

## Clinical posters

Thursday 17th September



**The opinions expressed are those of the authors. The views expressed do not necessarily represent best practice, or the views of the European Society of Endodontology.**

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## A MINIMALLY INVASIVE APPROACH TO RADIX ENTOMOLARIS DURING ENDODONTIC TREATMENT



### AIM

DESCRIBING A CONSERVATIVE APPROACH TO ENDODONTIC TREATMENT OF LOWER FIRST MOLARS SHOWING RADIX ENTOMOLARIS USING CARRIER BASED OBTURATION TECHNIQUE

### INTRODUCTION

RADIX ENTOMOLARIS (RE) IS A SUPERNUMERARY DISTAL ROOT ON THE LINGUAL ASPECT OF MANDIBULAR MOLARS (LENHOSK 1922, STAMFEL 2014). IN EUROPEAN, AFRICAN, EURASIAN AND INDIAN POPULATIONS IT HAS BEEN REPORTED THAT A SEPARATE RE IS PRESENT IN THE MANDIBULAR FIRST MOLAR WITH A FREQUENCY <5%, WHILE IN POPULATION WITH MONGOLOID TRAITS THE RE IS MORE FREQUENT (UP TO 40%). [2] THE MAJORITY OF THE RADICES ENTOMOLARIS ARE SMALLER THAN THE DISTOBUCAL ROOTS [3], PRESENTING MODERATE/SEVERE CURVATURES (MOOR ET AL. 2014). CURVATURES IN THE MIDDLE/CORONAL PORTION OF THE ROOT CANAL IN RE ARE VERY COMMON AND ARE GREATER IN BUCCAL-LINGUAL DIRECTION THAN ON THE MESIAL-DISTAL PLANE. UNFORTUNATELY, ONLY THE MESIO-DISTAL PLANE IS VISIBLE ON PERIAPICAL RADIOGRAPH, WHILE BUCCO-LINGUAL CURVATURE CAN BE PERCEIVED WITH INTRA-OPERATIVE RADIOGRAPHS, TAKEN WITH DIFFERENT PROJECTION OR WHIT CT THAT PROVIDED MORE ACCURATE INFORMATION IN TERMS OF RE INCLINATION AND ROOT CANAL CURVATURE. CLINICIANS SHOULD BE AWARE OF THE CURVATURE OF DL ROOTS THAT COULD BE MASKED ON REGULAR PERIAPICAL RADIOGRAPHS (YI-CHEN CHEN ET AL 2009). AN INVASIVE INSTRUMENTATION COULD LEAD TO INSTRUMENT SEPARATION, CANAL TRANSPORTATION AND/OR ROOT PERFORATION (SOUZA-FLAMINI ET AL 2014).

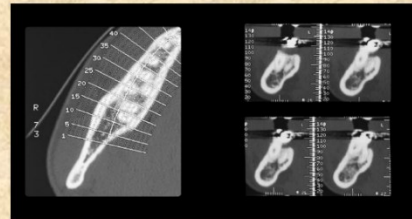


Fig. 1

### CASE PRESENTATION

A 35 YEARS OLD WOMAN COMPLAINED FOR PAIN ON BITING ON LOWER RIGHT MOLAR REGION. ELECTRIC TEST, PERCUSSION TEST AND THERMAL TEST LED US TO THE DIAGNOSIS OF PULP NECROSIS ON TOOTH NUMBER 46. PRE-OPERATIVE RADIOGRAPH (FIG. 3A) AND CBCT (FIG. 1) REVEALED THE PRESENCE OF RE. TREATMENT OPERATIONS INCLUDED: IAN ANESTHESIA, RUBBER DAM

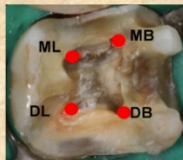


Fig. 2

ISOLATION AND AFTER CARIES REMOVAL THE PULP CHAMBER WAS OPENED.

A TRAPEZOIDAL ACCESS WAS PERFORMED IN ORDER TO LOCATE THE ACCESS ORIFICE OF THE ROOT CANAL IN THE DISTO-LINGUAL ROOT (FIG. 2). ALL THE CANALS WERE SHAPED USING PROTAPER UNIVERSAL FILES (DENTSPLY MAILLEFER) UP TO F2 FILE, EXCEPT FOR RE CANAL WHICH WAS SHAPED USING PROTAPER FILES UP TO F1 AND PROFILE 30.04 (DENTSPLY MAILLEFER).

WORKING LENGTH DETERMINATION WAS VERIFIED ELECTRONICALLY AND RADIOGRAPHICALLY (FIG. 3B). CHEMICAL DEBRIDEMENT AND DISINFECTION WAS OBTAINED ALTERNATING E.D.T.A. 10% AND SODIUM HYPOCHLORITE 5% DURING ALL SHAPING PHASES. CONTINUOUS WAVE CONDENSATION (CWC) TECHNIQUE WAS USED TO FILL ALL CANALS EXCEPT FOR RX WHERE A THERMAFILL 25.04 WAS USED (FIG. 3C).

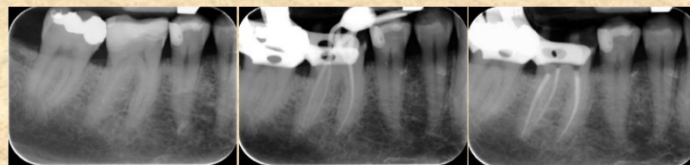


Fig. 3A

Fig. 3B

Fig. 3C

### DISCUSSION

PREDICTABLY SUCCESSFUL IN A RE ROOT CANAL TREATMENT DEPENDS ON A PROPER ANGULATION AND INTERPRETATION OF RADIOGRAPHS, IN A STRAIGHT LINE ACCESS WITH A TRAPEZOIDAL OPENING CAVITY AND IN A CORRECT CLEANING, SHAPING AND OBTURATION SYSTEM.

MOST RE ARE THINNER THAN OTHER ROOTS AND OFTEN PRESENT A SEVERE CURVATURE WITH A BUCCAL ORIENTATION STARTING FROM THE CORONAL THIRD. THESE FINDINGS DESERVE ATTENTION DURING MECHANICAL PREPARATION OF THE CANAL: A NON CONSERVATIVE INSTRUMENTATION TECHNIQUE CAN RESULT IN INSTRUMENT SEPARATION AND OTHER PROCEDURAL ERRORS SUCH AS LEDGES, STRIPPING AND ROOT PERFORATIONS. AS TAPER HAS NO INFLUENCE IN CLEANING ABILITY, A CANAL PREPARATION WITH TAPER 04 REDUCES RISKS WITHOUT AFFECTING DISINFECTION OF ROOT CANALS (SIQUEIRA ET AL 1999, DE LIMA, MACHADO ET AL 2010, AYDIN ET AL 2007, ARAVITI & KHABBAZ 2011) AND ALLOWS AN ADEQUATE OBTURATION USING CARRIER BASED TECHNIQUE (FIG. 4).



Fig. 4

THE THERMAFILL (DENTSPLY MAILLEFER) SYSTEM IS A PROPER ALTERNATIVE TO CWC FOR ROOT CANALS FILLING WITH CORONAL CURVES: IT REQUIRES LIMITED CANALS DIAMETERS COMPARED TO CONTINUOUS WAVE CONDENSATION, MOREOVER CORONAL/MIDDLE CURVATURES OFTEN DO NOT ALLOW THE INTRODUCTION OF PLUGGERS TO 4-6MM FROM WL (CANTATORE 2002) (FIG. 5).

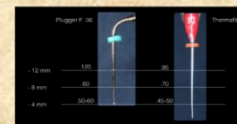


Fig. 5

### CONCLUSIONS

CARRIER-BASED OBTURATION IS A GOOD CHOICE FOR RADIX ENTOMOLARIS ROOT CANAL FILLING AS IT ALLOWS A MORE CONSERVATIVE INSTRUMENTATION TECHNIQUE REDUCING THE RISK OF IATROGENIC ERRORS IN MODERATE/SEVERE CURVED CANALS.

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## Diagnosis of perforating internal root resorption by cone-beam computed tomography (CBCT)



### – a case report

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**Aim:** to present a case of a tooth with perforating internal root resorption diagnosed with the cone-beam computed tomography.

**Summary:** A 41-year-old female patient was referred to a dental office for the treatment of maxillary left central incisor due to its discoloration. The tooth was traumatized during childhood. Information concerning previous treatment in another dental surgery two years previously was obtained (Fig.1). The tooth had been treated with the direct pulp cupping with the Mineral Trioxide Aggregate (MTA). Since then the tooth had been painless but had become discoloured in the cervical area. CBCT examination of the tooth was carried out to verify the provisional diagnosis of root canal resorption and to evaluate the extend of tissue damage. The resorptive lesion was estimated to measure 4x3.5 mm in apico-coronal and bucco-palatal directions, respectively. In addition, a perforation of 1.6 mm on the distal surface of the root was detected (Fig.2a,b). Based on the information obtained, a diagnosis of perforating root canal resorption in the cervical one-third of the root was established. Due to the small size and location of the perforation, non-surgical root canal treatment was carried out. The root canal was chemomechanically prepared using the NiTi rotary instruments with crown-down technique. The perforation was repaired with MTA and the canal dressed with calcium hydroxide for one month, before being filled with gutta percha, to a level apical to the resorptive defect, using the continuous wave of condensation obturation technique. Finally, the root was reinforced with a fibreglass post (Fig 3). All treatment was carried out with the aid of a surgical microscope.

#### Key Learning Points:

- Internal root resorption presents diagnostic and treatment challenges.
- CBCT is a valuable diagnostic aid for root resorption.
- In some cases the successful non-surgical treatment of perforating internal root resorption is possible using MTA and the surgical microscope.

Fig.1. Radiograph taken during previous treatment



Fig. 2a. CBCT scan – sagittal view

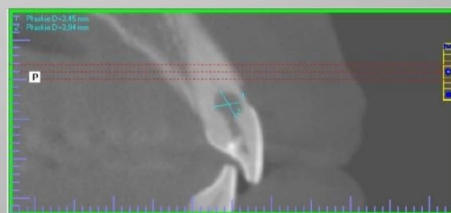


Fig. 2b. CBCT scan – axial view

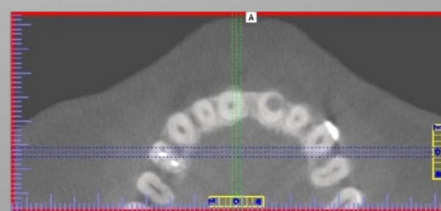


Fig. 3. Postoperative radiograph





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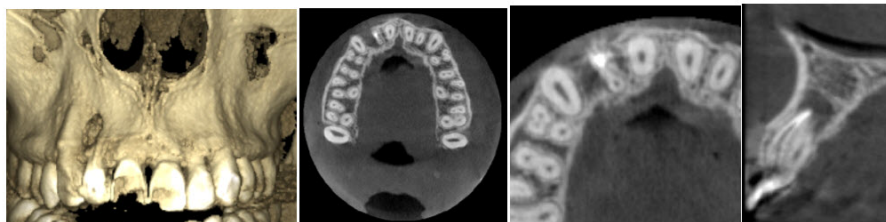
### **Treatment of a two rooted maxillary lateral incisor by using CBCT as a diagnostic aid.**

#### **Aim**

To describe how a cone beam computed tomography (CBCT) can help us in the visualisation of unusual root anatomy in a maxillary lateral incisor with two separate canals and apices.

