Clinical Poster Oral Prize Presentation 2

Clinical posters

Clinical Poster Oral Prize Presentations

Friday 15th Meeting Studio 211 & 212
9:00-10:30

Poster Presentations 13:30–14:30 Grand Hall 1

Thursday C1 – C18

Friday C19 – C36

Saturday C37 – C53
SUCCESSFUL ENDODONTIC AND SURGICAL TREATMENT OF DENS INVAGINATUS WITH INFECTED INVAGINATION AND VITAL PULP: A CASE REPORT

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Aim

To present a case of successful treatment of chronic apical periodontitis with a cyst-like lesion of tooth \#12 with an infected invagination (Oehler's Type 3) and the surrounding vital pulp.

Introduction

Dens invaginatus (DI) is a malformation of the tooth. It results in a deepening or invagination of the enamel organ into the dental papilla prior to calcification of the dental tissues. Oehler\textsuperscript{1} first described different types of DI. Type 3: invaginations extend into the root and exit buccally or apically. There is usually no communication with the pulp. Any communication between the oral cavity and the invagination can cause to an inflammatory response within the periodontal tissue ("post-invagination periodontitis") (PIP). Wherever PIP exists but the pulp remains healthy all efforts should be aimed to preserve pulp vitality (2).

Case Presentation

14-year-old male was referred for root canal treatment of tooth \#12.

Complaint: constant jaw pain, tenderness to percussion and palpation, swelling history in the past.

Intraoral examination: abnormal looking tooth \#12 compared to left maxillary second bicuspid (Fig. A). Tooth revealed a normal response toulp testing.

CBCT imaging: a huge radiolucency cyst-like lesion around tooth \#12 and the invagination extending to the periodontium (Fig. B, C, D).

Treatment: under the microscope the space of invagination was cleaned chemomechanically using Ca(OH)\textsubscript{2} paste was inserted for 2 weeks. After medical patient had no complaints and no sinus tract. Pulp revealed normal response. Apical part of invasion was filled with MTA, rest space filled with storage gutta-percha and sealer. Cavity was sealed with "Biodentine" to protect vital pulp and composite crown filling.

After 3 months surgical procedure was performed under general anesthesia. The cystic foramen granulation tissue was carefully excised without damaging periapical region of teeth \#11, \#12, \#13. Histological examination confirmed the diagnosis of radiocementoplasty.

Control visits for tooth vitality and function were made after 1, 2, 3, 6 and 12 months. Patient had no complaints and were no signs of infection (Fig E, F). In the follow up after 12 months CBCT examination showed fully repaired bone structure (Fig G, H).

Discussion

Surgical treatment approach in such cases is debatable. There are opinions, that surgical interventions for large periapical lesions should be applied only in cases where the orthograde canal treatment was not successful (3). On the other hand, 'true' cysts are completely separate from the root canal, and are less likely to heal by nonsurgical root canal therapy alone (4). Preservation of the pulp vitality allowed us to save as much as possible of the root dentin and consequently, increased our expectations for the long-term treatment success. The extended follow up period of 12 months proved the successful outcome of the selected treatment procedure.

Conclusion & Clinical Relevance

In the presented case, endodontic treatment success was based on careful diagnostics and adequate treatment planning. All efforts should aim to treat PIP and to preserve pulp vitality in Oehler's Type 3 anomalies.

References

Endodontic treatment of a cutaneous sinus tract with the aid of CBCT: report of a case with 6-year follow-up

Tsurumachi T, Tsurumachi E

Department of Endodontics, Nihon University School of Dentistry, Tokyo, Japan.

Aim
To report a complicated case of a 34-year-old woman manifesting a cutaneous sinus tract, related to a perforated mandibular second molar.

Introduction
Cutaneous sinus tract may occur as a result of an inflammatory process associated with a necrotic pulp. However, several non-odontogenic disorders may also produce similar skin conditions. Thus, the differential diagnosis of this clinical finding is important in providing appropriate treatment. Because misdiagnosis of this condition may result in healing failure or unnecessary treatment. Cone beam computed tomography system (CBCT) was used for diagnosis and treatment planning of odontogenic cutaneous sinus tract.

Case presentation
Endodontic treatment of the mandibular right second premolar (tooth 45) was initiated one year previously and the referring dentist reported that a perforation of the root had occurred during the treatment. Clinical examination revealed a skin swelling approximately 2.0 cm in diameter on the right cheek (Fig. 1). Intraorally, no vestibular swelling was present (Fig. 2). A periapical radiograph showed a diffuse radiolucency on teeth 45, 46 and 47 (Fig. 3). One month later, the main canal and perforation area were obturated by lateral condensation of gutta-percha on tooth 45 (Fig. 4). The CBCT (3DX Micro-CT) picture was thus ordered to confirm the diagnosis and treatment planning. The three-dimensional images revealed that the exact source of the skin lesion was related to the mandibular right second molar (tooth 47). After removing the metal crown, endodontic retreatment was performed with K-files, using the step-back technique. From the inspection of three root canals, the mesio-buccal canal had an iatrogenic perforation. The patient returned after 3 months, and root canals were obturated with root canal sealer and gutta-percha by the lateral condensation in the distal canal and thermoplasticized gutta-percha technique in the mesial canals (Fig. 5). The patient was reexamined periodically for postoperative care (Fig. 6). Six years later, the tooth appeared clinically and radiographically healthy, and the cutaneous sinus tract disappeared (Fig. 7).

Discussion
The most common cause of a cutaneous sinus tract is a chronic periapical lesion. Its diagnosis is not always easy unless the treating dentist considers the possibility of its pulp necrosis origin. Early diagnosis of the origin of the cutaneous sinus tract will prevent unnecessary treatments and enhance skin healing. The CBCT helped to evaluate the exact extent of the lesion and its relation to tooth 47. An axial and a coronal sectional images detected the expansion of periapical lesion that could not been seen clearly by the conventional radiography, and the lesion perforated the lingual plate.

Conclusion & Clinical Relevance
Cutaneous sinus tract as a result of chronic periapical lesion was successfully managed by root canal retreatment using a CBCT.

References
Orthograde endodontic treatment of an immature
Type III dens invaginatus: a case report
Ju-Kyang Lee*, Hyeon-Cheol Kim, Euisong Kim

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Department of Conservative Dentistry, Pusan National University, Korea

Aim
To describe the nonsurgical endodontic treatment of a type III dens invaginatus with associated periapical lesion.

Introduction.
Dens invaginatus is a developmental anomaly resulting in a deepening of the enamel organ into the dental papilla before calcification of the dental tissues. The etiology of this malformation remains controversial and unclear. Oehlers classified this anomaly into three types. Of particular interest in his classification is type II, in which invagination communicates apically or laterally with the periodontium but there is no direct communication with the pulp chamber. Hence organisms may by-pass the pulp, producing “periapical” infection in spite of a vital pulp.

Case presentation:
A 9-year-old male patient visited with spontaneous pain on #31 with the shape of dens invaginatus and macrodontia. Radiographs showed periapical lesion on #31 and wide open apex. Based on clinical and radiographic assessment, the tooth was diagnosed as a type III dens invaginatus and normal pulp with symptomatic apical periodontitis due to invaginated portion of the tooth. Two-visit orthograde endodontic treatment was performed on the invaginated portion of #31 associated with a periapical lesion using Pro-Root MTA. The tooth was isolated with a rubber dam during procedures. At a 1.5-year recall, apex closure of #31 was observed as well as root development.

Discussion:
Most authorities consider that during development the enamel organ becomes distorted so that part of it protrudes into the dental papilla. This results in the formation of an enamel-lined channel communicating with the exterior by a narrow entrance, usually in the region of the cingulum, or occasionally at the incisal tip. Particularly in case of a type III dens invaginatus, the invagination communicating with the periodontium may produce periapical lesion and cause symptoms, irrespective of pulp vitality. Clinicians, therefore, are necessary to comprehend these clinical and radiographic properties of a dens invaginatus and make a proper treatment plan with an accurate diagnosis. It is utmost important to maintain pulp vitality especially in immature teeth because it allows a continuous root development of the tooth and guarantees a long-term prognosis.

Conclusions and Clinical Relevance:
In cases of type III invaginations with periapical lesion, endodontists may limit the endodontic therapy to the only invaginated portion of the tooth to preserve pulp vitality if there is no communication of the invagination with the pulp.

