in diabetic patients, who often require longer periods of time for periapical lesions to heal. This may explain the absence of radiographic changes after RCT and intentional reimplantation (3). The intentional replantation procedure was performed in accordance with the respective European Society of Endodontology Position Statement (4). Endodontic treatment outcome can be divided into success (remission of pathological signs and symptoms) and survival (maintained tooth function). In the present case, tooth survival was achieved at 6 months of follow-up (5).

## Conclusion and Clinical Relevance

Based on the results of the present case report, intentional reimplantation can be a potential treatment option for the treatment of persistent periapical lesions suspected of being a cyst in type I diabetic patients. The use of evidence-based standardized treatment procedures is paramount to increase their reproducibility and possibility of success.

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# Multidisciplinary approach of a complex trauma case

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## Aim

Management of dental trauma should be based on evidence-based long-term clinical results, with special attention to the functional and esthetical outcome.

## Introduction

10.8% of orthodontic patients present with dental injuries before onset of orthodontic treatment (1). The treatment plan of these cases will depend on several factors such as the number of missing teeth, status of remaining teeth, possible concerns about occlusion, space availability, age, facial morphology, growth pattern and tooth morphology (2).

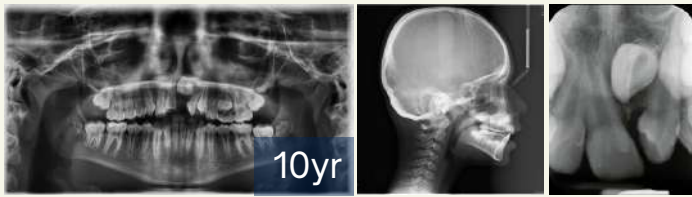
## Materials and methods

1



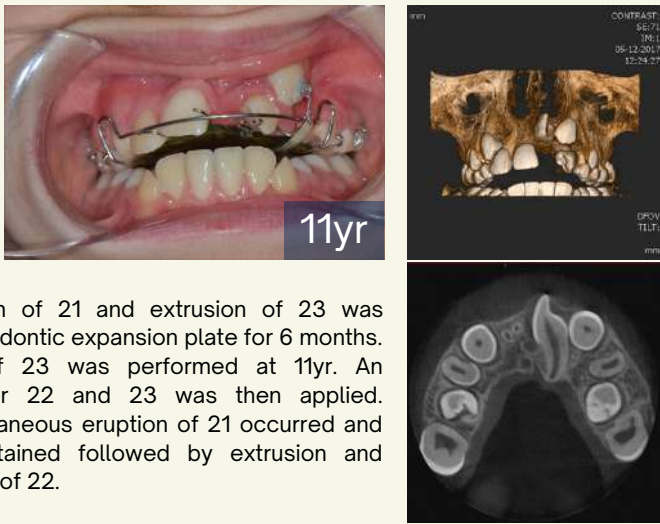
**Initial trauma** at 2,5yr with avulsion of 51 and 52 and **second trauma** at 5yr with subluxation of 61. No specific treatment.

2



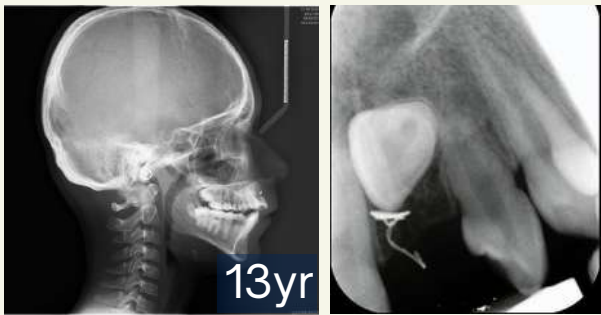
Intake of orthodontics at 10yr. Impaction of 21 and 23 was diagnosed. A distal skeletal relation and disto-occlusion, convex profile and incompetent lips were also seen.

3



Space for eruption of 21 and extrusion of 23 was created by an orthodontic expansion plate for 6 months. Next, exposure of 23 was performed at 11yr. An extrusion plate for 22 and 23 was then applied. However, no spontaneous eruption of 21 occurred and exposure was obtained followed by extrusion and further distalization of 22.

4

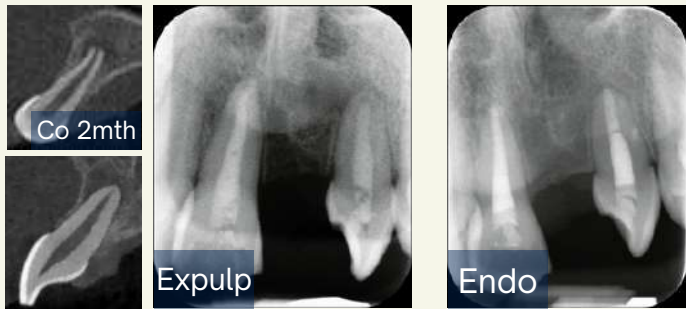


Failure of eruption of 21 after 14 months of extrusion leads to a change of orthodontic treatment plan involving extraction of 21 and mesialization of the second quadrant.

5



A **third trauma** at 13yr with subluxation of 11 and 22 leads to necrosis of both teeth. An expulp session with UltraCal XS (Ultradent Products, Inc., South Jordan, UT, USA) and temporary filling was done. The definitive endodontic treatment was performed 5 months later (because of covid-19). A 5-mm thick layer of ProRoot MTA (Dentsply Sirona, Charlotte, NC, USA) was applied as an apexification. On top of this, gutta percha was applied together with a resin-based sealer. The cavity was then closed by means of a flowable composite.



6

Sectional braces with no orthodontic forces on 11 and 22 were applied for 11 months. After control radiography, derotation of 22 and mesialization was performed with radiographical and clinical follow-up of the traumatized teeth following the guidelines of the International Association of Dental Traumatology (3).



7



Actual situation 2yr after final trauma, just before finishing the orthodontic treatment. Notice the slight apical resorption due to orthodontic forces. Also, a slight discolouration of tooth 22 and 11 can be noticed due to the bismuth oxide of the MTA.

## Discussion

In this case, transplantation of a lower premolar could have been a viable treatment option, since orthodontic extractions were necessary due to lack of space in the lower jaw. However, mesialization of the second quadrant was preferred to replace 21 because of the repetitive traumatic injuries, lack of patient cooperation, increased overjet, lack of space in the arches, the anatomy of 22 and 23 and the potential for skeletal growth (2). To avoid discolouration, an alternative hydraulic calcium silicate cement without bismuth oxide as radiopacifier could have been used. In this case, a specific sequence of orthodontic wires was used to avoid excessive forces on root level and root cementum (4). Also, orthodontic treatment was postponed for 1yr after endodontic treatment due to the large lesion and maturogenesis of 22 and 11. Earlier movement is possible, but delays the healing process (5).

## Conclusion and clinical relevance

Complex trauma cases often require a multidisciplinary approach in order to achieve a long-term beneficial result for the patient. Also, a flexible treatment plan anticipating on potential complications is important.

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# Alopecia areata – endodontic treatment and retreatment

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**Aim:** To present the patient state with severe Alopecia areata before and after endodontic treatment and retreatment of several teeth suspected to be the cause of „focal infection“.