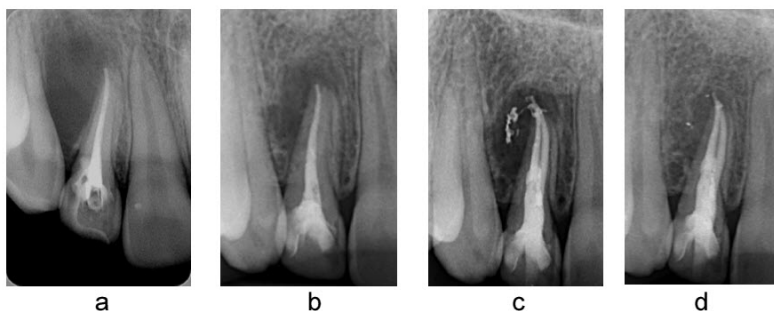
#### **Summary**

A 20-year-old patient presented with a chief complaint of pain while biting on his maxillary lateral incisor. Clinical examination revealed tenderness on palpation of the bucco-gingival fold and a sinus tract formation. On the x-ray taken on the diagnostic visit in 2012 an apical reaction was visible. Also the root canal filling seemed offset to the distal side of the root. Closer inspection of the x-ray made us suspect an extra root(canal) to be present. In order to determine the presence and location of an extra root(canal) a CBCT was taken. On these images indeed a supernumerary root is shown with a proper apical foramen. It starts 2mm under the entrance of the buccal canal to the palatal side. In essence this is not a dens invaginatus or dens in dente, since two separate apical foramina can be determined. Meaning this maxillary lateral incisor has two separated root canals.



Endodontic treatment was performed, treating the extra palatal canal and retreatting the buccal canal. Rotary NiTi instruments (Mtwo, VDW, Munich, Germany) were used for shaping, passive ultrasonic irrigation was performed with NaOCl 2,5% and obturation was carried out with a vertical warm obturation technique.

A 2 years follow-up shows healing of the peri-apical tissue.



a) final x-ray 2007, b) diagnostic x-ray 2012, c) final x-ray 2012, d) follow-up 2014

#### **Key learning points**

- Untreated root canals contain necrotic tissue, which can allow irritants to reach the periapical tissues, and initiate inflammatory reactions and ultimately pain.
- The classic diagnostic x-ray already gave us the suspicion of an extra root or root canal. The use of CBCT diagnostics helps to determine the presence of a supplementary root canal and gives insight in its location.



## Endodontic treatment of complex crown and root fractured first and second maxillary bicusps: clinical and CBCT radiographic case report

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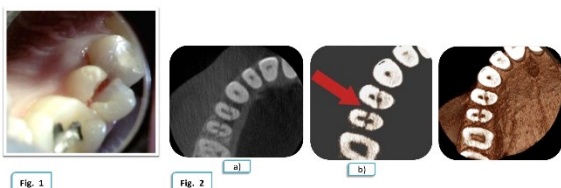


### Aim

To present a diagnostic procedure, endodontic treatment outcome and one year follow up in patient with complex crown and root fractures in both maxillary right bicusps with the aid of intraoral photographs, periapical radiographs and cone-beam computed tomography.

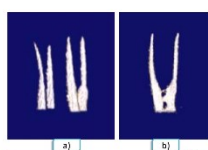
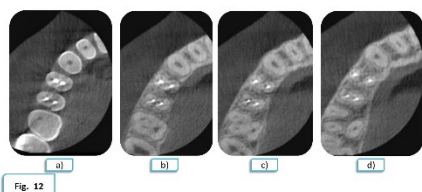
### Introduction

Fracture of a tooth crown associated with the root fracture could cause numerous and various problems in both endodontic treatment and restoration of such cases. Since no reports about combined fractures of crowns and roots in two adjacent teeth has been found in the current literature it was decided to present a case with complex fractures of both maxillary premolars, treatment outcome and one year follow-up.



### Case presentation

A male patient age of 20 came to the Department of Restorative Odontology and Endodontics with constant pains in the region of right maxillary premolars, two months after accident, when mandibular fracture has been treated with mini-plates surgery procedure. Clinical examination revealed vertical fractures in both maxillary right bicusps, with separation of fragments of the crown on tooth 14 (Fig. 1), and discrete cracks on mesial and distal aspects of the tooth crown in tooth 14 (Fig. 1). Series of CBCT images on Scanora 3DX (Soredex, Tuusula, Finland) at different levels, and 3D reconstructions, were made to achieve complete diagnosis and treatment plan (Figures 2-8). Coronal fragments were fixed with the circular metal band (Fig. 9) and root canal instrumentation was conducted using ProTaper Next (Dentsply/Maillefer, Ballaigues, Switzerland), and Revo S (Micro Mega, Besançon, France) on teeth 14 and 15, respectively. Granulation tissues were removed using "SAF" system (RedentNova, Raanana, Israel) (Fig. 10). "Biodentin"- tricalcium silicate cement (Septodont, Saint Maur des Fosses, France) was used for permanent obturation (Fig. 11), and coronal defect restored with combination of GJC and composite material. At one year follow-up series of CBCT scans were made to confirm effect of the whole treatment.

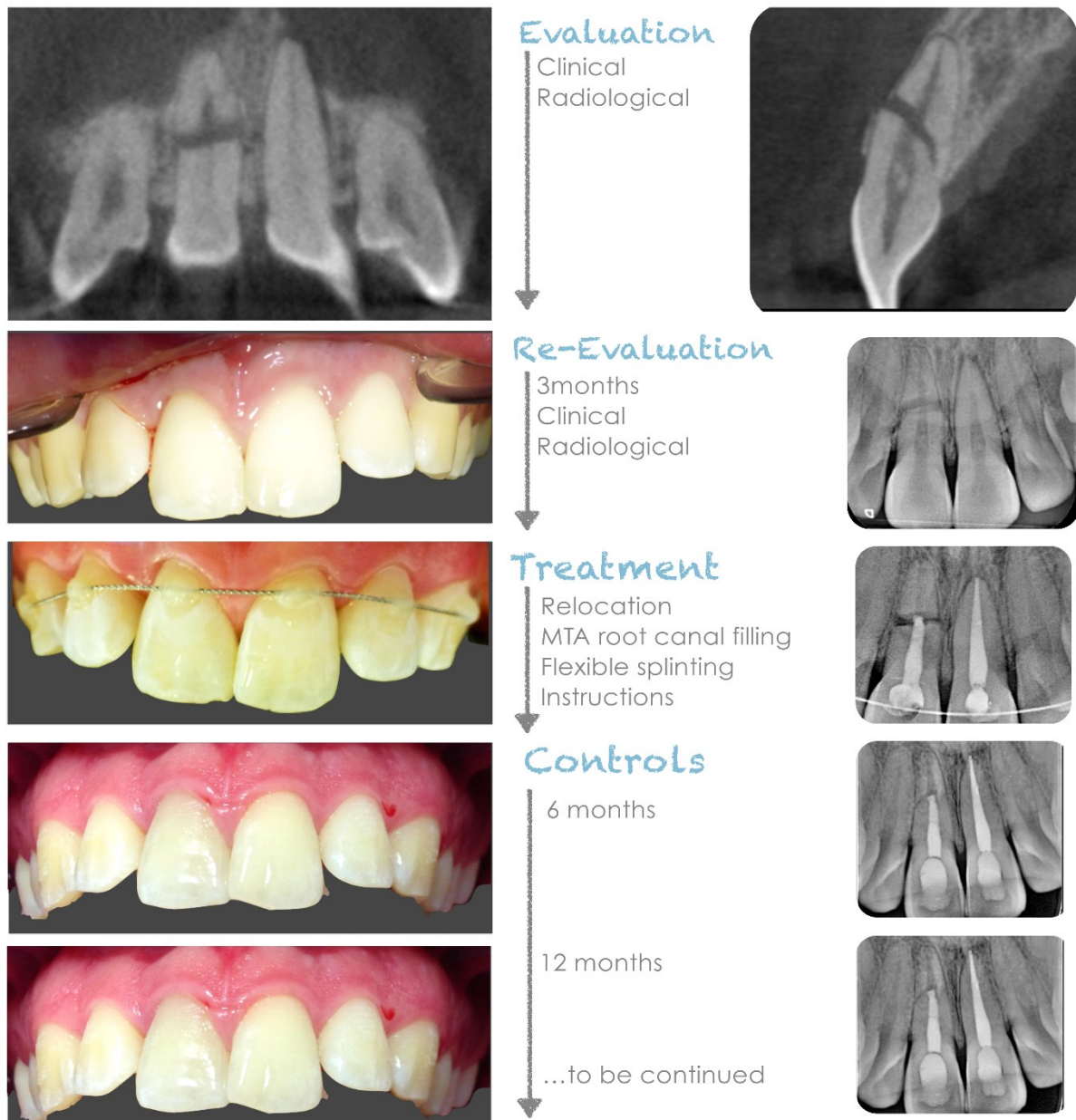


### Key learning points

- CBCT is powerful mean in certain and reliable diagnosis of complex root fractures and endodontic treatment outcome and control follow-up.
- With careful and adequate instrumentation and removal of all necrotic and granulation tissues from all root canals, followed by permanent obturation with bioactive solid material, it is possible to successfully treat complex root fractures, even neglected for several months.

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**GUIDELINES FOR THE MANAGEMENT OF A HORIZONTAL ROOT FRACTURE**


International Association of Dental Traumatology guidelines for the management of traumatic dental injuries: 1. Fractures and luxations of permanent teeth; Diangelis AJ, Andreasen JO, Ebeleseder KA, Kenny DJ, Trope M, Sigurdsson A, Andersson L, Bourguignon C, Flores MT, Hicks ML, Lenzi AR, Malmgren B, Moule AJ, Pohl Y, Sukiboshi M.; Dent Traumatol. 2012 Feb.

Horizontal root fracture treated with MTA, a case report with a 10-year follow-up; Roig M., Espón J., Mercadé M, Duran Sindreu F.; Dent Traumatol. 2011 Dec.

Comparative study of mta and other materials in retrofilling of pulpless dogs teeth Bernabé PF, Holmd R, Morandi R, De Souza V, Nery MJ, Otoboni, Filho JE, Branz Dent J., 2005.

## Intraoperative use of CBCT: report of two clinical cases

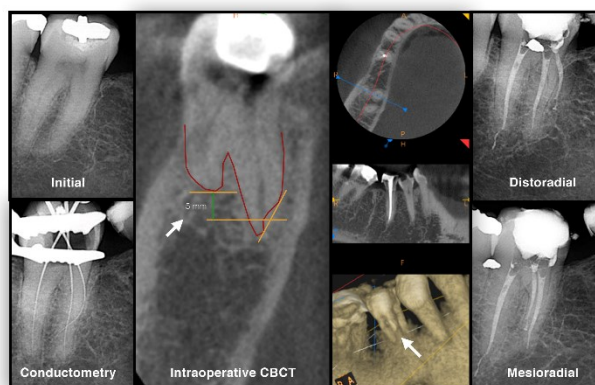
De la Rosa, H; Valencia, O; Díaz-Flores, V; De la Torre, F; Cisneros, R.

**Aim:** The aim of this poster is to show the intraoperative CBCT clinical influence: two clinical cases.

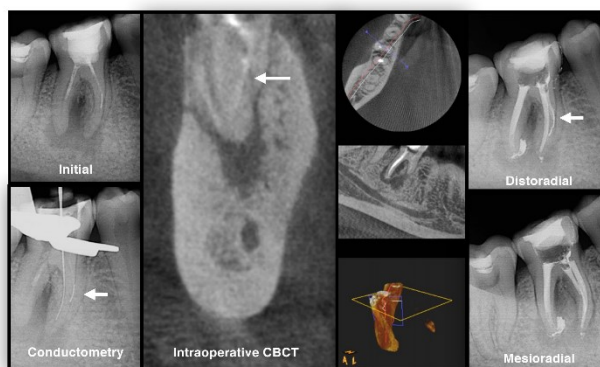
**Introduction:** During the endodontic treatment may arise situations that can complicate achieving the treatment goals, as irrigation, root canal preparation, disinfection or three-dimensional sealing. These unexpected situations are due to different factors such as partial file fracture, root canal location or complex anatomy <sup>1,2</sup>.