References
M. HÜLSMANN  Dens invaginatus: aetiology, classification, prevalence, diagnosis, and treatment considerations  IJE 30, 79-90, 1997
Guided Endodontics: A case report
Andres Torres1, Evan Sheehan2, Paul Lambrechts1
2. OMFS IMPATH Research Group, Department of Imaging and Pathology, Faculty of Medicine, KU Leuven, Leuven, Belgium.
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Aim
Present a novel method to create a 3D printed guide to gain access to obliterated root canals on the basis of CBCT data.

Introduction
A 65-year-old female ASA III was referred for endodontic treatment of tooth 22. Clinically there were no complaints and no percussion pain. Radiographically the tooth presented an obliterated canal with an apical radiolucency without sinus tract. Tooth was diagnosed with asymptomatic apical periodontitis.

Methodology
The DICOM images and the images scanned from the plaster cast are imported into Mimics Medical 19.0 software (Materialise, Leuven, Belgium). (A) The cast is registered to the upper jaw via point-based registration. (B) A path for the bur is defined. (C) The 3D guide is design in 3-matic software (version Medical 10; Materialise) (D) Two guides designed to fit #1 and #4 Munroe discovery burs (CJM Engineering, Santa Barbara, USA) are 3D printed in biocompatible material (E) The 3D guide is first tested on the plaster cast.

Case Presentation
(A) Clinical views of tooth 22. (C) The 3D guide is placed on the teeth and treatment is initiated using #1 Munroe discovery bur (Ø 3.8mm). (D) A cavity is precisely drilled up to halfway of the root length and the canal is found. (E – I) The tooth is then isolated and the root canal treatment is performed. (J) Periapical x-ray after treatment and (K) 6 month control.

Discussion
The concept of “Guided Endodontics” simplifies difficult root canal treatment in obliterated teeth; facilitating the localization of the canal and minimizing the risk of iatrogenic damage to the root.

Conclusion & Clinical Relevance
Guided Endodontics allowed an accurate access cavity preparation up to the middle of the root using a 3D printed guide. This may be a valuable tool for the negotiation of pulp canal obliteration with very little additional cost.

References
Endodontic Treatment of an Immature Permanent Canine Following Infant Oral Mutilation (IOM)

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**AIM:** To increase awareness amongst dental practitioners to the possibility of meeting the consequences of Infant Oral Mutilation (IOM) in immigrants patients from Africans countries.

**INTRODUCTION:** Infant Oral Mutilation is a practice of extracting primary canine tooth buds frequently practiced in some African countries. During this procedure the permanent canine bud can be affected.

**CASE PRESENTATION:**

**Dental history:** A 21-yr-old Ethiopian female was referred to our department due to a sinus tract appearing near tooth #43. Rule out trauma in the past.

**Clinical finding:** Tooth #43 presented enamel hypoplasia, with no increased sensitivity to percussion or palpation and no response to vitality test. Sinus tract buccal to tooth #43

**Radiographic finding:** Crown - discontinuity of the enamel. Root - wide canal with narrow dentin walls and open apex and a 10x5 mm lateral radiolucency between #43 and #42

**Diagnosis:** Pulpal - pulp necrosis. Periapex - chronic apical abscess. Other - open apex.

**Treatment plan:** Root canal treatment with artificial apical barrier formation tooth #43

**Clinical procedure:**
- **1st appointment:** Biomechanical preparation with Self Adjusting File and NaOCl 3%. Interappointment dressing of Ca(OH)₂ for 1 month.
- **2nd appointment:** The sinus tract had disappeared. Gray Mineral Trioxide Aggregate was used for apical barrier formation. MMS seal and warm injectable Gutta Percha was used to obturate the canal. The access cavity was scaled.
- **12 m. follow up:** The tooth was clinically asymptomatic, without swelling and without a sinus tract. Radiographically: healed lesion

**DISCUSSION:**
This case introduces successful treatment in immature permanent canine following IOM.

**CONCLUSION & CLINICAL RELEVANCE:**
It is important that dentists who treat African immigrant patients be aware of IOM and recognize its dental implications.
THURSDAY C-1

ENDODONTIC MANAGEMENT OF EXTRAORAL SINUS TRACT OF ENDODONTIC ORIGIN RELATED TO LOWER CENTRAL INCISOR: A CASE REPORT

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Aim
The aim of this case report is to present the management of extraoral sinus tract of both endodontic and periodontal origin related to lower central incisor by conventional endodontic treatment.

Introduction
Periapical pathologies may lead to the formation of an extraoral sinus tract, due to possible reasons, such as the position of the root, the connection with the muscles, etc. These pathologies are often misdiagnosed and patients are exposed to unnecessary surgical interventions. After a good examination and diagnosis, extraoral sinus tracts of endodontic origin can be successfully treated with nonsurgical endodontic treatment (1).

Case Presentation
A 28-year-old woman presented to the endodontic clinic with complaints of mobility, percussion, and palpation (Fig.1). Extraoral sinus tract was observed (Fig.2) and a negative response was obtained in the vitality test from the mandibular left central incisor. The result of the radiographic examination (Fig.3) revealed a large radiolucent area in the pterygoid bone of the related tooth.

Following anesthetic anesthesia, endodontic access cavity was prepared with a diamond round bur. Then rubber dam isolation was provided and an ISO size X-type stainless steel file was placed in the root canal, and the working length was determined by electronic apex locator (Raypex 6, VDW, Germany). Root canal preparation was completed with stainless steel hand files and 1.3% NaOCl gel (Fig.4). With each irrigation, the root canal was irrigated with 1 cc of 5.25% sodium hypochlorite, 3% NaOCl was followed by 1 cc of 17% EDTA and 3 cc of saline in the final irrigation. Calcium hydroxide was placed in the root canal and the patient was given an appointment a week later. After removal of calcium hydroxide in the second appointment, an ISO 30 K-file was placed in the root canal and master cone radiography was taken (Fig.5). Root canal treatment was completed by cold lateral condensation using rein forced root canal sealer (AH26, Meta Biomed, Korea) and gutta percha cones (Fig.6). After the root canal retreatment, the patient referred to the Department of Periodontology for periodontal treatment. It is seen that the sinus tract was closed in 4 months follow-up (Fig.7). A 2 years follow-up revealed that the sinus tract has completely healed (Fig.8) and radiography showed bone formation (Fig.9).

Discussion
Extraoral sinus tract cases that originating from endodontic infections are frequently misdiagnosed and patients are exposed to unnecessary procedures. These patients often think that these formations in the face area is a skin problem and they refer to dermatology clinics. Extraoral sinus tracts that receive a source of endodontic infection of mandibular teeth frequently appear in the chin and submental area (3). A careful clinical and radiographic examination is crucial for a correct diagnosis (3). Non-surgical endodontic treatment is the first choice in the treatment of extraoral sinus tracts of endodontic origin (3).

Conclusion & Clinical Relevance
Endodontically induced infections must be questioned in cases of extraoral sinus tract cases in the antrostomous region. In cases that endodontically induced infections cause progression of the sinus tract formation, dentist often refer to undergo surgical intervention or antibiotic therapy to control infection. This case report shows us that the presence of extraoral sinus tract can only be healed with a successful endodontic treatment.

References


Figure 1
Figure 2
Figure 3
Figure 4: Master cone radiography
Figure 5: Control radiography
Figure 6: 2 weeks control
Figure 7: 5 months follow-up
Figure 8: 4 months follow-up
Figure 9: 3 months follow-up
Figure 10: 3 years follow-up
Figure 11: 2 years follow-up
Endodontic treatment of a lateral incisor with hypoplasia due to trauma to its predecessor
Mammadi M*, Bücher K, Diegritz C, Hickel R.

Aim
This case describes the endodontic treatment of an upper lateral permanent incisor with hypoplasia and a history of trauma to the predecessor.

Introduction
Developmental disturbances on an un-erupted permanent tooth may result from close proximity of primary root tip and crown of the permanent successor. The damage of the un-erupted permanent tooth may occur by transmission of traumatic forces to the permanent tooth germ or by transmission of infection. Various developmental disturbances are given. Hypoplasia, eruption disturbances or enamel opacities have been reported.

Case Presentation

Primary dentition
- 06/2006 Female (4y) - 1st visit after trauma, apical periodontitis on affected incisors (Fig. 1a & b)
- Extraction of upper right lateral and central incisors
- 11/2009 Pulp necrosis with fistula of upper right primary canine, eruption of lateral permanent incisor with signs of structural defect
- Extraction of primary canine (Fig. 1c & d)
- 01/2014 Composite filling on permanent lateral incisor
- Follow-ups recommended, orthodontic treatment

Permanent dentition
- 04/2015 Pulp necrosis of the permanent lateral incisor
- Initiation of root canal treatment, no show-up (Fig. 2a & b)
- 05/2016 Severe pain on lateral incisor
- Re-entry and disinfection of root canal (Fig. 2c)
- 06-08/2016 Clinically asymptomatic tooth
- Root canal treatment and indirect restoration with composite filling (Fig. 2d, e & f)
- 12/2016 Healing of the periapical radiolucency (Fig. 2g)

Discussion
In this case, structural crown defect on palatal side (not photo-documented) has caused bacterial penetration into the root canal, which has lead to succeeding pulp necrosis most likely associated with trauma history of the primary predecessor (probable cause: an initial luxation injury in combination with chronic apical inflammation).