## Case Presentation

A male patient 34 years old came to our Department with no endodontic symptoms but with an extensive medical history on his disease - Dg: Alopecia areata- AA. The analysis of CBCT revealed a number of teeth with inadequate endodontic treatment: missed canals, insufficient canal obturations with PAL around most of the root apices. Decision has been made to treat five teeth with most prominent periapical lesions. Two most complex cases are presented (figure 2 a,b,c,d; figure 3 a,b,c,d). Microbiology samples were collected from undetected and reobtured canals and subjected to polymerase chain reaction (PCR) analysis. A single-stage and nested PCR assays revealed the presence of the following microorganisms: Human cytomegalovirus, Epstein-barr virus, Actinomyces comitans, Tannarella forsythia, Eikenella corrodens, and Fusobacterium nucleatum. Figure 5 a,b,c,d the same patient head 6 months postoperatively, with regenerated hair in terms of its density and color.



Figure 1 a, b, c, d : The most severe hair loss was present on his skull



Figure 2 a, b, c, d: Patient skull three months after endodontic procedures



Figure 3 a, b, c, d, e: First maxillary right molar before and after retreatment and 3D obturation

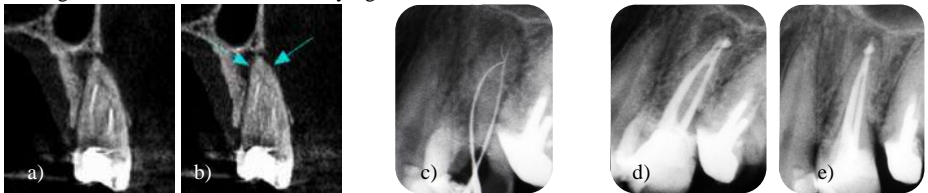


Figure 4: First maxillary left bicuspid before (a,b,c) , after retreatment (d), and three months postoperatively (e)

## Discussion

Alopecia areata has been related to the presence of infective foci and considered as an autoimmune disorder since autoantibodies play predominant role in its pathogenesis. Our results strongly imply the potential involvement of detected microbiota and their toxins as antigens and sources of focal infection in pathogenesis of AA, supported by images of the patient with total regeneration of the skull hair one year after endodontic therapy of all suspected teeth.



Figure 5: a) b) c)

## Conclusion & Clinical Relevance

Endodontic therapy should always be performed at the highest possible standards since pure treatment could seriously jeopardize and damage patient's general health.

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# Management of root resorption using MTA and short fiber-reinforced composite: A case report

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**Aim:** To discuss the use of short fiber-reinforced composite (SFRC) as a potential root canal filling material, after one shot apexification with an apical MTA plug.

**Introduction:** Endodontically treated teeth are most often structurally compromised and could require reinforcement even in the root canal. SFRC can provide a relatively easy solution in many clinical situation.

## Case Presentation

27 years old male patient was referred for endodontic treatment. CBCT examination confirmed inflammatory external and internal root resorption (Fig. 1.). Radiographic working length determination was carried out (15,5 mm) with previous measurements on the CBCT slide. LightSpeed and EndoVac Systems were used for shaping and cleaning of the canal, special care was taken for proper apical cleaning of the granulomatous tissue.(Fig.2.) Mineral Trioxid Aggregate (MTA+, Cerkamed, Poland) apical plug was created in 5 mm depth (Fig. 3, 4.). Coronal to the plug the canal was filled with the Bioblock technique, using dual curing adhesive ( ) and SFRC (everX Flow, GC, Europe) (Fig. 5.). No conventional obturation was carried out. Coronal cavity was restored with an indirect composite overlay (Fig. 6).



Fig. 1.

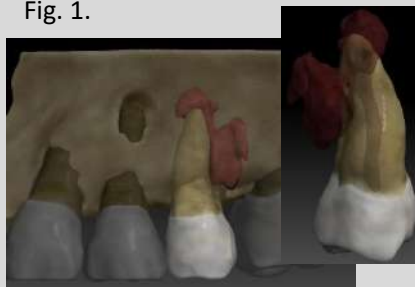


Illustration by Balázs Szabó Dr.



Fig. 2.



Fig. 3.

**Discussion:** SFRC can be used to homogeneously fill out the remaining irregular root canal space after the set of the apical plug, providing not only an easy and fast treatment solution, but also a real option for individualized reinforcement.

## Conclusion & Clinical Relevance:

This case shows that the Bioblock technique could be an effective way to restore and reinforce teeth after the apexification with an MTA plug.

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Fig. 4.



Fig. 5.



Fig. 6.



# Non-surgical management of external root resorption caused by orthodontic treatment: a case report



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**Aim:** The aim of this case report is to describe the treatment of a 32-year-old patient who suffered from external inflammatory root resorption of the permanent mandibular first premolar following orthognathic surgery.

**Introduction:** The non-surgical management of external resorption includes calcium hydroxide dressing of root canal until the healing signs around the resorptive defect were observed in the radiographic evaluation. Following this procedure, orthograde filling of the root canal using tricalcium silicate cements is a suggested treatment option.

**Case Presentation:** A 32-year-old male patient was referred to Endodontic Department after radiological examination (fig.1a,1b,1c). The patient had no complaint about the related tooth. As a result of the detailed radiological and clinical examination, tooth #44 was diagnosed with external inflammatory root resorption. It was thought that resorption developed due to trauma during orthognathic surgery or orthodontic movement. The root canal was chemomechanically instrumented using stainless steel K-files and rotary instruments and irrigated using 2.5% sodium hypochlorite (NaOCl). Irrigation solution was activated by ultrasonic energy. Calcium hydroxide ( $\text{CaOH}_2$ ) was used as an intracanal medicament (fig.2) and multi-visited treatment protocol was applied until the healing signs were observed radiographically (fig.3). After inducing hard tissue formation, the root canal including resorptive defect was filled using MTA, and the coronal half of the root canal with gutta-percha cones and resin based sealers. The tooth was restored using composite resins.

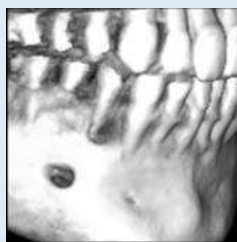


Fig.1a: Pre-operative 3D reconstruction CBCT image



Fig.1b: Preoperative CBCT image (Sagittal view)



Fig.1c: Preoperative panoramic radiograph

**Discussion:** Evidence of radiological and clinical positive outcome supports the application of long-term calcium hydroxide dressing of the root canal including external resorption. Additionally, the use of MTA as a biomaterial may lead to an increase to survival time of tooth.



Fig.2: Periapical RG after  $\text{CaOH}_2$  dressing



Fig.3: Periapical post-RG following initiation of the endodontic treatment after 7 month



Fig.4: Filling of the root canal including resorptive defect using MTA



Fig.5: Backfilling of the root canal using gutta-percha and resin based sealers

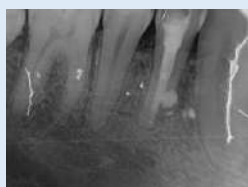


Fig.6: 6 month follow-up RG



Fig.7: 12 month follow-up RG

**Conclusion & Clinical Relevance:** The post-operative periapical radiograph showed that the canal was obturated properly. The patient was recalled after 6 months (fig.6) and 12 months (fig.7). Clinical evaluation revealed that the tooth was asymptomatic. The formation of new periodontal attachment and the signs of bone healing were observed in the follow-up radiographic images.