**Case presentation 1:** In this second inferior molar (47), we saw a significantly shorter length between the two mesial canals.

After performing an intraoperative CBCT, we found that it was just an unusual molar anatomy.



**Case presentation 2:** This is a second inferior molar (46) started with the presence of a fractured file in mesiolingual canal. After a huge effort to try to do a bypass, we decided to perform a intraoperative CBCT due to the difficulty of the case.



After performing an intraoperative CBCT, we found that mesiolingual canal joins at the apical third with mesiobuccal canal, ending in one foramen.

**Conclusion:** The intraoperative CBCT, is a helpful tool that can be used to obtain a three- dimensional view of the root anatomy providing necessary data to solve incoming clinical complications <sup>1,2</sup>.

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## Bone-Like Tissue In-Growth, Transient Ankylosis and Continued Root Formation Following Replantation of an Avulsed Immature Tooth: A Report of a Case

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**Aim:** Avulsion is a dental emergency in which the speed and nature of management affects the prognosis of the tooth. Replantation is, in most situations, the treatment of choice and numerous biological pulpo-dentinal responses may follow it. A case of bone-like tissue in-growth, transient ankylosis and continued root formation after replantation is presented.

**Summary:** A six year-old girl sustained an avulsion injury to her maxillary right central incisor (Fig. 1). The tooth was immersed in milk within 5 minutes of the incident and was replanted approximately one hour after the injury (Fig. 2). It was then monitored for 44 months. Radiographic review 6 months after the injury disclosed a bone-like tissue growth in the root canal space of the replanted tooth and signs of ankylosis, including a high-pitched percussion tone, decreased mobility and 1 mm of infra-occlusion in relation to the adjacent central incisor (Fig. 3). Although decoronation was indicated according to Malmgren (2013), it was decided to continue close follow-up. Forty-four months follow-up revealed that the replanted tooth was in supra-occlusion by 1-2 mm, relative to the adjacent central incisor and it exhibited no signs of ankylosis. Radiographic signs of continued root formation, i.e., elongation and thickening of the dentinal walls and narrowing of the apical foramen, were noticed (Fig. 4).

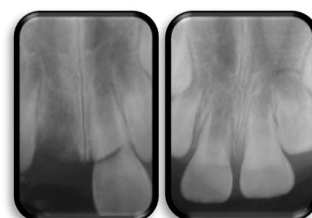


Fig. 1

Fig. 2

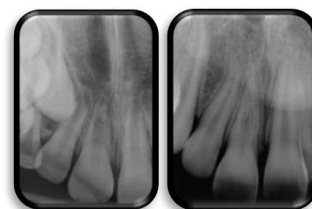


Fig. 3

Fig. 4

### Key Learning Points:

- Although decoronation is indicated in the literature when signs of ankylosis and initial infra-occlusion are present, in case of a very immature tooth replanted in favorable conditions, regular monitoring without any intervention might be suggested as long as there are no pathologic signs or evident of progression of the infra-occlusion.
- Clinicians should bear in mind that in some cases transient ankyloses may occur, thus rendering decoronation unnecessary.

**References:** Malmgren B (2013) Ridge preservation/decoronation. *Journal of Endodontics* 39, 67-72.



## The Value of Cone Beam Computed Tomography in Detecting Suspicious Vertical Root Fracture; A report of a case

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**Aim:** Vertical root fracture (VRF) develops longitudinally along the root and might be difficult to diagnose clinically and radiographically. Classic clinical findings include the presence of an isolated deep periodontal pocket, crestally located sinus tracts and the presence of "halo" radiolucency around the root or angular radiolucency in the crestal bone and along the root. However, it is difficult to reach a definitive diagnosis on the basis of signs and symptoms alone because they are not always present and are not specific to fractures. Furthermore, conventional digital radiograph is limited by its 2- dimensional nature; VRF is detected if there is a separation of the root fragment or if the fracture is transverse in the direction of the beam. A case of an undiagnosed VRF on the buccal aspect of upper molar palatal root is presented.

**Summary:** A fifty years-old woman was referred for consultation regarding a 10X10 mm radiolucency surrounding the upper right second premolar and first molar (Fig. 1). The first molar was endodontically treated more than 15 years ago. Since no signs or symptoms were present and the premolar was diagnosed as vital, cone beam computed tomography (CBCT) was performed. Large perforation at the furcation was diagnosed and the tooth was extracted (Fig. 2). Radicular cyst was diagnosed following enucleation and biopsy. On clinical examination, the furcation area was found to be intact. Surprisingly, a VRF on the buccal aspect of upper molar palatal root was clinically noticed (Fig. 3). Both conventional radiography (CR) and CBCT failed to detect VRF.



Fig. 1

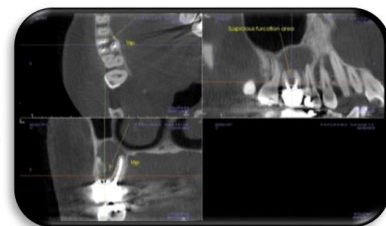


Fig. 2



Fig. 3

### Key Learning Points:

- No superiority of CBCT compared with CR was found in the present case. Furthermore, an unexcited perforation was falsely diagnosed on CBCT followed by a tooth extraction.
- Although VRF is commonly found on the buccal aspect of buccal roots, clinicians should bear in mind the possibility of VRF on the buccal aspect of palatal root, which might not be diagnosed following clinical examination, CR and CBCT.

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*The importance of CBCT (cone beam computed tomography) in the evaluation of periapical lesions caused by endodontic failures.  
 A case report.*

**Aim:** Our purpose is to discuss the advantages of the CBCT in the damage assessment compared to the conventional radiographs.

**Introduction:** Cone beam computed tomography has been proved to add a huge variety of advantages, in quality as well as precision. Thus, it was decided to evaluate a case using both techniques, in which an endodontic failure was found, in order to compare the results.



Fig. 1



Fig. 2

**Case presentation:** This patient came with a pain in one of his teeth (4.7.), which is referred to have an endodontic treatment a year ago. During the diagnosis, a conventional periapical radiograph was made to evaluate the cause of this problem. It showed an obturation deflection on the distal root of the teeth. Nevertheless, no periapical lesion was found (fig.2). It was decided to contrast this information with a cone beam computed tomography image. Using a narrow field of view (FOV), the results were divergent. It was found to have bone damage, confirming the defective root canal filling (figs 3, 4).

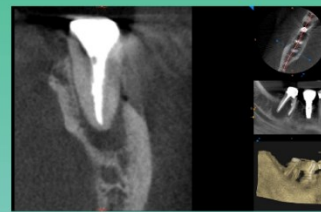


Fig. 3

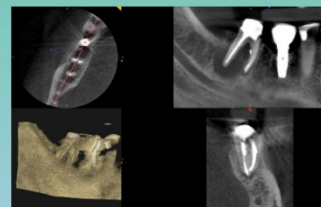


Fig. 4



Fig. 5

**Discussion:** CBCT was able to determine whether a periapical lesion was present due to a defective root filling although conventional radiograph showed no alteration. Cone beam computed tomography adds quality and precision to the radiographic imaging, which is a positive feature when diagnosing. The symptoms were relieved after retreatment was performed (fig.5).

**Conclusions and clinical relevance:** Cone beam computed tomography is a useful tool in endodontics, even though of its higher cost and its wide learning curve. CBCT give us a more precise image, appropriate in the valuation of periapical damage, compared to other imaging techniques.

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## Detection of vertical root fractures using Digital Subtraction Radiography: Report of 3 cases



**Aim:** To evaluate the suitability of a Digital Subtraction Radiography (DSR) technique for the early diagnosis of vertical root fractures (VRFs) of endodontically treated teeth in 3 clinical cases.

**Introduction:** Vertical root fractures (VRFs) are most commonly associated with root filled teeth. Diagnosis is challenging, because the clinical signs and symptoms are not completely pathognomonic and due to the low sensitivity of conventional periapical radiograph. DSR is a technique that can detect small changes between two successive radiographs.

**Cases Presentation:** All patients' medical histories were non contributory. Access opening was made for each tooth and the root canals were instrumented using the ProTaper Next Ni-Ti rotary system (Dentsply-Maillefer, Maillefer Instruments SA, Ballaigues, Switzerland). The root canals were irrigated with 2.5% NaOCl and an EDTA paste (Glyde, Dentsply-Maillefer) was used as a lubricant. Ca(OH)<sub>2</sub> paste was placed as an interappointment medicament. The root canals were obturated by using the lateral condensation of gutta-percha points technique and Roth's 801 (Roth International Ltd., Chicago, IL, USA) as a sealer. A recall programme was then scheduled. After 3 and 5 years respectively, the patients referred symptoms. No fracture line was visualized by periapical radiographs. Subsequently, DSR images were carried out between the post operative and the recent radiograph. A new digital image processing software (EIKONA SUBTRACTION RADIOGRAPHY) was used for this purpose. The resulting digital subtractive images were further processed by using contrast enhancement and pseudocoloring methods. Regions where both radiographic images had the same intensity are shown as gray on the digital subtractive image. Regions where the later radiograph is more radio-lucent than the earlier one are demonstrated as dark regions on the digital subtractive image, whereas regions where the later radiograph is more radio-opaque than the earlier one are presented as white regions. So, the dark lines viewed in the main body of the root show the fracture line. By applying contrast enhancement methods on the DSR images, the dark areas that demonstrate tooth separation, were made more distinguishable over an homogeneous grey background. By using pseudocoloring methods, the dark areas of the DSR images were colored red. The confirmation of the VRFs was made either after the extraction of the tooth or after the flap reflection, or after the full radiographic separation of the fragments into the mass of the root filling materials.

**Case 1: Tooth #34**  
a. Post-operative radiograph.  
b. 3years recall: radiolucency in the proximal area.  
Clinical findings: tenderness to percussion and biting.  
c. Result of digital subtraction of (b.) from (a.).  
d. Image (c.) processed using contrast enhancement.  
e. Image (d.) processed using pseudocoloring. The VRF line was colored red.  
f. VRF in the extracted tooth.



**Case 2: Tooth #14**  
a. Post-operative radiograph.  
b. 5years recall: j-shape radiolucency in the mesial area.  
Clinical findings: swelling and sinus tract.  
c. Result of digital subtraction of (b.) from (a.).  
d. Image (c.) processed using contrast enhancement.  
e. Image (d.) processed using pseudocoloring. The VRF line was colored red.  
f. VRF showed after flap reflection.



**Case 3: Tooth #36**  
a. Post-operative radiograph.  
b. 5years recall: periapical radiolucency.  
Clinical findings: tenderness to percussion and biting.  
c. Result of digital subtraction of (b.) from (a.).  
d. Image (c.) processed using contrast enhancement.  
e. Image (d.) processed using pseudocoloring. The VRF line was colored red.  
f. VRF-Separation of the fragments clearly viewed in 8years recall radiograph.



**Conclusion:** The use of DSR proved to be a useful diagnostic tool for the detection of VRFs of endodontically treated teeth in these 3 clinical cases.