Conclusion & Clinical Relevance
Dentists should make the parents aware of the possible complication of untreated trauma to a primary tooth, also on the long run, and of the necessity of frequent follow-up appointments.

References
DISCOLORATION OF TOOTH CROWN AND ATTACHED GINGIVA FOLLOWING MTA REvascularization THERAPY OF A TRAUMATIZED IMMATURE PERMANENT NECROTIC TOOTH: TREATMENT, RADIOGRAPHIC AND CLINICAL OUTCOME

Shlomo Elbahary, Anda Kfir, Hila Elias

To report a case of extreme discoloration of the crown and of the free gingiva after MTA revascularization of a traumatized permanent immature necrotic tooth, and to examine the effect of internal bleaching.

Introduction

Revascularization is a new therapeutic option with promising results in case of immature tooth with pulp necrosis. It allows for an increase in both root wall thickening and lengthening of the root. However, it presents a unique challenge: an esthetic discoloration of the crown is an undesired consequence of minocycline when dressing with the triantibiotic paste, or from the MTA coronal barrier. In the present case, an unexpected discoloration of the crown and buccal mucosa was observed following the revascularization procedure.

Case Presentation

A healthy 8-year-old female was referred for evaluation and treatment of left maxillary incisor with pulp necrosis, asymptomatic apical periodontitis, uncomplicated crown fracture. Revascularization procedure was performed using DAP (Metronidazole and Ciprofloxacin) and White MTA as coronal barrier. 22 months later the patient was asymptomatic and a dark discoloration was present in the cervical area of the crown and in the buccal mucosa. MTA apexification followed by NVB (non vital bleaching) procedure was initiated.

Methodology

Debridement was carried out using K-files and XP-Endo Finisher (FKG Dentaire SA) and 3.5% NaOCl, Ca(OH)2 was placed for 1 week. At the second appointment the canal was filled using MTA as apical plug, followed by warm vertical condensation. Intra coronal bleaching with sodium perborate mixed with Saline (1/0.5, powder/liquid) was left in the pulp chamber. A week later both the tooth and gingiva returned to their original shade.

Discussion, Clinical Relevance

Although the incidence of tooth discoloration induced by MTA is frequent, there have been few published reports addressing this issue. There have been several recommendations solutions including internal bleaching, applying bonding agent before MTA™. Jang et al concluded that Removing the discolored MTA materials contributed more than post-treatment internal bleaching - the present case the combination of the two resulted in a complete resolution of the discoloration.

**References**

One visit pulp revascularization using MTA after sole use of sodium hypochlorite disinfection: Case report

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Dept. of Conservative Dentistry, Pusan National University, Korea

Aim
To discuss only use of sodium hypochlorite for pulp revascularization case of immature tooth with necrotic pulp.

Introduction.
Pulp revascularization may be a promising alternative for the treatment of immature teeth with pulp necrosis. A variety of protocols for pulp revascularization have been reported involved with using sodium hypochlorite as irrigant solution, triple/double antibiotic paste (TAP/DAP) as intracanal medicament and platelet-rich plasma (PRP) as a scaffold material. However, these intracanal medicament and scaffold materials have some controversies on these protocols and/or result of revascularization. This following cases report presents one visit pulp revascularization using MTA after sole use of 2.5% sodium hypochlorite solution as a disinfectant for the immature teeth of dens evaginatus and invaginatus with pulp necrosis.

Case presentation:
A 10-year-old male patient visited with gingival swelling and radiograph showed periapical lesion on #35 and wide open apex. #35 had Dens evaginatus and sinus tract. Based on clinical and radiographic assessment, #35 was diagnosed as pulp necrosis with chronic apical abscess. One visit pulp revascularization was performed on #35 using Pro-Root MTA after abundant use of 2.5% NaOCl solution. At a 5-month recall, periapical healing state was observed as well as root development. At a 2.5-year recall, root wall thickening and root length development were observed.

Discussion:
Although a number of studies with different disinfection protocols and trials of scaffold materials for pulp revascularization therapy have been reported, this cases report shows that the sole use of 2.5% sodium hypochlorite as irrigant and disinfectant solution without any antibacterial intra-canal medicaments lead to satisfactory treatment results with root development in necrotic immature teeth through one visit procedure. One visit pulp revascularization with MTA after sole use of 2.5% sodium hypochlorite is a feasible treatment protocol for the management of immature necrotic teeth.

Conclusions and Clinical Relevance:
Pulp revascularization is a promising treatment option for immature tooth with pulp necrosis resulting from various etiologies. The SOLE use of NaOCl may provide sufficient biologic environment for the pulp revascularization.

References
Introduction

The aim of this paper is to show the importance of cone beam computed tomography (CBCT) in diagnosing and managing ECR lesions. ECR is a form of external root resorption, characterized by cervical resorption, an agressive and an invasive nature.[1-2] Conventional radiographic techniques revealed limited information on the true extent and nature of the resorptive lesion. Recently, CBCT, which is an external 3-dimensional imaging technique, has been used to assess ECR lesions. The position, depth of the lesion and the resectibility of the tooth can be assessed objectively. The diagnostic accuracy of CBCT is superior to intraoral radiographs in assessing the real extension of the resorptive lesion.[3-4] Treatment, where indicated, should aim at the excision and removal of all resorbing tissues and the reconstitution of the resorptive defect by the placement of a suitable filling material.[1]

Case Presentation

An 18-year-old female patient presented for advice regarding the left mandibular first molar with an unusual metal radiolucency. Clinical, radiographic and CBCT examinations were performed and a diagnosis of a normal pulp with normal periapical tissue, and ECR (Class I, Hackett classification) was established.

The treatment was decided after the extention of the lesion was determined by means of CBCT and the prognosis was favorable for this tooth.

Discussion

It is well known that the effective dose of a CBCT scan is higher than PA radiography. Therefore, the potential benefit of CBCT imaging should outweigh the potential risks. The radiation dose of CBCT scans should be kept “as low as reasonably achievable” and it is essential to use a high-resolution with small field of view.[5] The superior diagnostic accuracy of CBCT in diagnosing resorption lesions is a result of the three-dimensional assessment of those resorption lesions.[4] The sophisticated CBCT software allows for the selection of the most favorable orthoginal views for each specific problem being assessed. In addition, the thickness of each slice and the interval between each slice may be adjusted. These factors significantly result in root resorption lesions being significantly more detectable to the clinician compared with intraoral radiographs.[3-4]

Conclusion

CBCT’s superior diagnostic accuracy changed the way we look at the diagnosis and prognosis of ECR lesion. It increased the likelihood of correct management of resorption lesions compared with intraoral radiographs.

References

THURSDAY C-6

ENDODONTIC TREATMENT OF DENS INVAGINATUS
WITH PRESERVATION OF THE INVAGINATED TISSUES
A CASE SERIES

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Dept. of Endodontics

Aim
Present 3 cases of non-surgical root canal therapy of type II Dent’s dens invaginatus with preservation of the invagination’s anatomy

Introduction
Dens invaginatus consists of an intrusion of a tooth’s outer portion (enamel) into the inner portion (dentine) during the soft tissue stage of development with the formation of a pocket or root space. Dens invaginatus can be classified according to its severity, with the most commonly accepted classification of Dent’s describing three types as determined by how far they extend radiographically from the crown into the root: type I invagination is limited to the crown, type II invagination invades part of the root and type III invagination invades the entire root. Dens invaginatus type II is a rare occurrence with higher incidence in mandibular permanent lateral incisors. Most cases of dens invaginatus are detected and confirmed with periapical films. Most often the canal infection is due to the passage of microorganisms from oral space to pulp space, making endodontic endoradicular therapy of the invagination lumen, which might include, or not, the invagination removal.

General Endodontic Procedures
These auxiliary lateral incisions with Dent’s type II dens invaginatus were referred for evaluation. Diagnosis of pulpal and periapical pathology was made based on pulp tests and periapical radiographs. Non-surgical root canal therapy was recommended and performed under local anaesthesia. In all cases, tooth structure was preserved by removing the invagination without incorporation into the adjacent pulp space. After proper anesthesia and rubber dam placement, access was obtained and full debridement was performed under copious irrigation with 5.25% NaOCl. In one case, an apical barrier of MTA was placed at the teeth were obturated with a resin-based sealer and warm gutta percha.