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# Computer aided planning : The promise of a more predictable endodontic practice

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## • Aim

To discuss, through a clinical case, the interest of computer assisted planning in the removal of a separated instrument in a maxillary first molar.

## • Introduction

The access to separated instruments can induce excessive tissue removal and potentially impact mechanically the tooth (1). The retrieval is traditionally evaluated through radiographs or slices of a cone beam computed tomography (CBCT), an approach that did not allow an easy three-dimensional view and comprehension of the specific dentin removal required to release the instrument (2).

## • Case Presentation

A 46-year-old male patient was addressed to the department of endodontics of the Lyon University Hospital for a fractured instrument in the distal root canal of the right first maxillary molar (Fig1&2). The maxillary area was scanned before any intervention to evaluate the instrument position using cone beam computed tomography (Planmeca ProMax 3D, Helsinki, Finland) operating at 120 kV, 100 mAs, with a slice thickness of 0.75 mm (Fig3).



Fig.2 : CBCT Preoperative axial view



Fig.3 : Simulated root canal using the software EzDent-i (Vatech, Gyeonggi-do, South-Korea)

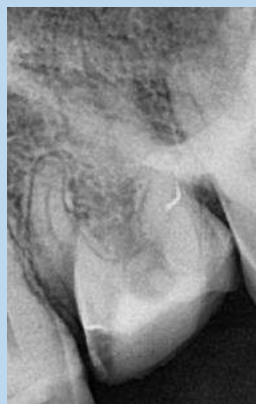


Fig.1 : Pre-operative radiograph

The different anatomical structures were segmented, and an ultrasonic tip ET25 (Acteon, Merignac, France) was simulated to plan a virtual treatment (3). The dentin removal to loosen the instrument could be planned on the 3D reconstructed image and the remaining dentin thickness was assessed (Fig4).

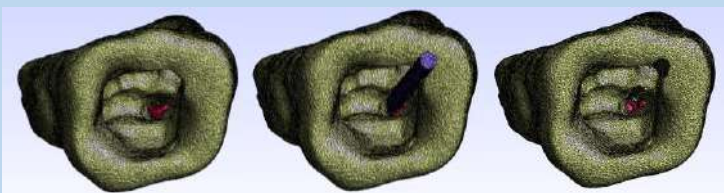


Fig.4 : occlusal view of the virtual treatment planning with fractured instrument (red) and ultrasonic (blue) using the free software GMSH

This virtual planification allowed a selective tissue removal so that, the instrument was successfully removed (Fig5).



Fig.5 : Post operative radiograph

## • Discussion

Virtual treatment planning enables here in to conduct a minimally invasive instrument retrieval, but segmentation is highly time consuming and sensitive to presence of artefacts.

## • Conclusion & Clinical Relevance

Virtual treatment planning opens many clinical perspectives to anticipate potential complications due to excessive tissue removal and could become a new treatment assistance tool.



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# ORTHOGRADE ENDODONTIC RETREATMENT OF A FAILED APICOECTOMY



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## Aim

Our report describes a successful orthograde retreatment of upper right central incisor which had been previously endodontically and surgically treated.

## Introduction

Endodontic surgery is an important aspect of endodontic therapy but it cannot compensate for inadequate orthograde endodontic treatment. When post apicoectomy failure occurs, it is important to discuss its causes and possible treatment options: orthograde, orthograde plus surgical or just surgical retreatment.

## Case presentation

A 51-year-old male patient was referred to our department for treatment of a symptomatic maxillary right incisor. His chief complaints were short episodes of spontaneous pain and that the tooth was painful when biting. Patient gave a history of endodontic treatment and subsequent apicoectomy due to inadequate initial treatment and persisting symptoms. Intraoral examination revealed composite filling on palatal side of the tooth, percussion sensitivity and scar in the buccal gingiva. Periapical radiography showed resected root end with retrograde filling, probably amalgam (Fig. 1). Root canal was not visible on radiograph with filling material present only in coronal region. Possible treatment options were considered and after patient's consent it was decided to try orthograde endodontic retreatment as the most sparing and comfortable for patient.



Fig. 1 Pre-operative radiograph



Fig. 2 Post-obturation radiograph

The tooth was restored with glass ionomer cement and composite resin filling. Control examination, three years and eight months later, showed that the treated tooth was asymptomatic and control radiograph revealed no signs of periapical pathology (Fig. 3).



Fig. 3 Control radiograph

## Discussion

In previous endodontic treatment root canal was probably assumed to be mineralized and unnegotiable. This probably led to apicoectomy as a treatment option, which on the other hand did not eliminate intraradicular microorganisms. Apicoectomy is of little value in cases with poor endodontic therapy as it only transfers apical foramen coronally and creates an open apex predisposed to recurrent infection.

## Conclusion & Clinical Relevance

Our case report indicates that orthograde nonsurgical retreatment after failed apicoectomy may be a treatment modality with good prognosis. When inadequate endodontic filling is a cause of treatment failure, orthograde retreatment could be the first-choice therapy.

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# Selective Root Canal Treatment in Dens in Dente with Vital Pulp, Apical Periodontitis, Open Apex and unusual Canal Morphology

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## Aim

Selective endodontic Treatment with appropriate armamentarium in a rare case of dens in dente type III-b (1)

## Introduction

In few cases of Dens in Dente, Apical Periodontitis exists along with vital pulp in the main canal (2) making selective treatment of the Dens alone a possibility.

## Case Presentation

An 11 years old healthy patient. Tooth 12 was responsive to cold tests, no sensitivity to percussion and palpation were revealed. Periapical radiograph demonstrated a large radiolucency (Fig 3). Following PA and CBCT the diagnosis was: Dens in dente type IIIB. **DENS:** Pulp Necrosis, Asymptomatic Apical Periodontitis. **DENTE:** Normal Pulp, Normal Apical Tissues, Open apex and unusual morphology (Internal resorption- like area, Fig 4,5).

Selective RCT was performed in the Dens. Two visits using FKG XP Endo Finisher and Calcium Hydroxide medication for 3 weeks followed by obturation with a Bioceramic sealer (FKG Total-Fill BC Sealer) utilizing the one cone technique (Fig 6). At 1 year Follow up the tooth was responsive to cold test and a complete healing of the radiolucency was noticed (Fig 7, note-patient under orthodontic treatment).

## Discussion

Due to the unusual morphology (internal resorption like area ,Fig 4,5 ) the XPF was chosen as a main instrument. Open apex and technical inability to perform a classical apexification or the apical plug technique in addition to the high probability of sealer over – filling, influenced the decision to use the most biocompatible endodontic sealer – BC sealer.

## Conclusion & Clinical Relevance

Unusual morphology of Dens in Dente may lead to a rare situation where Apical Periodontitis develops despite vital pulp in the main canal.

Diagnosis may be a challenge.

Selective treatment of the Dens is recommended.

Instrumentation and obturation materials and techniques must be selected accordingly (3).