**Key learning Points**  
•Vertical root fracture •Digital Subtraction Radiography

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## Contemporary management of a perforated mandibular first molar by a multidisciplinary approach : report of a case with 7-year follow-up

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**Aim** To report on the multidisciplinary treatment of a mandibular first molar tooth with a root perforation.

**Introduction** Root perforations can occur as an unwanted event during nonsurgical endodontic treatment and can present significant treatment challenges. The prognosis of the treatment of root perforations depends on the size and location of the defect, the length of time the perforation is exposed to contamination, and the accessibility of the perforation to repair.

**Case presentation** A 52-year-old woman was referred to the Endodontic Department for assessment and treatment of a swelling associated with the mandibular left first molar tooth. Endodontic treatment was initiated on the tooth one year previously and the referring dentist reported that a perforation of mesial root had occurred during the treatment. In our department, non-surgical endodontic retreatment was carried out and the tooth was clinically and radiographically reviewed on a three-monthly basis for 18 months. However, the tooth remained symptomatic and swelling in the area of the tooth persisted during the review period. Despite its apparent poor prognosis, the patient expressed a desire to maintain the tooth, and a multidisciplinary treatment plan was formulated. The tooth was extracted and hemisected. Then, the distal part of the tooth was replanted and sutured. Ten months after the surgery, a miniscrew was implanted to move the replanted distal root mesially, and produce adequate space for an abutment. Two years after the hemisecting of the tooth, the distal root was used as the distal abutment for a bridge. The tooth was reviewed after 7 years, and clinical and radiographic examination revealed that the mandibular first molar tooth was periodontally stable without the presence of root resorption.

**Discussion** Iatrogenic root perforation is one of the most frustrating complications caused during root canal instrumentation. Hemisection and intentional replantation can be a treatment alternative when non-surgical endodontic treatment is either impossible or has not been successful, and periradicular surgery is not advisable because of poor visual and/or surgical access to the perforation site. Orthodontic miniscrew has provided rigid anchorage, and made biologically permissible movements possible. Fixed prosthetic bridge was performed for the hemisected and replanted tooth to maintain the favorable occlusion.

**Conclusion** Failed endodontic therapy as a result of iatrogenic root perforation was successfully managed using a multidisciplinary treatment approach.



Fig. 1

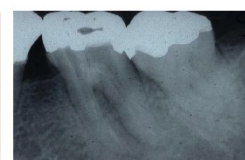


Fig. 2



Fig. 3



Fig. 4



Fig. 5

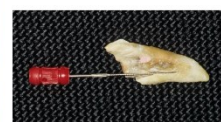


Fig. 6



Fig. 7

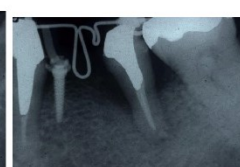


Fig. 8



Fig. 9



Fig. 10

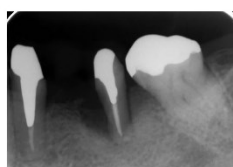


Fig. 11

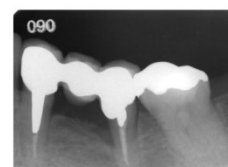


Fig. 12



Fig. 13



Fig. 14



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## Removal of separated files

### Using a needle & glue with operating microscope

**Aim :** To discuss various removal techniques of separated files.

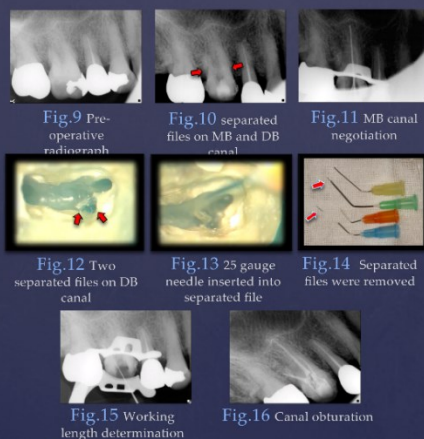
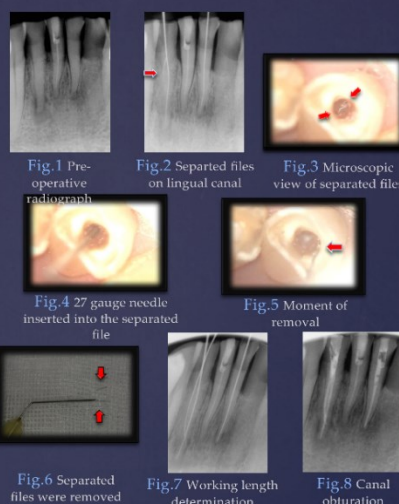
#### Introduction

A separated file blocks an access to apex remaining untreated root canal. Untreated pulp tissue and necrotic tissue induce inflammation and endodontic failure eventually. Improper use, limitations in physical properties, inadequate access, root canal anatomy, and possibly manufacturing defects are causes of separation.<sup>1)</sup> Removal of Separated files is difficult because of limited vision and access. Using operating microscope improve the vision and the smaller gauge needle make the access easy.

There are two cases of separated files on the coronal thirds of calcified root canals. For a removal of separated files, a smaller gauge needle and instant glue with operating microscope were used.

#### Case 1

An 80-years-old male was referred to department of conservative dentistry for endodontic treatment in lower right lateral incisor and left central incisor. Pre-operative radiograph showed a radiolucent lesion at the apex and calcified canals. ( Fig.1 ) During a canal negotiation of the lateral incisor by resident #10 K-files were broken, then referred for removal of separated files. Separated files were located on coronal third of lingual canal. ( Fig.2 ) With operating microscope, two separated files were found in lingual canal. ( Fig.3 ) One of separated files was removed with ultrasonic tip ( Endo Success Kit, Satelec ). But the other one binding firmly wasn't removed. A 27 gauge needle and instant glue ( LOCTITE401, Henkel ) were used because of small access cavity of lateral incisor. At first, made sure that the 27 gauge needle is suitable diameter for the separated file with operating microscope. The instant glue was coated to the tip of needle in extraoral. Then, the 27 gauge needle was inserted into the separated file quickly with operating microscope. ( Fig.4 ) After several attempts for bonding, the separated file was removed with the 27 gauge needle. ( Fig.5,6 ) Working length of buccal and lingual canal were determined. ( Fig.7 ) After Cleaning and shaping was completed, Canals were obturated by the continuous wave of condensation, using gutta-percha ( Dia-pro 04, Diadent ) and AH-26 plus jet ( Dentsply Maillefer ). ( Fig.8 )



#### Case 2

A 76-years-old female was referred for endodontic treatment of a upper right first molar from department of prosthodontics. After gold inlay fabrication, the patient was suffered from biting pain. The diagnosis was a cracked tooth syndrome, crown was fabricated, and endodontic treatment was performed for pain control by resident. Pre-operative radiograph showed calcified root canals. ( Fig.9 ) After access cavity preparation, mesiobuccal and distobuccal canal were not negotiated and improper use of a hand file made a separation. The patient referred for a removal of separated files and canal negotiation. ( Fig.10 ) The separated file on mesiobuccal canal was removed with ultrasonic tip and operating microscope. ( Fig.11 ) But the removal of two separated files on distobuccal canal was failed. ( Fig.12 )

Finally, a 25 gauge needle and instant glue were used for removal. The instant glue was coated to the tip of needle in extraoral. The 25 gauge needle was inserted into the separated file with operating microscope. After several attempt for bonding, separated files were removed. ( Fig. 13,14 )

Working length were determined. ( Fig. 15 ) After cleaning and shaping was completed, canals were obturated by the continuous wave of condensation, using gutta-percha( Dia-pro 04, Diadent ) and AH-26 plus jet( Dentsply Maillefer ). ( Fig.16 )

#### Discussion

Canal negotiation is difficult in calcified root canal. With operating microscope, straight line access, and careful instrumentation is mandatory to avoid separation of instrument. In case 1 and 2, difficulties in straight line access and calcified canal may cause of separation. In addition, improper use of hand file to bypass the separated file made another breakage of instrument. If file separation occurs, it is important to secure a vision with operating microscope and choose proper technique for removal.

#### Conclusion

A Smaller gauge needle and instant glue with operating microscope is one of the useful techniques for removal of separated file.

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**Title:** The use of Miller broach during microsonic removal of separated endodontic file: Case report

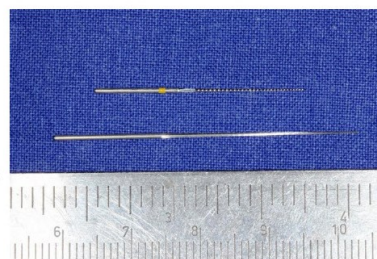
**Authors:** Schreindorfer Károly, Krajczár Károly

**Institution:** University of Pécs Medical School Department of Dentistry, Oral and Maxillofacial Surgery

**Aim:** Our goal was to evaluate the usability of Miller needle in microsonic removal of broken endodontic instruments.

**Introduction:** Endodontic instruments fracture is a great concern during root canal treatment. Microsonic technique is a widely accepted method for file removal. During microsonic removal the extent of the visible operation area can be influenced by the shape, length and type of ultrasonic instruments. (**Fig.1**)

Ledge formation can also be a big problem during preparation. The properties of the Miller broach can match the need of microsonic preparation, but its usage for this purpose was not yet described in the literature.



**Fig. 1**

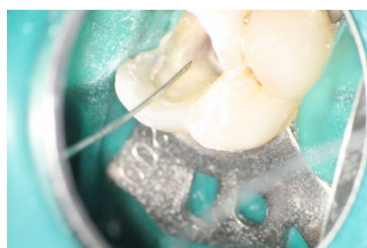
**Case presentation:** Our case report demonstrates broken instrument removal from 1.6 tooth with microsonic technique (**Fig.2**). Miller broach mounted in a piezoelectric scaler (UDS-E, Woodpecker, Guangxi, China) was used to remove broken instrument. The removal did not differ from the classical microsonic technique. Based on this case we try to evaluate controllability and efficiency of the Miller needle (**Fig. 3**, **Fig. 4**). The quality of definitive root canal filling and the preparation error was also evaluated according to periapical radiograph. The success of the treatment was assessed (**Fig. 5**).



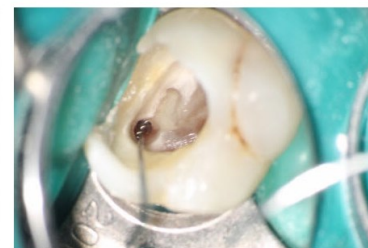
**Fig. 2**



**Fig. 5**



**Fig. 3**



**Fig. 4**

**Discussion:** The removal was successful. Severe preparation error did not reveal. The quality of definitive root canal filling was ideal. Using Miller broach with piezoelectric device proved to be successful for broken file removal. Based on our case several advantages of Miller broach were noticed.

**Conclusion & Clinical Relevance:** The shape, length, and diameter of Miller broach fulfill the requirement of microsonic technique.

**Key-words:** case report, broken instrument, ultrasonic technique, ledge formation, Miller broach.

**References:** Gianluca Plotino et al.: Ultrasonics in Endodontics: A Review of the Literature  
JOE Volume 33, Issue 2, Pages 81-95, 2007 Febr.



## A NEW TECHNIQUE AND A NEW DEVICE TO REMOVE BROKEN ENDODONTIC INSTRUMENTS FROM ROOT CANALS

Four case reports

### AIM:

For endodontic cases where it is not possible to leave a fragment, we present a new substance preserving and reproducible instrument removal device and technique using ultrafine wires.

### INTRODUCTION:

In many cases, preservation of a tooth containing a fractured endodontic instrument is only feasible, if the fragment can be removed. In particular, in serious cases with deeply located fragments in the apical root third or fragments that are penetrating the maxillary sinus or mandibular canal, removal by means of US technique or tube technique is not viable – here, the loop technique offers crucial advantages.