Case presentation 1
A 34-year-old Caucasian male presented a diagnosis of periradicular endodontic treatment with asymptomatic apical periodontitis on tooth 12. After accessing the pulp chamber, two canal orifices were evident with the calcification noted in between. Both canals were treated independently, leaving the invaginated tissues in the root canal. The root canal was filled with warm gutta percha and a cone sealer (Densply Tulsa Dental, USA) using the continuous wave of condensation technique. A 2-months follow-up revealed satisfactory healing of the inflammatory process associated with the teeth.

Case presentation 2
A 41-year-old female patient was referred for endodontic therapy on tooth 22. After endodontic access, two canals were located and identified with ultrasonic tips (FLEXZIT, USA). The first root canal was widened and instrumented with ProTaper (Dentsply® Tulsa Dental, USA) and filled with warm gutta percha and AH Plus sealer (Dentsply Tulsa Dental, USA) using the continuous wave of condensation technique. A 2-months follow-up revealed satisfactory healing of the periapical lesion.

Case presentation 3
A 43-year-old male presented with a necrotic pulp and symptomatic apical periodontitis on tooth 22. A routine access to the main root canal system was prepared and access to the interior of the invaginated tissues was performed with ultrasonic tips (rotates, Dentsply Tulsa Dental, USA). The root canal system and invagination were instrumented and debrided independently, not removing the entire dens invaginatus. At the second visit, both the root canal and invagination were filled with warm gutta percha and AH Plus sealer (Dentsply Tulsa Dental, USA) using the continuous wave of condensation technique.

Discussion
Teeth with dens invaginatus pose challenges for root canal treatment because of their anatomical complexity. Endodontic treatment of type II invaginatus is often difficult, because pulp pathology usually requires treatment of both the invagination and the main root canal. In such situations, the decision of either treating the invagination lumen separately or its incorporation into the main root canal has to be made. Improvements in endodontic armamentarium makes the conservative treatment of such complex root canal morphologies possible, without combining the root canal and invagination lumen during treatment. This obviously has the advantage of conserving tooth structure.

For the three presented cases, 1.2 years follow up of these cases showed clinical and radiographic success following endodontic treatment.

Conclusion and Clinical Relevance
With Dent’s type II Dens invaginatus, non-surgical endodontic therapy with preservation of the invagination is a valid treatment option, allowing for healing of periodontal tissues and conservation of tooth structure.

References

With Dent’s type II Dens invaginatus, non-surgical endodontic therapy with preservation of the invagination is a valid treatment option, allowing for healing of periodontal tissues and conservation of tooth structure.
An immunohistological comparison of a revitalized and a sound tooth

Nastaran Meschi a, Petra Hilkens a, Athina Mavridou a, Olaf Strijbos a, Ivo Lambrichts b, Paul Lambrechts a

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b Biomedical Research Institute (Morphology Lab), Hasselt University

Aim
To assess the immunohistological outcome of an infected immature permanent human incisor 5.5 months post revitalization and the sound contralateral incisor.

Case Presentation
The avulsed tooth 11 of a 6-year-old girl (Fig. 1a) presented an acute apical abscess 1 month post reimplantation. A revitalization procedure was performed (Fig. 1b, ref. 1), though 5.5 months later, the tooth had to be removed due to invasive replacement resorption and ankylosis (Fig. 1c,d). Post orthodontic advice, tooth 21 was also extracted. Nano-CT and immunohistological stainings were performed. From coronal to apical, the immunohistological stainings of the revitalized tooth presented a calcifying bridge underneath the Portland cement (Fig. 1e), connective pulp-like tissue (PLT) with blood vessels and mineralization nuclei (Fig. 1m,n,o), DSPP osteodentine against the resorbed root canal walls (Fig. 1f,g). The sound tooth presented vascularized pulp tissue (Fig. 1d) without resorption on the DSPP pulpdentine surface (Fig. 1g,i). The epithelial cell rests of Malassez in the periodontal ligament of both teeth were PC (Fig. 1j,k). The neurovascular bundles in the PLT of the revitalized tooth (Fig. 2h,i) were much less NF than in the pulp of the sound tooth (Fig. 1f).

Conclusion & Clinical Relevance
Revitalization of this infected immature permanent tooth resulted immunohistologically in an intracanalicular connective tissue with a regulated physiology. Revitalization of an immature permanent infected tooth may result in a combination of regeneration and repair of the pulp-dentine complex.

References
Evaluating canal trajectories in mesial roots of lower molars with a new endodontic software for CBCT

Priscilla A. Ropini, Irina Petrova, Riccardo Costantini, Simone Staffoli, Lucilia Piaschi, Dario Di Vardo, Gabriele Miccoli, Luca Testaroli, Gianluca Gambarini

Sapienza, University of Rome, Master in Endodontics

Aim: Evaluating canal trajectories in 3d by using a new endo software for CBCT.

Introduction: Understanding root canal complexities is a key factor to perform endodontic therapy with no iatrogenic errors. In the present study mesial roots of mandibular first molars in an Italian population were investigated by means of a new endodontic software for CBCT, aiming at identifying confuent and curved root canals.

Methods: 100 molars were examined, selected from the CBCT scans of 50 patients who previously required CBCT for surgery or implant placement. A new endodontic software (3d Eado™, Dentsply Sirona) for CBCT was used. The following parameters were evaluated: number of canals, the presence of apical confluences, the distance between confluences and apical foramen, which canal showed a more complex curvature. Data were collected and statistically analyzed (paired t-test).

Cases presentation (results)

Discussion: All of the examined roots had 2 canals. Apical confluences were observed in 41% of cases. The average distance between confluences and apical foramina was 2.85 mm (SD +/- 0.49). The mesiobuccal (MB) canal showed more complex trajectories (higher degree of and/or multiple curvatures) than the mesiolingual one (ML), but in confluent canals this percentage was lower.

Conclusions: The new software allowed an easy and precise evaluation of canal trajectories, and determination of canal lengths.

References:

CBCT analysis of the mesial root of lower molars

<table>
<thead>
<tr>
<th>Canal</th>
<th>MB</th>
<th>ML</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal (no confluence)</td>
<td>59%</td>
<td>5%</td>
</tr>
<tr>
<td>Confluence</td>
<td>41%</td>
<td>42%</td>
</tr>
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The use of CBCT in a 5 canal maxilar first molar
Case report
Cardoso M., Reboio A., Clemente L., Noltes R., Paulo M.;
Health Sciences Institute - Universidade Catolica Portuguesa

Introduction
The upper molars frequently have 2 roots: mesio-buccal (MB), disto-buccal (DB) and palatine (P), with an estimated incidence between 73.0% and 94.6%. Cone-beam computed tomography (CBCT) is one of the most useful tools to analyze teeth with uncommon morphology and anatomic variations, which is essential to achieve a good treatment plan. CBCT allows the identification of canal variants overcoming the limitations of periapical radiograph.

Case Presentation
- Male, 23 years old.
- Acute symptomatology in the tooth 2.9.
- Tenderness on vertical percussion and thermal test with adjacent periodontal radiolucency.
- Axial CBCT images revealed one MB root with 3 canals and DB root merged with palatine root with 2 canals fused on coronal third.
- Under rubber dam isolation, the endodontic treatment was performed using ProTaper Universal system, irrigating with 2.5% NaOCl.
- All root canals were filled with paper points until obturated.

Obturation techniques:
1. With a gutta-percha cone, AHPlus® paste was placed inside the root canals; the excess was removed with paper points.
2. MB Canals
   - MB1: Guttacone® M (18 mm)
   - MB2: Guttacone® G (20 mm)
   - MB3: Single Cone F1 (17 mm)
3. DB Canals
   - DB1: ProFile 20/40
   - DB2: ProFile 25/40

CBCT - Axial Images

Discussion
The root canal anatomy complexity requires special care in diagnosis and endodontic treatment. CBCT allows clinicians understand in a better way all root and canal variations gathering all the conditions to provide a more suitable endodontic treatment. The use of combined thermoplastic obturation techniques is essential to fill the anatomic variations and hermetically seal the canal.

Conclusion & Clinical Relevance
The correct diagnosis and identification of tooth canal anatomy prevents missing canals and thus reduces the possibility of success. This case has a promising outcome since CBCT enabled a better understanding of the anatomy and the chosen obturation techniques ensured a hermetic obturation preventing reinfection.