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Fig 1



Fig 2



Fig 3



Fig 4



Fig 5



Fig 6



Fig 7



# Removing fractured lentulo spiral with modified tube technique in combination with dual-curing resin cement - Case report



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Dr. Roland Daubner



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## Introduction

Chemo-mechanical disinfection of the entire root canal system is crucial for successful root canal treatment. During this process instruments may fracture due to torsional load or cyclic fatigue (1), which may negatively influence treatment outcome as the fragment may block root canal areas making them inaccessible for chemo-mechanical disinfection, depending on the stage of root canal-procedure when fracture occurred (2). Therefore, in certain cases the removal of the fractured instruments is indicated. One of the retrieving techniques is the tube technique, wherein a tube is placed over the separated instrument (1).

## Case Presentation

### Aim

Remove broken lentulo spiral and locate buccal canals to perform root canal filling which contributes to restore tooth 26 and to the health of the neighboring tissues.

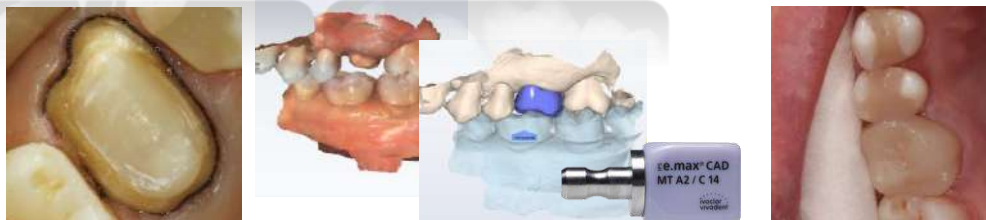
Young lady (33yrs) complained of discomfort and slight pain on tooth 26. In the periapical X-ray it became clear that there was a broken lentulo spiral in the palatal canal and buccal canals were not filled at all.



## Methodology

After removing crown and localizing the lentulo spiral, Miller broach in an endo-chuck was used for loosen the lentulo from the wall of the canal (3). Fitting blunt tip needle was chosen, filled with NX3 dual-curing resin cement (Kerr Dental CA USA) and placed over the lentulo spiral. After setting the 'lentulo-cement-needle-complex' was removed. For chemo-mechanical cleaning sodium-hypochlorite, EDTA, distilled water, C-pilot files (VDW Germany) and Hyflex-EDM (Coltene OH USA) files were used. After root canal filling Glassix fiber post (Nordin Switzerland) was cemented in palatal canal and core build up was performed.

Final restoration was made chair-side, with Planmeca FIT CAD/CAM system (Planmeca Finland).



## Discussion

Microsonic technique enabled minimal invasive preparation, good visibility and adequate access for retrieving the separated lentulo spiral.

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## Conclusion & Clinical Relevance

Without any special removal kit, simple dental instruments and materials can be useful to change the prognosis of a tooth with the help of the dental operating microscope.

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# Case series demonstrating interim pain relief modality for irreversible pulpitis in areas of poor dental access

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Case series Independently carried out

## AIM

To describe an interim low cost pain relief solution for patients suffering with irreversible pulpitis who cannot access emergency endodontic therapy.

## INTRODUCTION

Despite their debilitating nature affecting people's usual activities in most cases (Stoller 2001), epidemiological studies have shown high incidence of dental pain. For example, In Iran up to 55% of adults were reported to experience “toothache” in the past 6 months (Kakoei et al. 2013) and in the UK, a study in the UK found 41% of paracetamol overdoses were due to dental pain (Siddique, Mahmood et al. 2015). At the same time, cross sectional surveys have shown over 30% of patients have apical radiolucencies and the prevalence remains high over two 10 year studies (Razdan, et al. 2022), This suggests high levels of pulpal inflammation are experienced in the global population. Yet access to dental and medical professionals is most difficult for those most affected and effective over the counter relief is lacking. This problem is likely to be worse in countries or areas where access to dentists is low and exacerbated by dental treatment hesitancy due to dental anxiety.

## METHOD

In a rural setting with limited access to healthcare, patients diagnosed from clinical history and examination only were treated with synergistic anaesthetic agents combined into a rubber based polymer which was soft and mouldable. Patch clamp studies demonstrated synergy between herbal derived obtundent agent and anaesthetic agents (sodium channel blockers) allowing for high efficacy of pain relief at low and safe doses. This delivery method, named as “Tooth-aid”, would expel medicament onto the target tooth when pain arose.

The patient could apply gentle masticatory pressure when further pain relief was required.

Patients were selected on the basis of the following criteria:

### Inclusion criteria:

- Diagnosis of irreversible pulpitis
- Able to be monitored over 4 hours

### Exclusion criteria:

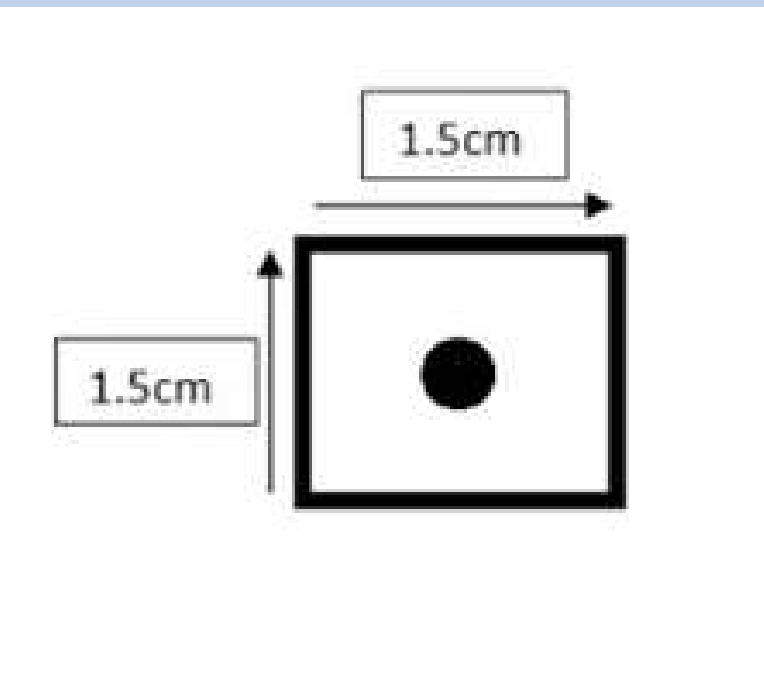
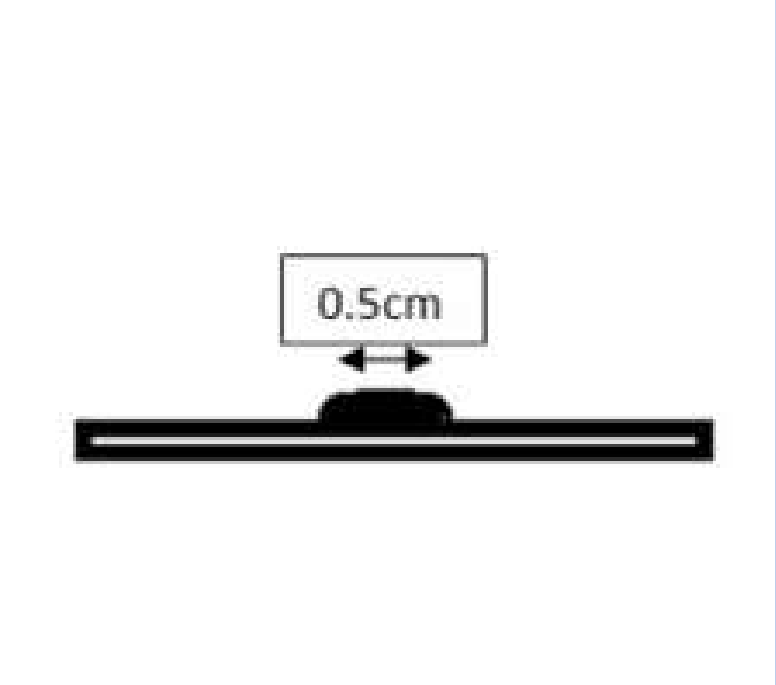
- Concomitant dental pain of other dental origin
- Taken oral analgesics in the last 24 hours
- Allergies to any ingredients