### METHODOLOGY:

The new instrument enables one-handed operation during the selective tapering of an ultrafine wire loop by an easily controllable adjustment ring on its steel structure. In order to place the wire loop on a fragment head, a gap of approx. 1mm depth through must be prepared by ultrasonic. Once the wire loop is positioned around the fragment head, it can be braced on the fragment by reducing its diameter. Subsequent removal under visual control (microscope or loupes) is achieved by pulling the fragment out of the root canal.



Fig. 1  
prototype

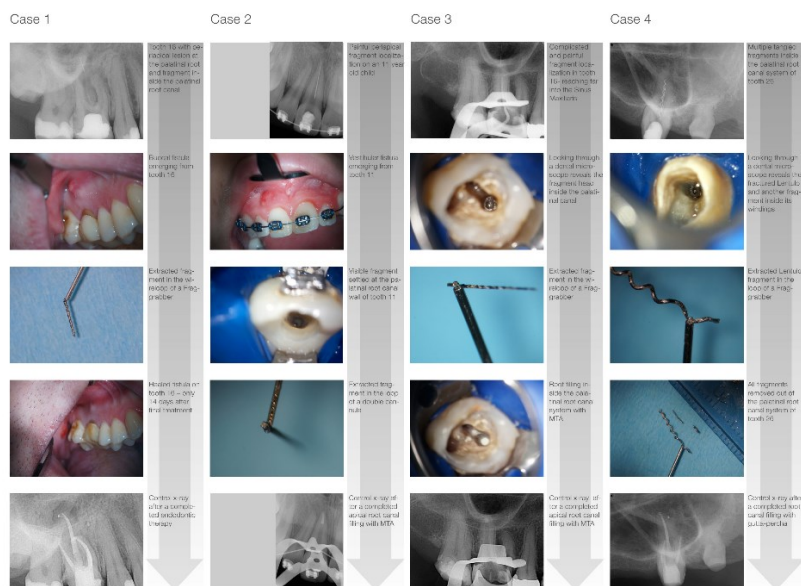


Fig. 2  
Drive wire with: Diameter ca. 0.5mm - 2.5mm,  
Wire thickness ca. 0.05mm - 0.075mm



Fig. 3  
Ground mandrel: Diameter ca. 0.4mm,  
Wire thickness ca. 0.07mm - 0.08mm

### CASE PRESENTATION:



### DISCUSSION:

The displayed cases clearly demonstrate that in a specific clinical situation, even a difficultly located fragment can be safely removed. An additional benefit of removing long fragments is an improved prevention of secondary fractures, as opposed to the ultrasonic technique.

### CONCLUSION AND CLINICAL RELEVANCE:

The wire loop technique is an efficient and substance preserving method of removing fractured root canal instruments out of root canals. No other fragment removal method allows for a better substance preserving procedure as this, even in cases of extremely far apical located fragments.

## Management of paraformaldehyde root canal cement in the inferior alveolar nerve canal with associated infection.



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### Aim:

This case report presents the management of an over-extended paraformaldehyde-containing root canal cement into the inferior alveolar nerve canal.

### Summary:

A 30-year-old man was referred for management of prolonged anesthesia in the right mandibular region following root canal treatment.

Panoramic radiography and cone beam computed tomography findings revealed that root canal cement had penetrated into, and laterally along, the inferior alveolar nerve canal mesial and distal to the distal root of the lower right second molar. The root canal cement contained paraformaldehyde.

Initially, the patient refused surgical removal of the cement. However, after 3.5 months, the patient returned with the complaint of an acute infection in the same region. After resolution of the acute abscess and root canal re-treatment, surgical treatment was performed under general anesthesia.

During surgery, a window through the cortical bone, extending from the distal aspect of the second molar to the mesial aspect of the first molar, was created by removing a block of the bone in order to provide access to the cement. Granulation tissue and necrotic bone surrounded the cement and these were curetted along with the cement. The block of bone was then repositioned with an 11 mm mini-screw to close the window.

Over the follow-up period of nine months, the patient showed some recovery in the sensory function of the buccal gingiva of the molar teeth when stimulated with a sharp explorer, compared with the pre-surgical situation. However, there have been no significant improvements in the sensory function of the lower right lip and the skin anaesthesia persists. A nine-month follow-up panoramic radiograph displayed no pathological changes in the surgical site.



Fig. 1. Panoramic radiograph showing the radiopaque root canal cement apical to the right mandibular second molar and in the inferior alveolar nerve canal.

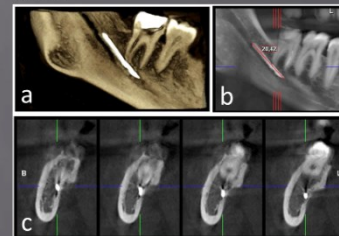


Fig. 2. CBCT images. a) 3-dimensional reconstruction. b) Panoramic reconstruction c) Cross-sectional images.



Fig. 3. Pre-surgical panoramic radiograph (3.5 months after the cement extrusion).



Fig. 4. Intra-operative view of the surgical procedure and the removed material. Note the granulation tissue around the extruded root canal cement in the inferior alveolar nerve canal.

### Key Learning Points:

Over-extended paraformaldehyde-containing root canal cement ideally should be removed immediately.

General dentists should be informed about the potential complications of using paraformaldehyde-containing root canal filling materials.

Careful radiographic evaluation throughout root canal treatment is crucial to minimize the risk of the cement being forced beyond the apical foramen.

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Barcelona – September 2015

## Displacement of calcium hydroxide paste in the inferior alveolar canal : transient and permanent paresthesia.

**Aim :** to discuss the consequences of accidental extrusion of calcium hydroxide paste in the mandibular canal.

**Introduction :** Denio et al. revealed that the apex of the second lower molar is on average located 3.7 mm from the upper border of the mandibular canal and that the mesial root apices of the first molar are further from the alveolar canal by about 6.9 mm (1). Calcium hydroxide pastes are intracanal antimicrobial agents of choice in endodontic therapy (2). Care has to be taken, as calcium hydroxide paste is able to induce intense inflammatory responses leading to necrotic and degenerative changes in animal models (3). The normal therapeutic sequence for injuries to inferior alveolar nerve (IAN) is the control of pain and inflammation and, whenever possible, the surgical elimination of the cause (4).

**Case report :** A 29-year-old woman without contributing medical condition was referred to complete endodontic treatment of tooth 46. Six weeks earlier, a pulpectomy had been performed and calcium hydroxide paste (Ultracal XS, Ultradent Products Inc. U.S.A) had been placed in the root canals with a syringe and a plastic needle. At the same time, extrusion of this paste into the inferior alveolar canal had occurred from the level of tooth 46 up to the mandibular foramen (fig1).

The patient had first complained of stabbing pain when the lower lip was mobilized and numbness of the left chin. Immediately after the event, she was given 24 mg of methylprednisolone per day for one week. She, then, started lowering the doses and stopped the medication at the end of the second week. The stabbing pain had disappeared but not the numbness.

The patient also reported having had the same accident when tooth 36 underwent pulpectomy and calcium hydroxide paste (type unknown) placement in 2002. The amount of extruded calcium hydroxide was less important than on the right side (fig 1). It was then decided to extract the tooth the same day. The numbness gradually disappeared without intervention over a period of 4 months.

Gambarini et al. considered cone-beam computed tomography (CBCT) an effective radiographic technique when endodontic-related IAN paresthesia is suspected (5). In the present case, CBCT clearly showed that the apices of tooth 46 were in contact with the inferior alveolar canal (figs 3 & 4). It also suggested that the extrusion occurred through the distal canal (fig 5). Information on possible apical damage during preparation was not provided. Clinical examination with thermal and mechanical tests confirmed paresthesia of the area of innervation of the inferior alveolar nerve (fig 4).

The endodontic treatment of tooth 36 was performed in one appointment (figs 6, 7 & 8). After anesthesia and isolation of the tooth with a rubberdam, the access cavity was refined. Working length was then measured with an electronic apex locator (Root ZX, Morita, Japan) and confirmed with a periapical radiograph. The distal canal was instrumented using K-files up to size 55 in a step-back technique. The mesial canals were prepared with nickel-titanium rotary files up to size 40 (Revo-S, Micro-Mega, Besançon, France). The root canals were irrigated with 2,5 % sodium hypochlorite and 17% EDTA. The tooth was filled with gutta percha and AH+ (Dentsply De Trey, Konstanz, Germany) using the lateral condensation technique.

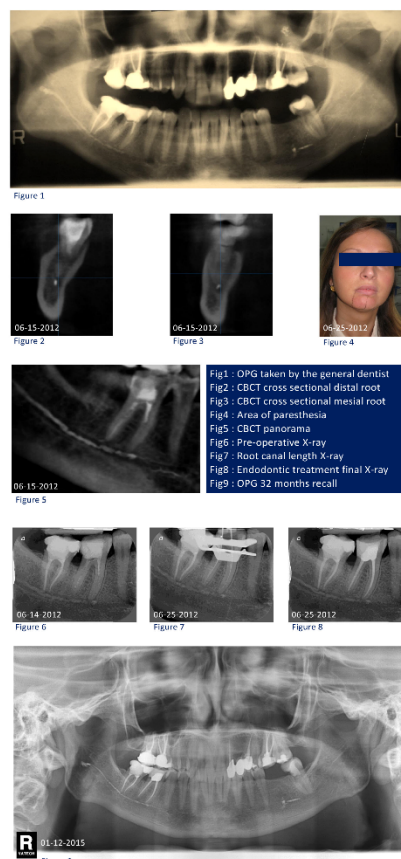
Paresthesia was monitored for up to 32 months from the initial consultation and did not show any improvement. The displaced calcium hydroxide paste did not show signs of resorption (fig 9).

### Conclusions and key learning points :

- Extrusion of calcium hydroxide paste in the inferior alveolar canal can cause paresthesia that may be permanent. The amount of extruded calcium hydroxide paste probably plays a role.
- Delivering calcium hydroxide paste with a syringe and needle should be done very carefully, especially when the inferior alveolar canal is very close to the apices. In such cases, the use of a Lentulo is probably safer.
- Calcium hydroxide paste does not show signs of resorption when displaced in the inferior alveolar canal.
- The prescription of corticosteroids was of very little help in the management of the paresthesia.

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## The influence of inadvertent MTA extrusion to the periapical tissue healing: a case report.

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**Aim.** To report on a case of inadvertent MTA extrusion during apexification in an immature tooth, which did not affect healing of the periradicular tissues.

**Introduction.** Over-extension of some root fillings may impair healing of the periradicular tissue. However, the biocompatibility of MTA means that in certain cases, it may not affect post-operative healing.

**Case report:** Almost half of the coronal tooth structure in an immature maxillary central incisor was lost in a 14 year-old patient (fig. 1). On completion of chemo-mechanical debridement of the root canal system, MTA (ProRootMTA, Dentsply Maillefer, Switzerland) was used to form an apical barrier (fig. 2 and 3). The root canal treatment was completed by lateral condensation of gutta-percha (fig. 4) and the tooth was restored with a glass fibre, post-retained composite resin restoration. The post was cemented with a dual-cure adhesive resin cement. Clinical and radiographic review of the tooth was carried out after one year. The tooth had remained asymptomatic and the pre-operative periapical radiolucency associated with the tooth had resolved, even around the extruded MTA (fig. 5).