References
Non-surgical endodontic therapy as preferential treatment for a misdiagnosed extraoral cutaneous sinus tract

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Introduction
The differential diagnosis of an extraoral sinus tract with other dermatological pathologies remains difficult. Although a correct diagnosis of the dental cause can prevent unnecessary antibiotic applications and surgical interventions, in this case a 20-year-old woman was referred for management of an extensive redness, spot on her chin. Previous surgical intervention by the dermatologist had not resolved the problem and the anatomopathological sample was not brought into relation with apical pathology.

Case presentation

Clinical appearance before and after treatment. (a) Frontal view of the patient at intake. (b) Sagittal view of the soft tissue base of the rod nodule. (c) Small discrete scar remained one year after endo-treatment. (d) Sagittal view one year after endo-treatment.

Clinical changes of the granulation tissue. (a) At intake. (b) Detail of the granulation tissue. (c) Shrinkage after use of a corticosteroid ointment. (d) Persistent exudate after use of antibiotics. (e) Small discrete scar one year after endo-treatment.

Parapical radiographs of tooth 32 showing the changes of the granuloma in time. (a) Parapical radiolucency. (b) Ca(OH)2 paste as an inter appointment dressing. (c) After finishing the endodontic treatment (Protaper Next®, NaOCl, EDTA, top-up and gutta percha). (d) 3 months follow-up with no radiological signs of healing. (e) 6 months follow up showing ongoing bone healing. (f) One year follow up showing complete healing.

Histological findings of an earlier removed dermatological extraoral fragment showing granulation tissue. (a) Overview. (b) Higher magnification showing several blood vessels embedded in a loose connective tissue containing fibroblasts and inflammatory cells (hematoxylin – eosin staining).

CBCT findings. (a) Axial image showing a disrupted cortical bone. (b) Sagittal image of tooth 32. (c) 3D reconstruction of the mandibular region. (d) CBCT one year after endodontic treatment showing bone healing. (e) Sagittal image showing healing of the spongy bone and the cortical plate. (f) 3D reconstruction one year later.

Supposed healing pattern. Sketch showing the supposed pathways of the granulomatous sinus tract and granuloma before and after endodontic treatment.

Conclusion & Clinical Relevance
The diagnosis of a cutaneous sinus tract is not an easy task due to the absence of symptoms and the distance between perapical origin and extraoral lesion. A dental cause must always be considered in the differential diagnosis. A proper examination can avoid unnecessary antibiotic and surgical therapies. CBCT can be helpful in the diagnosis and follow up of these lesions. The patient in this case was successfully treated with only endodontic therapy.

References
Endodontic Treatment of a Fused Central Incisor with a Supernumerary Tooth - Choosing Appropriate Instrumentation by CBCT Analysis

Alex Lvovsky, Joe Ben Itzhak, Michael Solomonov

**Aim**
To discuss the role of cone-beam computed tomography (CBCT) in the planning of endodontic treatment of a tooth with complex anatomy.

**Introduction**
The complex anatomy of a maxillary incisor fused with a supernumerary tooth presents both a challenging diagnosis and treatment. The implementation of additional imaging techniques is advised.

**Case Presentation**
A 21 year old healthy male presented with a complaint of a suppurating sinus tract adjacent to tooth 21. The tooth presented a wide clinical crown, without sensitivity to percussion and palpation. Probing depth was under 3 mm, and electric pulp sensitivity tests were negative. Radiographic examination suggested a complex anatomy with a periapical radiolucency around tooth 21. A CBCT scan revealed fusion of a central incisor with a supernumerary tooth.

**CBCT imaging**
CBCT scan revealing a complex anatomy and a variable cross section of the main canal along with an irregular space created by the union of the incisor with the supernumerary tooth.

Pulp necrosis with chronic apical abscess were diagnosed and a non-surgical root canal treatment was indicated. Endodontic access was gained separately into tooth 21 and the irregular space. Based on the CBCT scan, the DFR system was used in the canal of tooth 21 due to its long oval cross section and the XP-Endo Finisher rotary file used in the irregular space due to its shape, similar to that of an internal resorptive defect. Calcium Hydroxide paste was inserted into the canal spaces for 3 weeks. Following sinus tract closure, the canals were dried and filled with Gutta Percha and an epoxy root Canal Sealer using a combination obturation technique. A twelve months follow-up revealed advanced healing of the apical radiolucency. A composite build up was made to reshape the clinical crowns.

**Clinical Imaging**
On the left - an image of the clinical crown exhibiting a wide mesio-distal dimension. On the right - a clinical view of two separate access cavities.

**Discussion**
The complex anatomy often exhibited by fusion of teeth presents a challenge for the endodontist. CBCT scanning may aid in the successful treatment of such cases by revealing the true shape of the canal spaces, allowing precise access cavity design and selection of proper instrumentation techniques to match the individual shape of the canal spaces.

**Conclusion and Clinical Relevance**
A limited field of view CBCT scan is an important diagnostic tool in the treatment of cases with complex anatomy. The information gained about the cross sectional shape of the canals allows for a proper selection of instrumentation technique.
Treatment of a dens-in-dente Oehler type IIIB using 3D-imaging and planning

Maarten Van Meerbeeck, Raan Shani, Constantinos Politis, Paul Lamberth, KU Leuven, Leuven, Belgium

Introduction
A 24-year-old girl consulted the Department of Oral and Maxillo-Facial Surgery at the University Hospitals Leuven, Leuven, Belgium. The patient was referred by her general practitioner for an anterior open bite (a), due to long-term thumb sucking and tongue thrusting (b). Clinical and radiological examination revealed ankylosis of the upper right incisor. A C-AP X-ray was performed using conventional 2D (c, d, e, f). Sensitivity tests were performed with cotton tipped swabs and all upper incisors reacted positive (g).

Case presentation
Clinical and radiological examination
Clinical examination revealed a normal mandibular aspect of the tooth compared to the neighboring teeth (a). On the palatal aspect the incisor-velar contact was clearly visible. The radiographic exam was performed with conventional 2D (b) and CBCT (c, d, e, f). Sensitivity tests were performed with cotton tipped swabs and all upper incisors reacted positive (g).

3D-planning
The DICOM files of the CBCT scans were extracted and used to make a 3D model of the upper right incisor using MicroDicom software (i). Once the tooth was segmented and the 4D model was finished, the STL file was sent to the department of Oral and Maxillo-Facial Surgery, where the tooth was 3D printed using the Object Connex 350 printer (Stratasys, Edina, Minnesota) (j). The 3D model was used to guide all aspects of the endodontic treatment (a, b) prior to performing treatment in situ.

Endodontic treatment
Session I
The tooth was isolated using dental dam and dental wax. Endocone micro access into the incisor was performed (a, b). A K-files (Dentsply, Maillefer, Switzerland) and a P2 taper (ProFile, Dentsply, Maillefer, Switzerland) were used to widen the access. NaOCl 5% was used to disinfected the incisor (c, d). Consequently, the canal was flared with EDTA 17% and citric acid 20% to flush out remaining irrigant material and root canals were reamed using ultrasonic and infrared files (K files (Dentsply, Maillefer, Switzerland) (e, f). Further pseudo-pulpal bleeding was noted. Calcium hydroxide was applied into the incisor canal. A periapical radiograph was taken (g). An x-ray was performed after 4 weeks showing no signs of periapical healing (h).

Session II
After 4 weeks, the tooth still reacted positive to carbon dioxide snow. The calcium hydroxide was removed and an appointment for apicectomy was made 6 weeks later.

Session III
The tooth still reacted positive to carbon dioxide snow after 6 weeks. The tooth was treated using root end surgery. The temporary filling was removed using ultrasonic and access was established. NaOCl (2.5%) and EDTA 17% were used to flush out all organic and mineral remnants (histological material). A root fill with physiological saline was used to assess the possibility of bacterial re-infection of the root canal using microscopic techniques (microscopic field). A root canal was sealed using gutta-percha and a final filling materials was inserted using an apical condenser (i, j). A radiograph was taken (k).

Conclusions
The use of cone beam computed tomography in combination with three dimensionally printed models can help to understand the proximity between the root canal system and the incisor contact area. Deant treatment planning improves the predictability of endodontic treatments and can reduce treatment time.

References
Treatment of an internal root resorption in a mandibular molar using MTA: a case report

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1 Department of endodontics - Universidade Católica Portuguesa

AIM

To describe the use of MTA in the treatment of a mandibular first molar with internal root resorption (IRR).