Medicated product was then applied by a single operator. The following were recorded

- Pre-operative pain score based on a visual analogue scale
- Time taken until patient reported pain relief
- Duration of pain relief
- Quality of pain relief for majority of the time placed
- Side effects and comfort of device

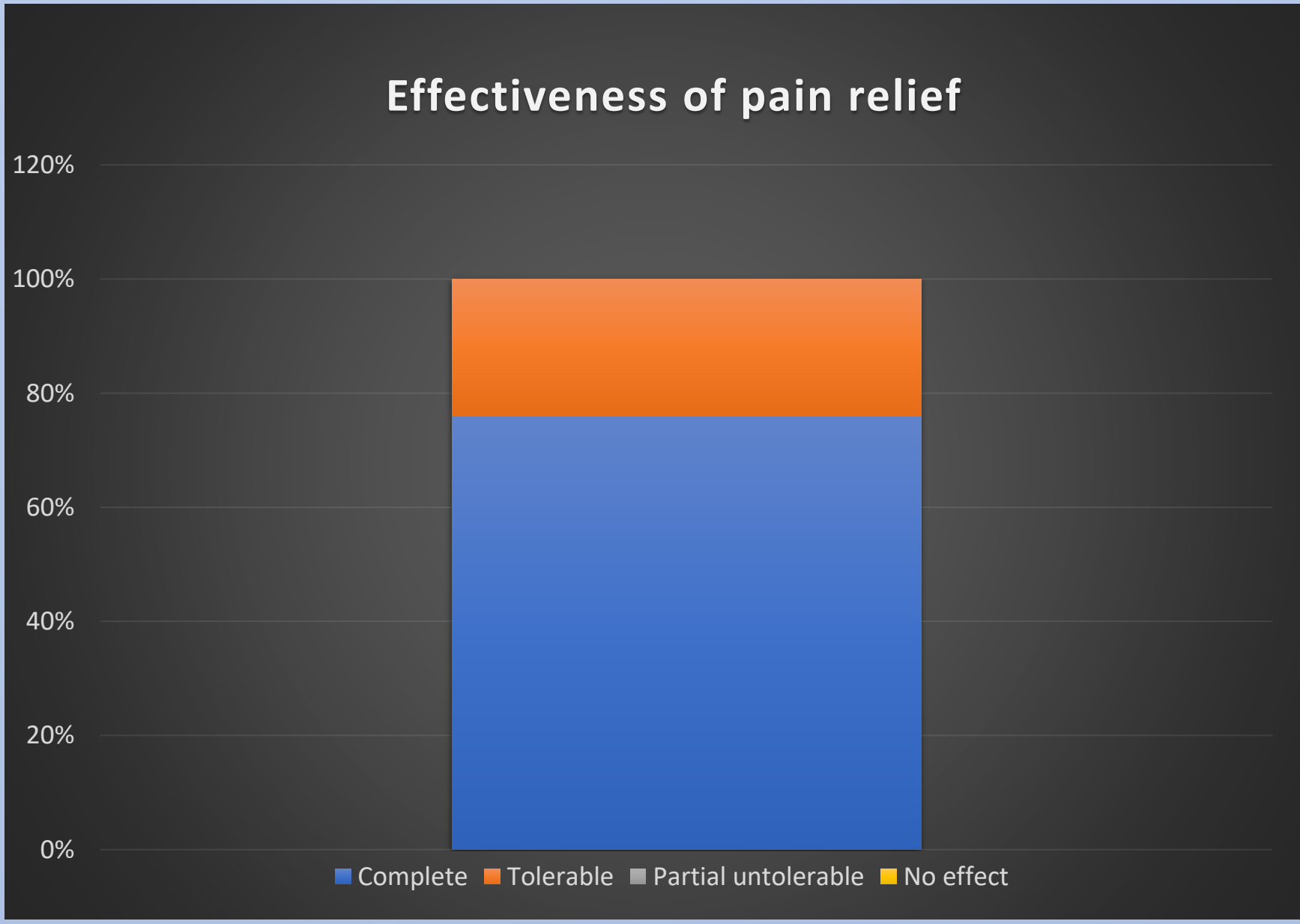
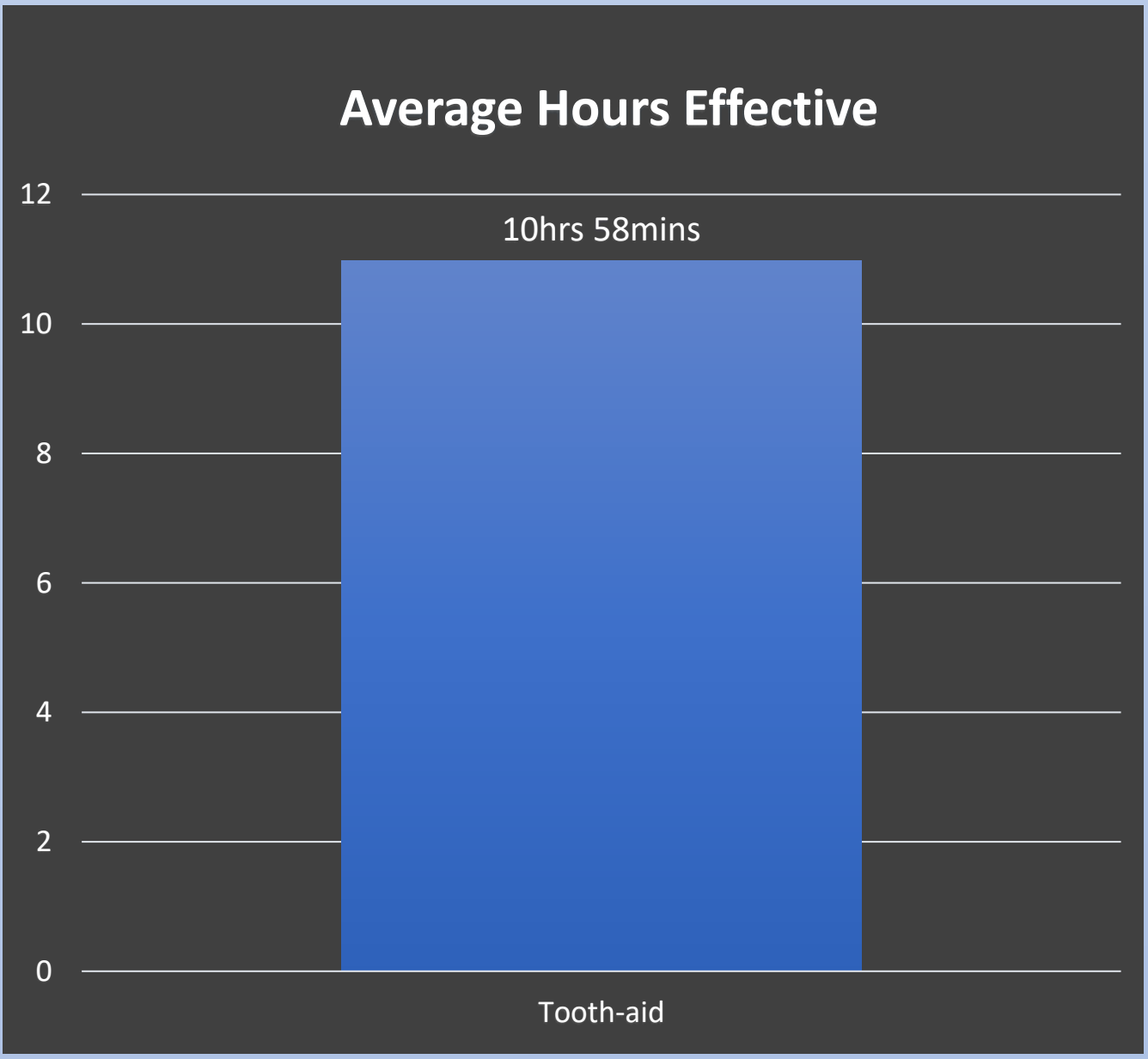
Two patients were randomly selected as controls where unmedicated polymer was placed on 2 patients for 10 minutes and patient pain scores to oral analgesia were also recorded