Fig. 1



Fig. 2

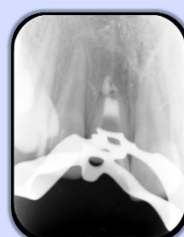


Fig. 3



Fig. 4

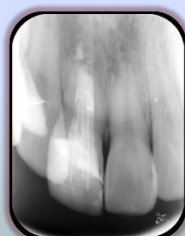


Fig. 5

**Discussion:** MTA is a material used in apexification. In this case it was observed that inadvertent extrusion of MTA during the apexification procedure did not affect healing of the periapical lesion, despite the material containing several heavy metals.

**Conclusion:** MTA is a biocompatible material, which is well tolerated by the periapical tissues, even in cases of inadvertent extrusion.

**Reference:** Chang SW et al. Heavy metal analysis of ortho MTA and ProRoot MTA JOE 2011 Dec;37(12):1673-6.

## Non-surgical single-visit retreatment of procedural severe mishaps occurred root canal therapy: Multiple case reports



ESKİŞEHİR OSMANGAZI ÜNİVERSİTESİ

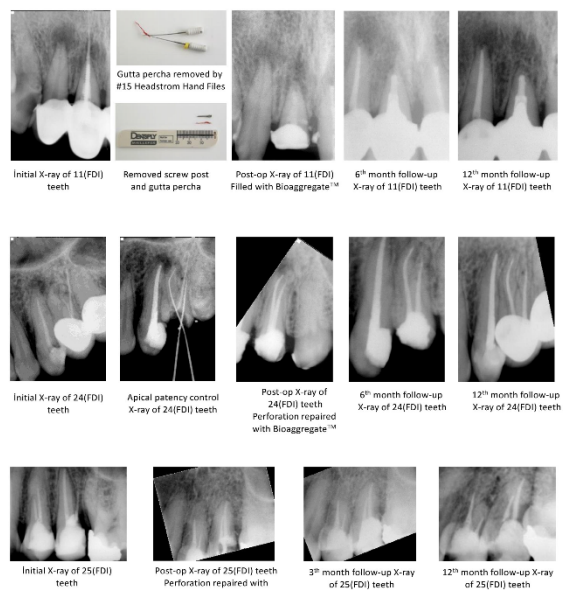
### Institute

### Aim

To present retreatment of procedural severe mishaps occurred root canal therapy using Bioaggregate™ without surgical procedures in single-visit.

### Case Report

Three different cases were presented with procedural severe mishaps occurred root canal therapy. The common and main symptom was pain during chewing in their endodontic treated teeth and the common problem was perforation detected in X-ray examination. Legal procedures were done before retreatment and old post-endodontic restorations were removed. Over filled gutta perchas were removed by using stainless steel hand files. Biomechanical preparation were performed using Reciproc® system (VDW GmbH, Munich, Germany) and 2% concentration of dental sodium hypochlorite in all cases. Bioaggregate™ (Innovative BioCaramix Inc, Vancouver, BC, Canada) was placed into perforation as a repair material in single-visit. Following the root canal fillings were done with cold gutta percha and sealer (AH Plus, Dentsply De Trey GmbH, Konstanz, Germany), teeth were sealed with cement temporarily. The initial symptoms were disappeared in all cases Patients were maintained asymptomatic condition during follow-ups. The apical periodontitis was decreased in X-ray examination in 12<sup>th</sup>-month.



### Key learning points

- Considering the superior physical and biologic properties, Bioaggregate™ could be the suitable repair material for perforations in non surgical retreatments in endodontics.
- These cases of a nonvital tooth with an apical periodontitis and a perforation that was retreated with a single-visit Bioaggregate™. There is no sign of pathology in X rays after 12 months and patients were clinically asymptomatic.



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## BROKEN FILE MANAGEMENT: REPORT OF SIX CASES

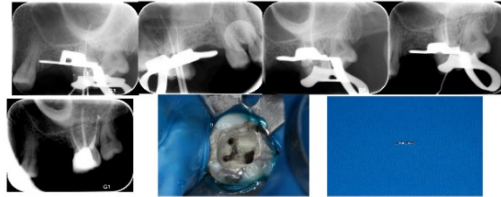


**Aim:** The aim of these case reports is to assess two broken file management techniques; by-pass method and using ultrasonic tips under the dental operation microscope.

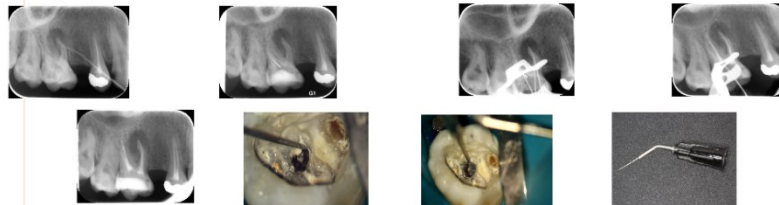
### Summary:

One of the most common complication in endodontic treatment is the fracture of instrument inside the root canal. The separated instrument, particularly a broken file leads to obstruction in the root canal and prevents thorough cleaning and shaping procedures. There are several methods and different techniques available to remove the separated instruments. A technique utilizing modified Gates Glidden burs to create a staging platform and the use of modern ultrasonic tips with a dental operating microscope has recently been advocated.

### CASE-1

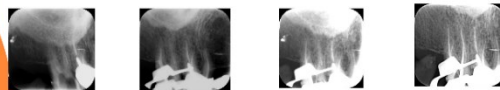


### CASE-2



Sometimes removal of a fractured instrument is impossible or undesirable. Failure in retrieval of the fractured instrument does not automatically result in failure of the case. There is still possibility to bypass the instrument. In these cases, bypassing the instrument is a valid alternative, which can lead to a favourable outcome.

### CASE-3



In these three cases we removed the nickel-titanium fragments using several ultrasonic tips under the dental operating microscope (OPMI PROergo, Zeiss) and in the other three cases we bypassed the separated fragments. The root canals were cleaned and shaped thoroughly with protaper universal rotary systems (Dentsply), 5.2.5 sodium hypochlorite as a main irrigant, and 17 Edra (Verax) as final solution, and then obturated by gutta-percha (Surendo) with lateral compaction. At 3 months follow-up, patients were free of symptoms.

### CASE-4



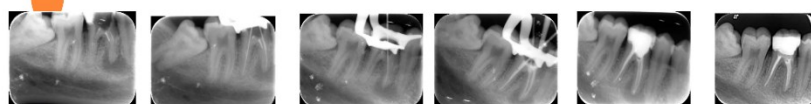
### CASE-5



### Key learning points:

- \*Using ultrasonic tips in conjunction with dental operation microscope is highly recommended.
- \*Create a staging platform with modified Gates glidden burs for direct visualization with operation microscope is necessary.
- \*If removal of the fragment fails, by-pass technique should be considered.

### CASE-6





## THE USE OF HYPODERMIC NEEDLES FOR THE REMOVAL OF THERMAFIL® STEMS IN ROOT CANALS DURING A RETREATMENT. REPORT OF A CASE



Nieto de Pablos, Jose María; Herrera trinidad, Ruben

### Aim

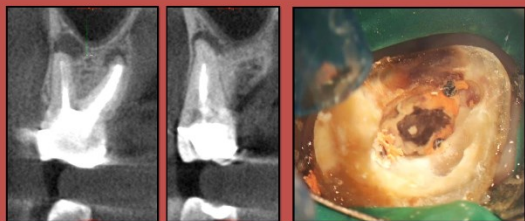
To show the clinician an economic and effective technique to remove Thermanfil® stems or other similar instruments from the root canal system during a retreatment.

### Discussion

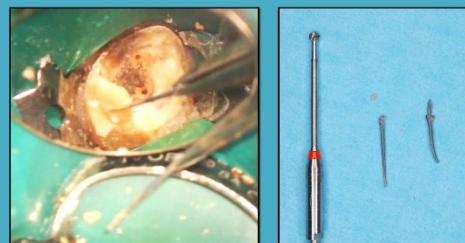
There are several techniques and instruments to remove broken files and other intra canal elements that the clinician could find during a retreatment, but the effectiveness of them is limited or there are very expensive. By the knowledge of this technique, the clinician could have another effective and cheap possibility for this purpose, because it uses normal elements at an endodontist office.

### Metodology

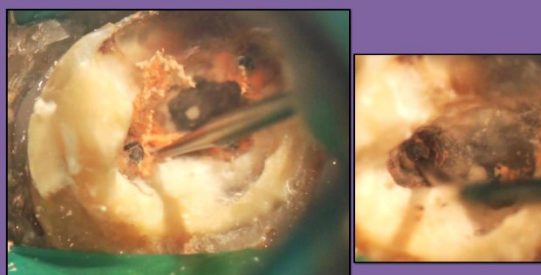
Because of several fractures of the coronal portion of a Thermanfil® stem in a palatal canal of an upper molar(16) during a root canal retreatment, it was arise the use of a modified subcutaneous needle cut by a diamond bur for about 10mm inserted into the canal, including in the interior the Thermanfil® stem, and catheterizing the needle by a k-15 file the stem was clamped, permitting the extraction using a Stieglitz clip



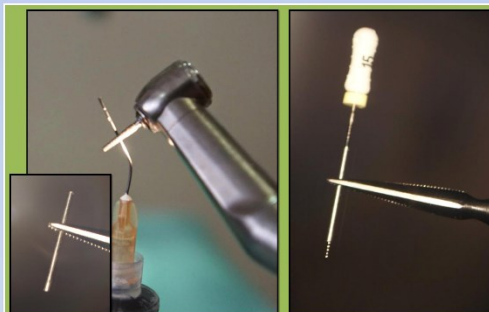
Preoperative cbct and camera aspect



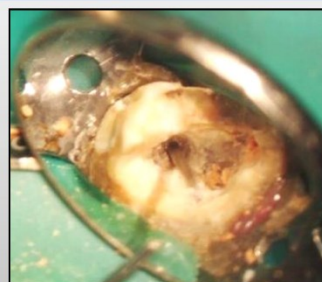
Mesial and distal stems removed with Stieglitz forceps



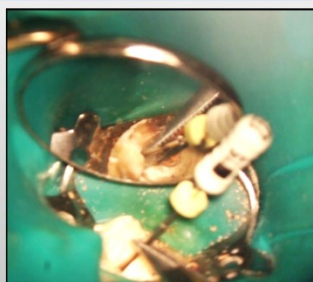
After the removal of the gutta-percha with a low speed bur we try to remove the stem using several techniques as two files or clamping it



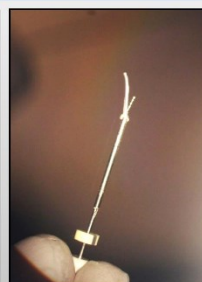
The instrument designed to remove the stem cutting a needle and catheterizing it with a K-file



Aplication of the cutted needle into the canal



The designed element with the k-file in action, blocking the stem



The Thermanfil stem extracted



Final Rx of the retreatment

### Conclusion

The knoledge of this technique allows the clinician another device for the removal of instruments from a root canal, using a few normal resources



## ***How Can Hypnodontics Manage Severe Gag Reflex for Root Canal Therapy? -A Case Report***

*Nafiseh Zarenejad, Mohsen Ramazani*

**Aim:** To present the importance of psychological impact on somatic unhealthy manifestations related to endodontics field.

**Introduction:** Severe involuntary gagging can be elicited by the endodontist fingers or instruments contacting the oral mucosa or even by nontactile stimuli, for example, seeing the dentist or remembering a previous dental experience.

Fortunately, there are ways, with some tricks and training to ease gag reflex, one of which is hypnosis.