INTRODUCTION

Resorption is a condition associated with either a physiologic or a pathologic process resulting in a partial loss of dentine, 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 male patient, 36 years old, caucasian, healthy with no allergies and no medication, presented with pain in the left mandible and recurrent abscesses in this region in 2011 to the Clinic of the Universidade Católica Portuguesa- Viseu. After radiographic study by periapical and panoramic X-rays, an enlargement of the mesial root canal space of the previously extracted tooth 3.6 was observed. Non-surgical endodontic retreatment of the 3.6 was performed in three sessions with interim appointment medication with Ca(OH)2 dressing. In the radiograph the mesial root measured 20mm, but in the electronic apex locator the Mesiodistal canal presented a working length of 15.6 mm and the MesioLingual 19.9 mm. Filling was done using MTA in the apical 5 mm and Gutta-percha injection (Reciproc) in the remaining canal to achieve an airtight sealing. The accessibility was restored with a composite resin filling. At the one-year follow-up, the tooth was asymptomatic and resolution of the redcoloredness in the apical region was observed.

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 dentin areas and hermetically seal the canal (3,4). MTA is a biocompatible material which induces bone and dentin regeneration. In this clinical case MTA associated with injection of thermoplasticized gutta percha was a suitable root filling given the communication between the resorption and the periodontium.

CONCLUSION AND CLINICAL RELEVANCE

The correct diagnosis of internal root resorption is necessary to program the right endodontic treatment. This case has a promising outcome since it allowed the maintenance of the tooth in the absence of any symptoms or radiographic lesion.

REFERENCES

Combined endodontic-surgical treatment of a maxillary canine with invasive cervical root resorption

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2 Department of Orthodontic and Craniofacial Anomalies, School of Graduate Dentistry, Rambam Health Care Campus, Haifa, Israel

Aim
To describe the use of a multidisciplinary treatment approach in the management of a maxillary canine with invasive cervical root resorption (ICRR).

Introduction
ICRR is a clinical term used to describe a relatively uncommon, insidious and often aggressive form of external root resorption characterized by its cervical location and invasive nature. This resorptive process can lead to a significant loss of tooth structure. This case report presents a treatment strategy that might improve the healing outcome for patients with ICRR.

Case Presentation
This case report presents a treatment of a 33 years old male, with a combined endodontic-surgical approach. The treatment was performed in a symptomatic Class IV ICRR (Heithersay's classification) case, in three sessions:
1. Non-surgical ICRR treatment. Root canal treatment was performed using an operating microscope. Cleaning and shaping of the canal and dressing using calcium hydroxide.
2. Obstruction of the apical part of the canal using AH Plus type of sealer and gutta-percha. Thus sealing the resorption area from an internal approach (inside the canal using mineral trioxide aggregate [MTA]).
3. Periodontal reconstructive surgery to expose the ICRR lesion's port of entry.

The 10% aqueous solution of trichloroacetic acid (TCA) was used to eliminate the continuous resorptive osteoelastic activity, while the glass ionomer filling was used for restoring the defect. Osteotomy of the marginal alveolar bone and the reconstruction of the cervical periodontal attachment apparatus was performed using bone substitute and guided tissue regeneration (GTR).

At 2-year follow-up period, clinical and radiographic examination demonstrated proper occlusal relationships, excellent tissue repair with no pathological changes. The patient was referred to periodontist to improve gums esthetics.

Discussion
Successful endodontic-surgical treatment of an impacted canine is presented. The severe ICRR had developed after recurrent Ortho-Surgical treatment of an impacted canine. Cone beam imaging was an essential diagnostic tool to determine the exact pattern and dimensions of resorption process. A direct communication was evident between the canine pulp chamber and the ICRR lesion. Therefore, a root canal treatment was initiated followed by surgical periodontal treatment.

Clinical and radiographic multidisciplinary approach which includes proper diagnosis and treatment planning, are the key features for a success.

Conclusion & Clinical Relevance
Diagnosis and treatment of ICRR presents a challenge. The prognosis mainly depends on early diagnosis and the extent of the resorptive process. A surgical exposure and endodontic treatment may serve as contributing factors for the development of ICRR. The presented multidisciplinary treatment approach suggests the prudent clinician a solution in Class IV cases of ICRR.

References
THURSDAY C-15

A SAVE AND GENTLE TECHNIQUE TO REMOVE THERMAFIL CARRIERS OR SIMILAR PRODUCTS IN RETREATMENT CASES USING A NEW DEVICE

A case- and -technique presentation

Nils Widera, Leipzig, Germany

AIM/
In retreatment cases it is necessary to remove old root filling material, therefore high pressure at the root canal walls and accidental transporting of filling materials into the periapical region needs to be avoided.

INTRODUCTION/
In many cases, it is difficult to remove very long or durable Thermafil Carriers from the root canal. If the carrier gets separated in the apical third, it may cause an apical extrusion of plastic carrier Thermafil obturators.

TECHNIQUE/
The wire loop technique using the FragRemover

Using an ultrasonic tip, produce a narrow circle around the coronal part of the carrier.

Place the wire loop (diameter 0.1 or 0.15 mm) around the exposed carrier head.

Carefully tighten the wire loop with the FragRemover and pull it out of the root canal.

CASE/
tooth 46 after resection, chronic apical periodontitis

DISCUSSION/
The displayed technique clearly demonstrates that, in specific clinical situations, the Thermofil carriers can be safely removed. Its predictability without the need for root canal transportation presents an additional benefit.

CONCLUSION/
The wire loop technique using the FragRemover is a fast, efficient and save method that is easy to apply. It enables removing plastic carrier cores without the risk of chipping.
The prognosis of root canal treatment in cases with separated instruments

Agata Koprowicz, Joanna Gąska-Matikowska, Aleksandra Palatyńska-Ulatawska, Halina Pawlicka
Medical University of Lodz, Department of Endodontics

The aim of this study was to discuss different clinical cases of root canal treatment (RCT) with intracanal instrument separation, as far as their diagnosis, treatment and prognosis are concerned.

Introduction:
The separation of endodontic instruments in the root canal may influence the final outcome of the RCT. The success rate depends mainly on preoperative periapical status and the stage of canal preparation at which an instrument fracture occurs. Attempts to remove broken fragment may result in creating a perforation, a ledge, or weakening of the root canal wall [1].

Case Presentation:
A 35-year-old patient was referred by his dentist for a revision of RCT of tooth 26 (2016). Analysis of the radiograph revealed the RCT performed improperly, pathological lesions in periapical tissues and the presence of a broken Hedstroem file. It was removed with an ultrasonic file, all canals were prepared chemically using Reciproc and NaOCl and filled with DowPack and BackFill method of thermoplasticized GP and of AH Plus paste. In 2017, the X-ray control confirmed periapical healing. A follow-up observation is required due to inadequate sealing integrity of the prosthesis.

Case Presentation: In 2012, a 26-year-old patient was admitted for endodontic consultation of tooth #46. Having informed the patient about high risk of the treatment failure, a shared decision was made to perform RCT and prosthetic restoration. The standard post was retrieved using an ultrasonic tip Start-X #3 and the broken file from canal ML using modified injection needle technique. Distal canals were obturated with lateral compaction of GP and AH Plus paste whereas mesial canals were filled with MTA cement. After the RCT, the cavity was restored with composite resin material by patient's GDP. The control radiograph (2016) confirmed the healing process of the periapical tissues.

Case Presentation: A 30-year-old patient undergoing an orthodontic treatment was referred due to an unsuccessful attempt to remove broken file from canal ML of the tooth 36. The canal wall perforation noticed on the X-ray was confirmed under microscope magnification, the separated file was retrieved by copious irrigation with HoO2. After the canal preparation have been completed, its apical part was filled (GP and AH Plus) and the perforation was sealed with MTA cement. For the rest of the Canal Backfill method was applied. The patient was referred to his GDP.

Discussion:
Fractured file fragment itself does not contribute to the RCT failure in all cases. However, the prognosis may be uncertain unless compromised microbial control. At first, an attempt to bypass should always be considered, particularly in those multirooted teeth cases where the canals join before the apical foramen. If the decision is made to remove the broken file, it must be undertaken using the microscope magnification (Fig 1) and ultrasonics (Fig 2). In some instances it may be prudent to forgo instrument removal to prevent subsequent complications [1], particularly when the fragment lies on or in the canal curve [2]. The more apical the location of the fractured instrument the lower the fracture resistance of the root [1]. It seems that no matter the coronal sealing, the teeth with inadequate RCT have a higher prevalence for periapical pathosis compared to those with correct RCT [3]. According to research the coronal sealing quality and traumatic occlusion have a notable influence and the success of retreatment is equal to tooth persistence on the arch [3].