## DESIGN



## RESULTS

- 21 patients were administered with the active agent
- The 2 control patients did not report any pain relief after 10 minutes, but one ‘wasn’t sure’ for the first 5 minutes
- No adverse effects were reported
- The most common teeth were molar teeth
- Faster onset of pain relief (mean average 5mins)
- 76% had total relief with Tooth-aid and the remainder had relief to a tolerable level to allow them to function with day to day activities.
- Average hours effective in a single dose was approximately 11hours
- Wilcoxon signed rank test was used on the pre treatment and post treatment scores. The results indicated that the treatment had a statistically significant effect on irreversible pulpitis ( $p < 0.001$ )



## DISCUSSION

This case series demonstrated the utility of such interim treatments for patients with irreversible pulpitis, though not a substitute for pulp therapy. There was demonstrated to be a significant effect on patient pain score, with all patients having a reduction of pain down to at least a tolerable level. It was out of interest that a statistical analysis was undertaken, as this was not designed to be a randomised control trial.

In a survey in USA, 86% of patients seek self medication before seeing a professional (Stoller et al. 2001). In areas with poorer access to dental care, this figure may be higher and the pharmacist is often the first point of contact for most medical and dental problems. Taken together this would indicate an opportunity to help patients via over-the-counter pathways.

Currently, the ‘gold-standard for over the counter pain relief is Ibuprofen. This has a half life of approximately 1-2hours only and can take 25-30minutes to work and may not relieve severe pain. Therefore, before operative intervention can be arranged, such a device could give clinicians or pharmacists an alternative to non steroidal anti-inflammatory drugs which have significant contra-indications and side effects. Such a product may also help improve antibiotic stewardship as prescribers will have an effective alternative to offer especially as in some countries. However, such a product does require pharmacists or dental triage staff to be able to take an appropriate history in order to correctly determine that the source of dental pain is likely to be irreversible pulpitis.

Randomised control trials would be recommended to determine the efficacy of such treatment modalities.

## CONCLUSION & CLINICAL RELEVANCE

There appears to be scope to develop a low cost topical pain relief solution for patients until they are able to access dental treatment in the treatment of irreversible pulpitis. This could significantly improve patient experience as well reduce inappropriate administration of antibiotics by prescribers who are unable to advise an alternative while the patient waits for an operative appointment.

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# One-visit Pulp Capping or Two-Visit Regenerative endodontic therapy? A Case Report of One-visit Pulp Capping of Immature Permanent Incisor with Partial Pulp Necrosis and Sinus Tract.

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## Aim

To present the clinical outcome of a case where we decided to perform a one-visit pulp capping instead of the previously planned two-visit regenerative endodontic therapy.

## Case Presentation

A 9-year-old boy has been referred to our practice with a 6-month-long sinus tract buccal to the tooth 22. The patient and his mother did not recall any traumatic injuries. Clinical examination revealed no deviations to the latter and adjacent tooth 21. Both responded to cold sensibility test, but tooth 21 with a slight delay. A preoperative radiograph with inserted gutta-percha point through a sinus tract revealed a large diffuse radiolucency above the apex of tooth 21, an immature root with thin dental walls and a gutta-percha point located between both lateral and central incisor (Figure 1).

After access cavity preparation on the tooth 21 it turned out that only the coronal part of the pulp was necrotic while most of the root canal was filled by vital pulp-like tissue (Figure 2). The necrotic part was removed, canal disinfected and the coronal part of the pulp chamber filled with Biodentine (Figure 3).

At control check-up two weeks later, the sinus tract disappeared. Control local radiograph after 2 months revealed reduced periapical radiolucency (Figure 4). At the last control, 21 months after the treatment, the tooth is asymptomatic, responds to cold sensibility test and retains the original colour of the crown and slightly responds to cold-sensitivity test. Local radiograph reveals no apical pathology and thickening of the root canal walls (Figure 5).



Figure 1



Figure 3

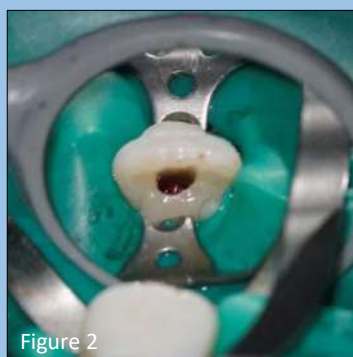


Figure 2



Figure 4



Figure 5

## Discussion

Regenerative endodontic procedures are the first treatment option for permanent teeth with incomplete root formation and sinus tract, as it is assumed that the pulp tissue is entirely necrotic. However, there might still be some vital tissue present in some of these teeth.

## Conclusion & Clinical Relevance

Even in cases with apical pathology, vital tissue can be found inside the root canal. Presence of vital tissue in immature permanent teeth certainly opens other, more conservative treatments options.

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# Non-surgical Endodontic Treatment of Severe Root Perforating Internal Replacement Resorption : A Case Report

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## Aim

To present a clinical case of non-surgical endodontic treatment of severe root perforating internal replacement resorption in a permanent first left mandibular molar in a 16-year-old patient.

## Introduction

In the replacement resorption, the resorptive activity causes defects in the dentin adjacent to the root canal, with concomitant deposition of bone-like tissue in some regions of the defect. It results in an irregular enlargement of the pulp space with partially or fully obliterated area of the pulp chamber. Histologically, a part of the pulp tissue inside the root canal shows resorptive inflammatory changes involving dentin resorbing cells (odontoclasts) in the resorption lacunes. If the pulp is not completely necrotized by advancing coronal infection, internal resorptive activity progressively resorbs the root canal dentin and eventually perforates the cementum.