**Case Presentation:** A 34-year old male referred to us for root canal therapy of his painful lower molar. He had not received any dental treatment during the past 9 years, just due to fear of experiencing gag reflex. Three an-hour hypnotic sessions were spent for simultaneous hypnosis and dental treatment interventions. The hypnosis methods used were eye fixation, progressive muscle relaxation and guided imagery. The gag reflex was turned from grade 4 to 1 of Dickson and Fisk scale, therefore all the needed dental treatments including RCT and prosthetic restoration were done successfully.



**Discussion:** Having analyzed the psychological components of the case, the gag reflex as a somatic situation was covered appropriately. According to psychology and psychiatry, each somatic intervention needs psychological evaluation as well. Gag reflex is not an exception.

**Conclusion and Clinical Relevance:** Psychological background of somatic manifestations such as gag reflex is not allowed to be ignored. This case report shows that hypnosis can effectively help control gag reflex for dental treatments.

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## Endodontic treatment with MTA apical plug : a case-report

**Aim :** to present endodontic treatment of a maxillary left central incisor tooth with wide open apex and necrotic pulp using MTA as apical plug.

**Summary:** A 13-year old male patient with pain was reported to our clinic with a history of trauma. Radiographic examination revealed large periapical lesion and wide open apex with incomplete canal obturation. A rubber-dam was used and gutta-percha was removed with ProTaper Universal Retreatment files. The working length was determined with an electronic apex locator and confirmed with radiographic image. The root canal was instrumented, dried with paper points and Calcium hydroxide was replaced in the canal. After two weeks, the temporary filling was removed and the root canal was irrigated with NaOCl. MTA was used as apical plug and confirmation radiography was taken. Then a wet cotton pellet was placed in cavity. After 2 days, patient remaining root canal space was obturated with gutta percha and AH Plus sealer. The coronal tooth structure was restored with composite resin. After 18-months, the tooth was clinically asymptomatic and new bone formation could be observed in the periapical region. There were also radiographic signs of lateral and apical root closure.

### Key Learning Points:

- Mineral trioxide aggregate (MTA) has been suggested as an effective material for apical barrier in teeth with open apices.
- MTA has shown a significantly great frequency of dentin bridge formation. An apical barrier formation can occur between the MTA plug and the root canal walls.



Fig 1 : Preoperative radiography of the maxillary left central incisor

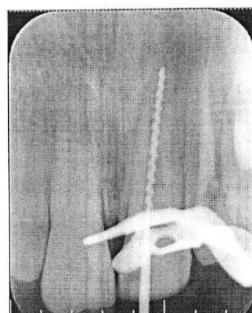


Fig 2 : Determination of working length.

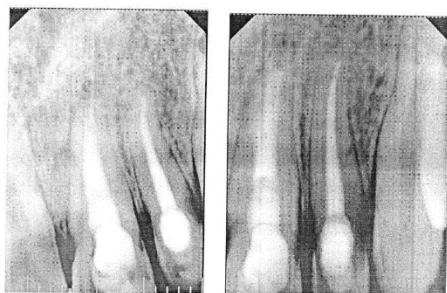


Fig 4: 18-month follow-up radiograph reveals a mineralized bridge in the apical region

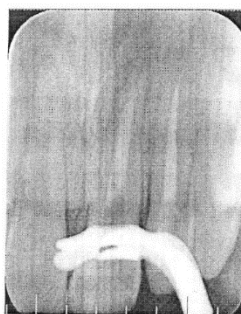


Fig 3 : Radiographic view of the MTA apical plug

# Internal root resorption obturation with GuttaFlow®: a case report



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<sup>1</sup> Department of endodontics – Catholic University of Portugal

## AIM

To describe the use of GuttaFlow® in the treatment of a mandibular canine with perforating internal root resorption (IRR).

## INTRODUCTION

Resorption is a condition associated with either a physiologic or a pathologic process resulting in a loss of dentin, cementum, and/or bone. Root resorption may occur after various injuries including mechanical, chemical or thermal injury. Generally, it can be classified as internal or external root resorption. IRR is a particular category of pulp disease characterized by the loss of dentine as a result of the action of clastic cells stimulated by pulpal inflammation (1,2).

## CASE PRESENTATION

A female patient, 58 years old, caucasian, healthy with no allergies and no medication, presented in 2006 to the Clinic of the Catholic University of Portugal – Viseu. After radiographic study by periapical and panoramic X-ray an oval enlargement of the root canal space of the tooth 4.3 was observed; the tooth was asymptomatic, with normal pulp test, characteristic of internal resorption. Etiology could not be determined. Endodontic treatment of the 4.3 was performed in three sessions with inter appointment medication with CaOH<sub>2</sub> dressing. Filling was done using the lateral / vertical cold gutta-percha compaction technique, associated with GuttaFlow® system to better adapt to the cavity of resorption and achieve an hermetic sealing. The access cavity was restored with a composite resin filling. After seven years, the patient returned to the University Clinic for a control and found that the tooth 4.3 did not show any signs of periapical lesions visible on radiographic control.



Fig. 1 – Panoramic radiography.

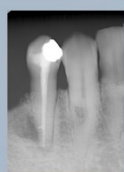


Fig. 2 – Preoperative radiography.



Fig. 3 – Working length – 24 mm.

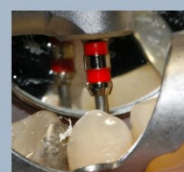


Fig. 4 – Apical preparation with Profile 06.25.

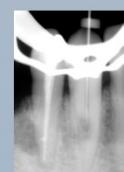


Fig. 5 – Location of internal resorption at 16 mm with a #25 K file.

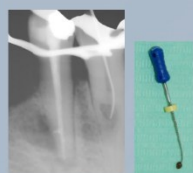


Fig. 6 – Resorption cleaning with a precurved #25 K file, with the aid of ultrasound.

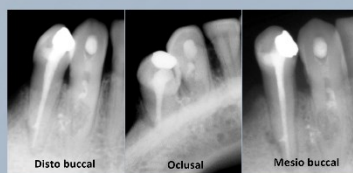


Fig. 7 – Different incidences locating the resorption in distolingual, Oclusal, Mesio buccal.



Fig. 8 – Master cone 25.06.



Fig. 9 – GuttaFlow® system.

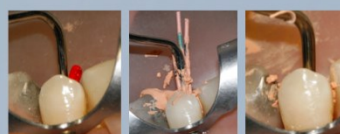


Fig. 10 – Gutta percha cold lateral and vertical compaction.



Fig. 11 – Postoperative radiography.



Fig. 12 – Control radiographies after 9 months, 5 and 7 years.



Fig. 13 – Panoramic radiography after 7 years.

## DISCUSSION


Internal root resorption is more prevalent in middle and apical thirds and once diagnosed, endodontic treatment must be performed (1,2). Literature suggests several filling techniques, however, most authors prefer thermoplastic techniques, since it is essential to fill the resorbed dentine areas and hermetically seal the canal (3,4). GuttaFlow® system combines in one product a sealer (polydimethylsiloxane) and gutta-percha. In this clinical case GuttaFlow® associated with lateral/vertical cold gutta-percha compaction was a suitable alternative to the thermoplastic techniques.

## CONCLUSION AND CLINICAL RELEVANCE

Correct diagnosis and early treatment of internal resorptions prevent the progression of internal resorption and thus tooth loss. This case, after a follow up of seven years, can be considered a success, since it allowed the maintenance of the tooth in the absence of any symptoms or radiographic lesion.

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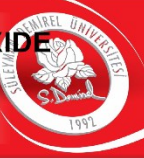
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## DIFFERENT CLINICAL APPLICATIONS OF MINERAL TRIOXIDE AGGREGATE IN ENDODONTICS: REPORT OF THREE CASES

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<sup>1</sup>Suleyman Demirel University, Faculty of Dentistry, Department of Endodontics

**AIM**

To present three cases where MTA was used to repair a furcation perforation, to seal an apical resorption and as a root-end filling material.

### INTRODUCTION

MTA is a hydrophilic endodontic cement that is extremely biocompatible, capable of stimulating healing and osteogenesis. Clinical applications of MTA include; pulp capping, pulpotomy dressing, root-end filling, resorption repair, perforation repair and apexifications. In all cases white colour of MTA (Angelus, Londrina, PR, Brazil) and lateral compaction technique was applied.

### CASE SERIES

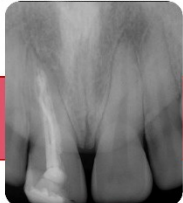
**Case 1.**






A 25-year-old female patient, who had a previously initiated therapy, who had complaints of pain and swelling associated with lower right molar tooth, attended our clinic. Clinical and radiographical examination revealed incomplete removal of pulp chamber roof, furcation perforation and two untreated root canals. In the first appointment, furcation perforation was sealed with MTA and calcium hydroxide was placed into four canals. Root canal treatment was completed one week later.

**Case 2.**






According to dental history of a 21-year-old male patient, his upper right central incisor suffered a lateral luxation and was root canal treated 10 years ago. In radiographical examination, severe root resorption was detected on the apical third of the tooth. An apical plug of MTA was used to seal the apical defect. Root canal was obturated with sealer and gutta-percha and final restoration was completed.

**Case 3.**







Apical surgery was planned for the upper right second premolar tooth of 34-year-old male due to recurrent endodontic pathosis. The root end was resected and MTA was applied as a retrograde filling after retrograde preparation.

### DISCUSSION

In all cases, symptoms had resolved and all radiolucencies had healed in follow-ups at 3, 6 and 12 months. Despite all benefits, MTA has also some disadvantages. The main drawbacks of MTA include the potential for tooth discoloration, high cost, long setting time, difficult handling and difficulty in its removal after setting.

### CONCLUSION & CLINICAL RELEVANCE

Considering the sealing ability and biological aspects of MTA, using it for perforation & resorption repair and retrograde filling seems to be a good treatment option.

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## Biodentine™: A new bioactive cement for pulp capping

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## Biodentine™: A new bioactive cement for pulp capping

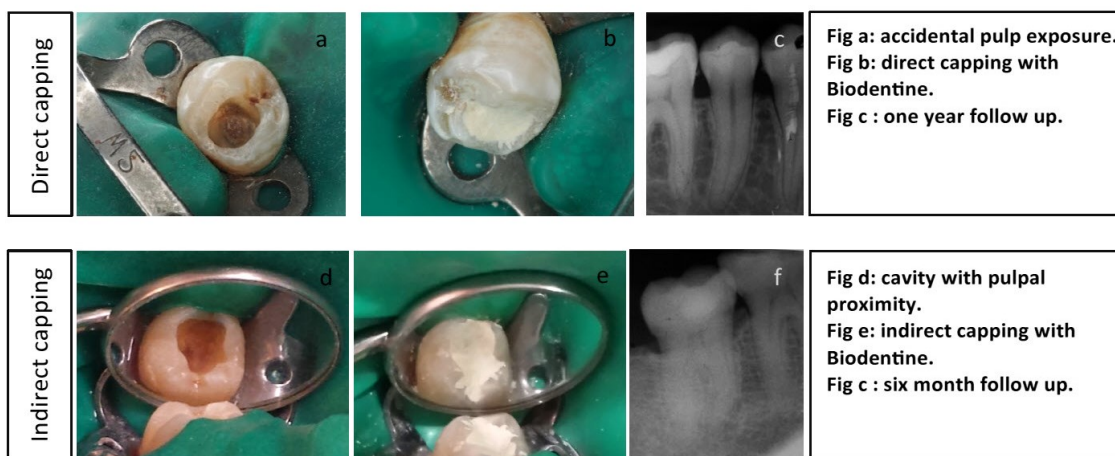
### Aim

Expose a group of clinical cases with pulp capping therapy using a recent bioactive material: Biodentine.