Conclusions and Clinical Reference:
Presented clinical cases might have seemed to have poor prognosis. Before treatment decision the following important aspects were considered. Firstly, dentist abilities, then the patient’s general health and motivations and, eventually tooth factors (microbial and technical). In all presented cases, indications of the treatment were based on oral rehabilitation. Despite the high risk of treatment failure the endodontic success was noticed. It concerned mostly young patients without general diseases. Other case should be still under long term follow-up (predominantly because of uncertain method of crown restoration or excessive weakening of the root).

References:
MULTIDISCIPLINARY MANAGEMENT OF COMPLICATE CROWN-ROOT FRACTURE

Bade Sonat, Bilge Sozeri

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Aim: The aim of this case report was to present the multidisciplinary management of complicated crown-root fracture of maxillary central incisor and one year follow-up.

Introduction: Crown-root fractures account for 5% of all fractures in permanent teeth and can involve anamal, dentin, and cementum. Depending on whether there is pulpal involvement, these problems may be classified as complicated or non-complicated. The treatment depends on the level of the fracture line, root length and/or morphology and esthetic needs. A fractured permanent tooth may induce some functional disturbances and in patients especially in younger persons, it seems to be a major problem comprising aesthetic appearance.

Case Presentation: 32 years old male patient was referred to our clinic with tooth fracture of the left maxillary central incisor after work accident (Fig. 1). Clinical and radiographic examination revealed the presence of crown-root fracture, which had elongated the buccal subgingival area (Fig 2). Extra oral examination revealed lacerations with swelling of upper lips. Introrally laceration were present on buccal mucosa and crown-root fracture extending below palatal margin were observed. Broken mobile fragment was removed than gingivoplasty and pulp extirpation was performed and access cavity sealed with temporary filling and then waited one week for healing (Fig 3). Postoperative clinical view was found normal and root canal preparation was done (Fig 4). Finally, tooth was restored with fiber post and composite resin (Fig 5). After one month, final restoration was made with porcelain crown (Fig 6).

Discussion: Management of complicated crown-root fractures remains a challenge. This is due to difficulty in achieving isolation with a rubber dam for a dry operating field, which might compromise the hermetic seal of restoration. Various treatment modalities have been proposed for crown-root fractures: like removal of coronal fragment with subsequent restoration above gingival level. This allows the subgingival portion of the fracture to heal with formation of a long junctional epithelium. The second option is to convert the subgingival fracture to a supragingival fracture with the help of gingivectomy and ostectomy procedures. However, it is not indicated in the areas where esthetics is required. The third option is removal of the coronal fragment and surgical extrusion of the tooth, to surgically move the fracture to a supragingival position. In this procedure, the periodontal ligament may fail to reattach to the root surface and remarkably increases the risk of root resorption. The fourth modality of the treatment is removal of the coronal fragment and subsequent orthodontic extrusion of the tooth.

Conclusions and Clinical Relevance: The patient should be followed for 3-6, 12 months esthetics, tooth mobility, and periodontal status should be confirmed both clinically and radiographically at these follow-up visits. After a 1 year of follow-up, there was no evidence of apical periodontitis and the tooth was satisfactory both esthetically and functionally.

Multiple dens evaginatus on the bicuspid of a 14-year-old Asian girl. Case report
Zioutis Vasileios¹, Idzahi Karim², Pantelidou Ourania³
¹DDS, ²DDS, MSc, ³Associate Professor AUTH

Aim
The aim of this poster is to demonstrate a case of dens evaginatus in order to help the general dentist to set an appropriate diagnosis avoiding undesirable complications.

Introduction
Dens evaginatus (DE) is a rare dental anomaly during tooth formation. It appears clinically as an additional occlusal cusp that is composed of enamel, dentin and usually enclosing pulp tissue. This abnormal occlusal accessory can be broken or worn out and it leads to pulp exposure which causes infection of the pulp necrosis and periapical inflammation. DE is observed frequently on the lingual surface of maxillary incisors and on mandibular premolars.

Case Presentation
A 14-year-old girl of Chinese origin presented mild pain to the right side of the upper jaw and was complaining about a swelling for a couple of days. Clinical and radiographic examination revealed a fistula and a periapical lesion, respectively. (Fig 1) around the root of premolar 15. During the clinical examination, premolars 14 and 15 were sensitive to percussion while the sensitivity test for 15 was negative with a grade 2 mobility. However, the premolar 15 was free of decay or fillings and the formation of the apex was still incomplete. The patient was under orthodontic treatment. More thorough examination revealed DE on the upper and lower premolars (Fig 2,6). The patient was referred to an endodontist for endodontic treatment. One oval-shaped canal was located and irrigations were performed with 2% sodium hypochlorite and 17% EDTA. MTA was placed in the apical part of the root canal (Fig 3). The remaining part was filled with gutta percha and the coronal restoration was finished with composite resin (Fig 4-5).

The further treatment plan consists of a) oral instructions, b) conservative drilling of the other non-pathological DE that were fractured and sealing with resin (Fig 7) and c) gradual and periodic reduction of the rest DE and application of 0.2% sodium fluoride.

Discussion
The drilling of DE and the sealing with resin are significant in order to prevent and avoid further attrition and exposure. However, it is possible during the drilling for a pulp exposure to occur if a pulpal horn is included in the DE. Then, a direct pulp capping (i.e. Biocalore) should be applied.

Conclusion & Clinical Relevance
A year follow-up shows no pathology and the pulp tissue remains vital. Early diagnosis and correct approach of DE play a vital role to the viability of the pulp and ensure a complete root formation.

Photodynamic therapy used in the endodontic protocol: Radiographic follow-up.

AIM: To evaluate the disappearance time of periradicular radiolucent areas after an endodontic treatment or retreatment associated to Photodynamic Therapy (PDT).

INTRODUCTION

PDT is a technique based on the use of a photosensitizer that is incorporated to the canal microorganisms. The use of a light inside the canal leads to an oxidative process that produces bacteria death.

CASES PRESENTATIONS

63 cases: 46 necrotic teeth (N) 37 retreatment (R)

Approved by the Universitat de València Ethics Committee / Informed Consent

Inclusion criteria:
- Some working protocols
- Permanent teeth with periradicular area
- Some experienced operator
- Use of surgical microscope
- Radiographic follow-up

Exclusion criteria:
- Temporal teeth
- Immature apex
- Perforation teeth
- Filling with bioceramic materials
- Radiographs with different projections
- Treatment is more than two visits

1st appointment: Canal preparation with Reciproc and sodium hypochlorite (2.5%). Ultrasonic cleaning (Emi S25) and sodium hypochlorite (2.5%). EDTA 17% with ultrasonic activation. PDT application: Toluidine blue (photosensitizer) was injected in the canal. Application of visible light (Futulight®) 30 seconds by canal. Removal of FS with sodium hypochlorite. Irrigation with sodium hypochlorite and temporary crown restoration.


2 calibrated observers. Measure tool from Kodak 6300. After clinical and radiological follow-up, we registered when the periradicular radiolucent area disappeared (months).

DISCUSSION

Healing peaks were observed at 4-7 and at 16-26 months, mainly corresponding to pulp necrosis and retreatments associated with lesions less than 4 mm.

Retreatments with lesions greater than 4 mm needed more time to heal.

In almost every case, a small loss of the limit of the lesion was found at 1-3 months, while greater changes were observed at 4-7 months.

CONCLUSIONS AND CLINICAL RELEVANCE

Radiolucent areas disappeared at different time periods (between 7 and 23 months), independently of the lesion’s size.

PDT can be an alternative technique to intracanal placement calcium hydroxide.

EndoValencia www.endovalencia.com
Apical plug technique using MTA in tooth with necrotic pulp and immature apex: a case-report

AHUVA SEGAL, GILAN, AVDEMIR SEÇKIN

*Roccelli University, Faculty of Dentistry, Department of Endodontics

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

Introduction: The apexification is the first alternative treatment on a permanent tooth in the presence of immature apex with pulp necrosis. Apexification with MTA to induce of apical closure produce more appropriate conditions for root canal filling.