## Case Presentation

Radiographs taken on the first visit of the 16-year old patient in the dental office revealed a severe internal root resorption and intraradicular radiolucency on the permanent first left molar (Fig. 1). Due to the age of the patient extraction and/or replacement with implant was not a viable option. Therefore, after analysing the CBCT image (Fig. 2), we decided to preform a non-surgical endodontic treatment.

Endodontic treatment was challenging and had to be made in three sessions. The perforation in the pulp chamber floor was closed with MTA, and the root canals and two other perforations were instrumented and filled with gutta-percha and AH+ sealer using a combination of cold and hot filling techniques (Fig. 3 and Fig. 5). After the treatment the tooth was restored with direct composite overlay restoration (Fig. 4.).

The periapical radiograph after one year showed sings of healing of intraradicular radiolucency (Fig. 6). The periapical radiograph after two years showed almost completely healed intraradicular radiolucency (Fig. 7.). The periapical radiograph after four years showed completely healed radiolucencies (Fig. 8). The tooth was in function and with out any clinical sings or symptoms.

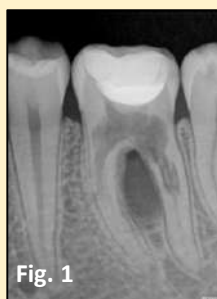


Fig. 1

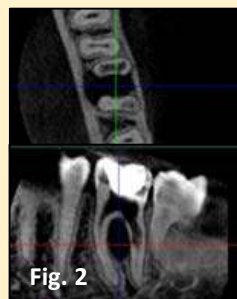


Fig. 2

## Discussion

Internal root resorptions are usually thought to be a result of a long-standing chronic inflammation of the pulp and are asymptomatic more often than not. The reason for internal root resorption in this case, was most probably the irritation of the pulp after placement of a deep filling. Among trauma, this is one of the most common causes for internal root resorptions.

## Conclusion & Clinical Relevance

The outcome of the non-surgical endodontic treatment of severe internal root resorptions is mostly depended on anatomy of the resorption and on the operator's skills. In young patients this is commonly the only viable and most patient friendly treatment option.



Fig. 3



Fig. 4

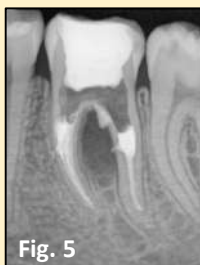


Fig. 5

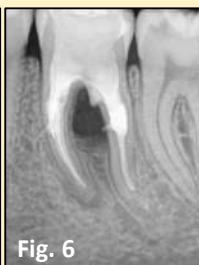


Fig. 6

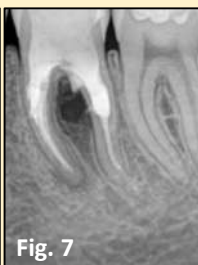


Fig. 7

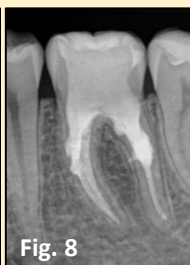


Fig. 8

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# When CBCTs are invaluable: A Case Series

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## INTRODUCTION

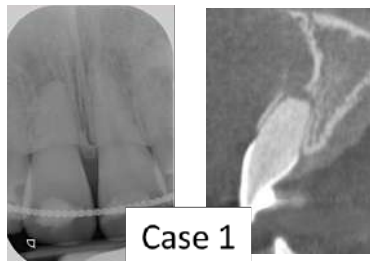
Cone Beam Computer Tomography (CBCT) is an invaluable tool in endodontics and is increasingly utilised in cases where the examination and plain film assessment produces an uncertain diagnosis. A CBCT provides a three-dimensional assessment and can be invaluable in cases with complex root canal anatomy, in patients with symptomatic teeth and unclear pathology, suspected root fractures, missed anatomy such as lateral/accessory canals and other complicating factors such as unclear periapical pathology due to complex extra radicular anatomy. The ESE (2014), AAE (2014) and Sedentext (2012) guidelines advocate the use of CBCT with careful case selection to provide net benefit in endodontic management.

This ultimately must be balanced against an increased exposure to ionising radiation and implications of cost. The result is that CBCTs are not advocated for all clinical situations, and it can be very challenging to determine which case would benefit from additional CBCT imaging. Even a reduction in dose with a CBCT using a small field of view covering the area of interest (the tooth and the surrounding structures) can produce a dose exceeding 5-7 periapical radiographs<sup>1</sup>. This series of cases focuses on a series of common diagnostic quandaries which benefit most from CBCT imaging.

## AIMS

- To highlight the type of cases which most benefit from CBCT imaging over conventional periapical radiographs (PA).
- To present a series of cases when CBCT assisted in the clinical management and improving the outcome of treatment planning and patient care.

## CASE PRESENTATION



Case 1

**Case 1:** A periapical radiograph showed pulp canal obliteration and external surface resorption of UL1. No clear pathology was visible. The CBCT confirmed the presence of periapical pathology perforating the buccal plate and complete canal obliteration. The CBCT altered the management plan and a retrograde treatment approach was planned, as orthograde treatment was not feasible.



Case 2

**Case 2:** The patient reported one episode of pain from LR6. There was a positive response to electrical and cold sensibility testing. The periapical radiograph showed irregularity of the pulp chamber. A CBCT confirmed external cervical resorption communicating with MB and DB canals. A combined endodontic and surgical approach was undertaken.

## CASE PRESENTATION (continued)

**Case 3:** Patient reported pain from LR6, which had been previously root filled. It was difficult to ascertain a diagnosis using a periapical radiograph. A CBCT confirmed apical root fracture of the distal root and therefore the tooth required removal.



Case 3



Case 4

**Case 4:** Patient reported pain from UL1, and 'hole at top of tooth'. Clinically, buccal cervical external resorption was noted, extending subgingivally. A periapical radiograph taken showed external cervical resorption, however a CBCT confirmed the extent of the resorptive defect and communication with the root canal. Orthograde endodontic treatment was undertaken and the external defect repaired surgically.

## DISCUSSION

Conventional periapical radiographs (PA) remain the routine method of imaging in endodontics. However, it has limited diagnostic accuracy due to compressed 3-D structures in a 2-D image. CBCT is indicated when plain film radiographs do not provide the clinician with sufficient diagnostic information.

All cases presented highlight the clinical need for CBCT in determining the prognosis and appropriate treatment options in endodontic management

- In Case 1, CBCT was required to identify the degree of pulp canal obliteration obstruction and demonstrated that orthograde access was not feasible in this case. The CBCT also confirmed the presence of periapical pathology which was not clearly visible in the plain film radiograph. This confirmed the need for endodontic intervention.
- In Case 2 and 4, the plain film radiograph identified root resorption. A CBCT was taken in each case to determine the extent of resorption and whether there was communication with the pulp canal. This then allowed meticulous planning to assess whether a combined endodontic and surgical approach was necessary. In both cases the CBCT confirmed communication with the root canals. In both cases root canal treatment was completed and the external resorptive defects were repaired surgically.
- Case 3 attended with non-specific signs and symptoms with previously endodontically treated LR6. CBCT confirmed apical root fracture which was not identified on a plain film.

Studies show CBCT is more accurate at detecting apical pathology in comparison to PAs. Additionally, the bucco-palatal extent of resorption can only truly be determined through CBCT, allowing adequate assessment and improved management of such cases. Further, CBCT is also indicated for the assessment of complicated root canal morphology, identifying lateral/accessory canals and pathology that may not be visible on conventional imaging as discussed above.