### Introduction

Conserving the pulp vitality must be the main concern of any clinician, by maintaining pulp vitality the defence functions are preserved, structural and biological modifications that weaken the dental organ are prevented but mainly the regeneration potential of pulpo-dentinal complex is kept.

### Case report



### Discussion:

If calcium hydroxide has long been considered a "Gold Standard" pulp capping therapy, the emergence on the market of new materials allows a better bioconservative approach. The success of this therapeutic depends mainly on the capacity of the material used to initiate the pulp tissue repair and dentinal bridge formation. Biodentine is a bioactive material, which allows the growth, proliferation and differentiation of stem cells regenerating from the pulp complex. Its physico-chemical and especially mechanical properties are similar to the dentin tissue, allows it to supplant most other materials, a single visit intervention and a short setting time with easy handling. This prompted its use in cases after iatrogenic pulp exposure and cases with pulpal proximity. After six-months follow up, those cases respond to the capping therapy with positive sensitive tests and no radiologic pathological finding.

### Conclusion

Biodentine™ is an interesting product, with the potential of making a major contribution to maintaining pulp vitality.

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BioMed Research International. Volume 2014.

Dammaschke. T

Biodentine TM: nouveau substitut dentinaire bioactif pour le coiffage pulpaire

Le Chir.dent.fr; n° 1500, 20 octobre 2011

Gilles koubi ; Gauthier Weizrock; Marie-josée Bottero; Jean-claude Franquin

Biodentine TM : un nouveau substitut dentinaire

Clinic 2011; 32: 497-505

Gilles Koubi ; Pierre Colon ; Jean-Claude Franquin Aline Hartmann; Gilles Richard; Marie-Odile Faure

Clinical evaluation of the performance and safety of a new dentine substitute, Biodentine in the restoration of posterior teeth : a prospective study

Clin Oral Invest 2013; 17:243-249

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## Restoration of Endodontically Treated Premolar Using Fiber Reinforced Resin Coating For Endocrowns: A Case Report

**Aim:** The purpose of this study is to evaluate the clinical efficacy of fiber reinforced resin coated endocrowns in restoring the posterior teeth that had endodontic retreatment to construct the pleasing function.

**Summary:** A 37-year-old man who reported a chief complaint of pain on account of insufficient endodontic treatment were referred for treatment. The clinical examination of the patient revealed that maxillary left second premolar (25) had gingival inflammation and broken crown. The tooth had retreated endodontically. Then the choices for the prosthetic restoration of the teeth were explained to the patient and he expressed preference for endocrown because of its more conservative restoration than post-core supported complete crown restorations.

The tooth was prepared for equigingival butt-joint margin and central retention cavity into the entire pulp chamber constructing both the crown and core as a single unit. After preparation GC everX Posterior a fibre-reinforced composite designed to be used as dentine replacement (GC corporation Tokyo, Japan) were applied into the isolated cavity and the undercuts were eliminated. Digital impression and bite scans were performed using an intra-oral scanner (Cerec OMNISCAN, Sirona Dental, Austria).



Fig 6-7. Clinical view of the final restoration from occlusal & buccal aspect



Fig 8. Restoration after 2 years time



Fig 9. Radiographic view after 2 years time

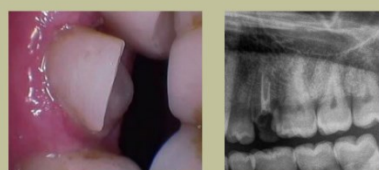


Fig 1&2. Initial clinical and radiographic view



Fig 3 Preparation of endodontically retreated maxillary premolar



Fig 4. GC everX Posterior a fibre-reinforced composite were applied into the cavity.

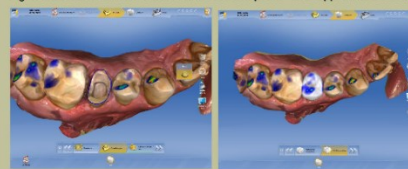


Fig 5 CEREC views

The endocrown was designed and milled using from a CAD/CAM composite resin block (LAVA Ultimate, 3M ESPE, Germany). Then it was luted using self-etch composite cement (RelyX Ultimate with Scotch-bond Universal 3M ESPE).

After cementation of the restoration, routine recall visits were performed 6 times over a 2 years period. At the time of examination period, no cracks, caries or decementation of the endocrown was seen.

**Key Learning Points:** Fiber reinforced resin coating for endocrowns seems as a successful treatment technique as an alternative to post-core supported crowns in restoring the posterior teeth that had endodontic retreatment to construct the pleasing function.



## TWO-VISIT MTA APEXIFICATION OF MAXILLARY INCISORS: TWO CASE REPORTS



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<sup>6,7</sup> DDS, PhD, Department of Endodontics, Erciyes University, Kayseri, Turkey

### AIM

The aim of this clinical study was to treat the teeth with necrotic pulp and immature apices with MTA (mineraltrioxide-aggregate) apical plug technique.

### INTRODUCTION

Traumatic injuries and dental caries in young patients can result in pulp necrosis in immature teeth. If the dental pulp is damaged before development of the root length and closure of the apical foramen, normal root development is altered or halted completely. In teeth with incomplete root formation and necrotic pulps, apexification treatment must be initiated (1). MTA has been popularly adopted as an intracanal medication in apexification/apexogenesis procedure.(2) MTA apical plug technique is an easy and quick solution for the treatment of necrotic teeth with apical periodontitis and immature apices.

### CASE PRESENTATION

**Case 1 :** 17 -year-old male patient having asymptomatic maxillary left central incisor with open apices was diagnosed with necrotic pulp and chronic apical periodontitis. At first visit, the access cavity was prepared. Then, minimal mechanical preparation and 20 ml 2.5% of NaOCl irrigation were done. Intracanal medication was established with Ca(OH)<sub>2</sub> and cavity was sealed with temporary filling material. After 10 days, temporary filling was removed, final irrigation was done and root canal was dried with paper-points. The root canal was filled with vertically compacted MTA and gently condensed apically. AH Plus sealer was applied to the canal walls using a lentulo spiral. Obturation was performed with BeeFill 2 in 1 System (VDW GMBH Munich Germany). Coronal restoration was performed using fiber post-core and composite resin. Control appointment was scheduled for 6 months later.

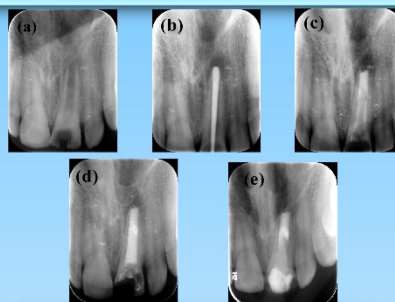


Figure 1 : Step by step radiographs for Case 1 in order

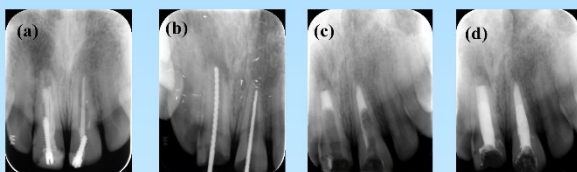


Figure 2 : Step by step radiographs for Case 2 in order

**Case 2:** 18-year-old male patient diagnosed with acute apical abscess accompanying tenderness to mastication and swelling of the buccal plate. In radiographs, previously done root canal treatments and post-core restorations in both teeth were observed. Firstly, restorations were removed and access cavities were prepared. Previously done root canal fillings were removed. Preparations and intracanal medications were performed. After 10 days, teeth were asymptomatic. Temporary fillings were removed. Final irrigations were done and canals were dried with paper points. MTA applications and obturations were performed as in the first case, and teeth were restored with composite resin. Patient was informed for further follow-up appointments.

### DISCUSSION

With the MTA apical plug technique, an alternative to conventional calcium hydroxide apexification for endodontic treatment of immature necrotic teeth has been proposed. (3) Although MTA can be considered a very effective material and a valid option for apexification in infected teeth with open apices with the added advantage of speed of completion of therapy, long-term follow up is needed.

### CONCLUSION AND CLINICAL RELEVANCE

In contrast with the conventional calcium hydroxide apexification technique, apical MTA plug can be a superior alternative in case apexogenesis or regeneration are not indicated and a quick solution is expected by the patient. In clinical practice, apical MTA plug and warm gutta-percha obturation are frequently chosen for the treatment of teeth with immature apices and periapical lesions. The main advantage of this procedure is the high predictability of apical closure with the reduction of treatment time, number of appointments, and radiographs.

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### Combination of a CAD-CAM Onlay and Endodontic treatment : A new concept of an 'all in one system'.

#### Aim

To describe a technique combining an endodontic treatment and the realization of a chairside CAD/CAM onlay with a rubber dam in situ throughout the whole procedure.

#### Methodology

After local anesthesia (Fig. 1,2), a partial mouth and a bite registration are scanned using the CEREC Omnicam (Bensheim, Germany) (Fig.1-3). A partial arch rubber dam is placed (Fig. 4).

The onlay preparation is performed and the 2/3 coronal part of the root canal is treated (Reciproc®, VDW, Dentsply, Germany). Subsequently a putty is placed in the pulp chamber. A composite wall (Z500, 3M, United States) is build around the putty.

Thereafter the tooth is scanned again (Fig. 5). The onlay design is scaled and smoothed virtually (Fig. 6, 7). An Enamic® block (Vita, Germany) is milled using the Sirona CEREC MC (Bensheim, Germany) milling unit during the time the endodontic treatment is completed (Fig. 8).

Subsequently the pulp chamber is sandblasted, bonded with Clearfill SE Bond (Kuraray, Japan) and filled with EverX Posterior (GC, Europe).

The onlay is fitted and its surface is treated with a hydrofluoric acid solution during 20sec (Porcelain etch, Ultradent, USA), and wetted with a Silane coupling agent (Ultradent, USA).

Finally the onlay is cemented using Rely X Ultimate (3M, USA) (Fig. 9).

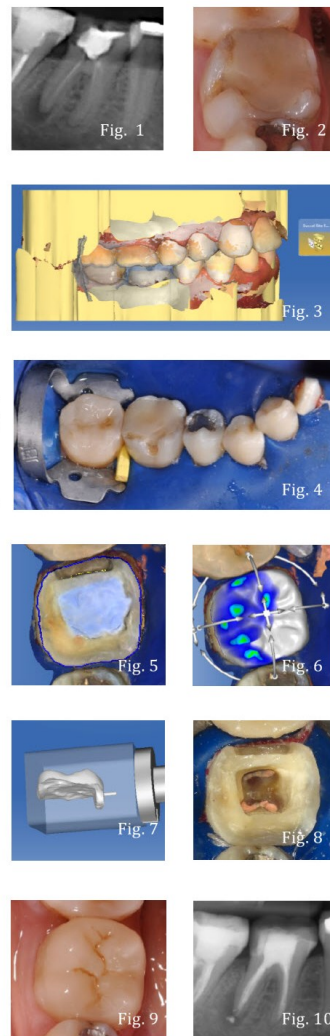
After removing the rubber dam, occlusion is checked and a control X-ray is taken (Fig. 10).

#### Discussion

When considering endodontic treatment, the quality of the restoration is crucial. The placement of a permanent restoration immediately after the endodontic treatment reduces the risks of marginal microleakage and fracture<sup>[1,2]</sup> and this without compromising the clinical quality. The choice of Enamic® as biomimetic restorations is based on its improved resilience, reliability, and biocompatibility.

#### Conclusion

After several cases we can conclude that the combination of an endodontic treatment and an onlay reconstruction based on CAD-CAM registration presents a promising option of an all-in-one treatment.



#### References

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