## CONCLUSION & CLINICAL RELEVANCE

CBCT plays a fundamental role in endodontics when 3-D imaging is required, aiding diagnosis and treatment planning, optimising clinical care and patient outcomes. The use of CBCT should be at the forefront of the clinical decision making process in endodontic cases and should be carefully selected in cases where plain film radiographs cannot be used to accurately manage the case and the benefits to the patient outweigh the risks.

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**Aim:** Root canal obturation techniques that make use of thermoplasticized gutta-percha present the vertical problem of a difficult control of the obturation. For more than 20 years the Microseal technique has been aimed at exploiting the advantages of the use of Ni-Ti files associated with the use of high fluidity gutta-percha and, at the same time, eliminating the problem represented by high incidence of overfilling.

**Methodology:** The apical finishing is performed using Ni-Ti files for cleansing the apical portion, thanks to two vertical and non-spiral blades with a strongly taper in the first mm of the working part.

**The first phase:** it consists in choosing a gutta-percha master cone with a taper 02 that adapts to the apical preparation and acts as a "plug". Once the canal has dried, the sealer-soiled master cone is then introduced into the last apical millimeters and compacted with a nickel titanium Spreader (Fig. 1), allowing the cone to make contact with the canal wall only at the level of the last apical millimeter and leaving sufficient space for the second phase of the obturation (Fig.2).



Fig. 1 Spreader 25.04.

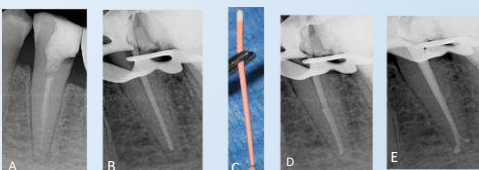


Fig. 2 A Preoperative radiograph 3.5. B Radiograph of trying the master cone of gutta-percha at a 1 mm working length without sealer. C Amount of sealer used with the gutta-percha master cone. D Radiograph after inserting the master cone of gutta-percha with sealer into the canal and lateral compaction with a spreader. E Postoperative radiograph after placement of preplasticized gutta-percha.

**The second phase:** it consists in the introduction of the thermoplasticized guttapercha using the rotating Condenser (Fig. 3-4). This, thanks to the design of the instrument blades, pushes the filling material towards the apex. If in the postoperative radiograph an imperfect obturation of the canal is observed, it is possible to re-enter the still soft gutta-percha with the Spreader, creating space for the insertion of another quantity of thermoplasticized gutta-percha with the Condenser.



Fig. 3 Condenser 25.04.

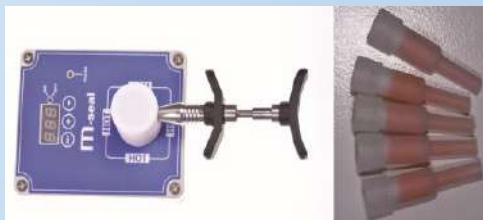


Fig. 4 Heater M-Seal and Microflow cartridge.

**Discussion:** Upon radiographic examination, the root canal obturations appear dense and homogeneous, the gutta-percha shows a good adaptation to the endodontic morphology, resulting in good filling of the irregularities of the root canal system. The presence of lateral canals and complex apical system were highlighted (Fig. 5-6-7).

**Conclusion & Clinical Relevance:** In the M-seal technique, the solution to the problem of vertical control of thermoplasticized gutta-percha was found using a gutta-percha master cone that can be well adapted to the apical preparation, thanks to the use of a very malleable guttapercha and the condensation action of the Spreader. After 25 years, the M-Seal technique can prevent the overfilling of the guttapercha, preserving the high filling capacity of the endodontic system that is characteristic of the techniques that use thermoplastic gutta-percha.

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Fig. 5 A Preoperative radiograph 1.6. B Postoperative radiograph. C Follow-up radiograph after 17 years.



Fig. 6 A Preoperative radiograph 3.8. B Postoperative radiograph. C Follow-up radiograph after 12 month.

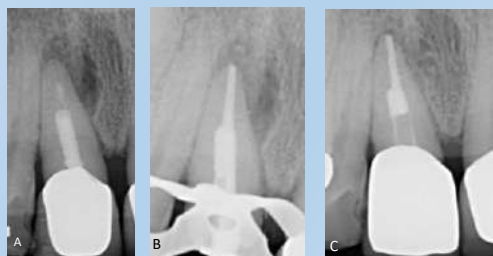


Fig. 7 A Preoperative radiograph 1.1. B Postoperative radiograph. C Follow-up radiograph after 14 month.

# Management of extensive external cervical resorption in a 14 years old patient

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## Aim

To present the management of extensive external cervical resorption (ECR) in upper first incisor in a 14 years old patient.

## Introduction

ERC is the dynamic loss of hard dental tissue in the cervical region of teeth of multifactorial aetiology: orthodontic treatment, traumatic injury, etc.

## Case Presentation

A 14-years old boy came to endodontic practice due to cavitation on the buccal cervical part of upper right first incisor. Clinical examination and periapical radiograph indicated diagnosis of ECR so the patient was referred to cone beam computed tomography (CBCT). The CBCT revealed the true nature of ERC and was defined as Patel class 2Cp (Fig.1).

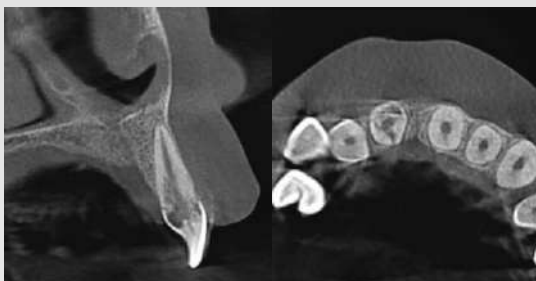


Fig.1

## Methodology

The ERC management included endodontic treatment and restoration of the resorptive defect. The granulomatous tissue was removed with sharp excavators and ultra-sonic endodontic tips (Fig.2). Persistent bleeding was present. The whole cavity was treated with 3% sodium hypochlorite solution (NaOCl) and granulomatous tissue was removed in two visits with calcium hydroxide as interappointment medication (Fig.3). The resorptive defect was closed with Biodentine (Septodont, Saint Maur-des-Fosses, France) using projector technique (Fig.4,5). The 3-4 mm of superficial Biodentine on the buccal side was removed and restored with glass ionomer (GIC) (Equia Forte HT, GC). Then the tooth was isolated and chemo-mechanical preparation using ProTaper Gold (Dentsply Sirona) and 3% NaOCl was finished and root canal filled with BioRoot RCS (Septodont) (Fig.6). The access cavity was closed with GIC (Equia Forte).



Fig.2



Fig.3



Fig.4



Fig.5

## Discussion

The resorptive defect was cleaned and restored conservatively with bioactive materials followed by endodontic treatment. After one year, the tooth is without symptoms and periapical radiograph does not show recurrence of the resorption (Fig.7).



Fig.6



Fig.7

## Conclusion & Clinical Relevance

The success of ERC management depends on accurate assessment of the lesion using CBCT and precise treatment plan with bioactive materials as great option for dentine substitution.

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