Methodology: 30-year old male patient with pain was referred to our clinic. Patient informed us that he had not trauma history. Radiographic examination revealed that large periapical lesion and wide open apex. Under rubber-dam isolation, the tooth was accessed using round bur. Working length was determined using Raypex 6 electronic apex locator (VDW, Munich, Germany) and confirmed with periapical radiograph. The root canal was instrumented with hand files. The canal patency was as large as a #100 H-file and the root canals was irrigated with 2.5% sodium hypochlorite. The root canal was dried with sterile paper points (Dentsply, Maillefer). Then calcium hydroxide paste was used as intracanal medicament, and the access was sealed with temporary filling material (Cavit). After 2 weeks, the tooth was asymptomatic. The temporary filling was removed and root canal was irrigated with NaOCl. MTA (Angelus, Londrina, FR, Brazil) was used as apical plug and confirmation radiography was taken. Then a wet cotton pellet was placed in cavity. After 2 days, the remaining root canal space was obturated with gutta-percha (Dentsply, Petropolis, Brazil) and AH Plus sealer (Dentsply De Trey GmbH, Konstanz, Germany). A postoperative final radiograph was taken and the coronal restoration was made with a universal composite resin restorative material. After 2 years, the tooth was still asymptomatic, functional and there were also radiographic signs of lateral and apical root closure.

Conclusion: MTA has shown a significantly greater frequency of dentin bridge formation. An apical barrier formation can occur between the MTA plug and the root canal walls.

References:
Endodontic treatment of maxillary right central incisor with horizontal root fracture - A case report

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Aim Early loss of permanent anterior teeth due to trauma can cause esthetic and functional problems for young patients. This study aimed to maintain both esthetic and function while protecting the tooth and alveolar bone.

Introduction This case reports the treatment of a horizontal root fracture in a maxillary right central incisor using a mineral trioxide aggregate.

Case Presentation A 17-year-old male patient referred to our faculty clinic, with dental traumatism. The patient reported that he had suffered a car accident 5 days ago and had dental and soft tissue injuries. Medical history of the patient did not reveal any relevant information.

Radiographic evaluation revealed horizontal root fracture in the apical third of the root (Fig. 1). The maxillary right central incisor was 2 mm extruded relation to the maxillary left central incisor, presented grade II mobility (Fig. 2). Clinical evaluation revealed that tooth repositioning by manual procedure was not possible. Thus, the alternative treatment plan consisted of repositioning the tooth after apicectomy.

At surgery, apical root fragment and granulation tissue were removed. The coronal part was repositioned carefully seeking alignment with the incisal edge of the maxillary left central incisor. Occlusal adjustment was made to prevent occlusal traumatic interference. The repositioned tooth was fixed with stainless steel semi-rigid splint (Fig. 3). After 1 week, surgical sutures were removed.

A rubber-dam could not be used due to splint. The canal length was determined with an apex locator and periapical radiography. After two weeks, the temporary filling was removed and root canal was irrigated with NaOCl. The canal was obturated with mineral trioxide aggregate (MTA Angelus) (Fig. 4). The splint was removed after 6 weeks.

After 12 months; tooth’s mobility was decreased and the tooth was functional; also, new bone formation could be observed in the periapical region (Fig. 5).

Discussion The treatment principles for horizontally fractured teeth involve maintaining pulp vitality by immobilizing the coronal segment. The first step for management of horizontal root-fracture cases is to reposition the tooth and confirm its position radiographically.

Conclusion MTA could be biocompatible filling material for the endodontic treatment of horizontal fractures.

INVASIVE CERVICAL RESORPTION: A CASE REPORT

Aim The aim of this clinical case report is to describe the diagnosis and treatment of an external invasive cervical resorption.

Introduction Root resorption is the loss of hard dental tissues such as cementum and dentin due to odontoclastic activity. Invasive cervical resorption is a relatively unusual form of external root resorption generally with no external symptoms. External invasive cervical resorption is very aggressive. The etiology of cervical resorption is unknown, but there are many predisposing factors such as injuries, orthodontic treatment, dentolo alveolar surgery, orthognathic surgery, periodontal treatment and tooth whitening procedures, alone or combined.

Case presentation A 22 year old male patient referred to our hospital with a staining in his anterior lower tooth. There was a pinkish coloration in the cervical buccal part of the right lower canine tooth in the clinical investigation. Also, the tooth was asymptomatic, and there were no any clinical signs of pain or infection. Radiological examination revealed invasive cervical resorption inside the cervical buccal dentine mass. Access cavity was opened on the palatal wall, the root canal was shaped and calcium hydroxide was used as a medicament. Trichloracetic acid was used for the resorption area, temporarily sealed with glass ionomer in the first session. 1 week later, the tooth was asymptomatic, the root canal was filled. Resorption area was filled with MTA and composite resin.

Discussion MTA is generally used to treat different kinds of root resorptions, because of the sealing ability of the material whether in case of the presence of oral moisture or blood. The treatment of root resorptions depends on the sealing ability of the material. The other important factor in the treatment is, removing the infected area in the resorption. In this case, calcium hydroxide was applied before the root canal filling. After the root canal filling, the area of resorption was filled with MTA and composite resin.

Conclusions and Clinical Relevance The treatment of the invasive cervical resorption of the anterior teeth is to deactivate the resorptive process by using Calcium hydroxide and Mineral Trioxide Aggregate and to restore the damaged tooth surface without any esthetic sequelae.

Management of severe odontogenic infections: Case series

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Aim: To present the treatment of odontogenic orofacial abscesses caused by root canal infections in different regions.

Introduction: Odontogenic infections can be classified as dental emergencies in the dental clinic. These emergencies can be the most important cases; owing to the complex microbiology of odontogenic infections and a potential for advancement to life-threatening medical emergencies. Acute dental abscesses have been reported to cause severe complications and even mortality.

Clinically, the patient with acute apical abscesses experiences mild to severe pain and swelling. Tympanic may occur. Systemic manifestations may also develop including fever, lymphadenopathy, malaise, headache and nausea.

Case Presentation:

Palatal Abscess: A 24-year-old patient was referred to our clinic with acute swelling, fever and pain. According to clinical and radiographical evaluation, a large periapical lesion and swelling originating from the root canal treated maxillary left lateral tooth were detected. A vertical incision was made, the abscess was drained. Root canal fillings were removed and Ca(OH)2 medication was applied for three weeks. After submission of acute symptoms, the root canal was obturated and a coronal composite restoration was placed. At one-year follow-up, healing was observed in periapical tissue.

Submental Abscess: A 54-year-old patient was referred to our clinic with acute swelling, fever and pain. According to clinical and radiographical evaluation, an abscess was observed in the submental region originating from the mandibular incisors and canines. The abscess was drained extraorally. Root canals were instrumented and Ca(OH)2 medication was applied for three weeks. Antibiotics and analgesics were prescribed. After submission of acute symptoms, root canals were obturated, prefabricated posts were inserted into the roots of canine teeth, and coronal composite restorations were placed. At one-year follow-up, periapical lesions healing were observed.

Fossa Canina Abscess: A 22-year-old patient was referred to our clinic with acute swelling and pain. According to clinical and radiographical evaluation, fossa canina abscess originating from the maxillary right canine tooth was observed. The abscess was drained from the root canal. Root canal was instrumented and Ca(OH)2 medication was applied for three weeks. Antibiotics and analgesics were prescribed. After submission of acute symptoms, the root canal was obturated and a coronal composite restoration was placed. At one-year follow-up, healing of the periapical area was observed.

Buccal Abscess: A 19-year-old patient was referred to our clinic with acute swelling and pain. According to clinical and radiographical evaluation, buccal abscess originating from the mandibular left first molar tooth and periapical lesion were observed. The abscess was drained from the root canal. Root canals were instrumented and Ca(OH)2 medication was applied for three weeks. After submission of acute symptoms, the root canals were obturated and a coronal composite restoration was placed. Although there was an instrument separation in the mesial root, the one-year follow-up showed satisfactory healing of the periapical radiolucency.

Discussion: Odontogenic infections are initially associated with the dental pulp region. If treatment is delayed, they may spread to other local and regional areas. Treatment of acute apical abscesses involves incision for drainage and root canal treatment or extraction of the involved tooth to remove the source of infection. Antibiotics are indicated for abscesses associated with systemic involvement, including fever, malaise and lymphadenopathy.

Conclusion & Clinical Relevance: Clinicians should evaluate endodontic approaches, surgical methods and antibiotic treatment together when treating odontogenic infected patients. The early diagnosis of odontogenic infections and its effective treatment may prevent the spread of the infection and its possible complications.

References:
ULTRASONIC TECHNIQUE TO REMOVE FRACTURED ROTARY NICKEL-TITANIUM ENDODONTIC INSTRUMENTS FROM ROOT CANALS: CASE REPORTS

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Introduction
Fractured endodontic instruments within root canals is one of the most challenging situations in endodontics. Root canal treatment is usually carried out using nickel-titanium endodontic files. These files are known for their excellent performance in root canals, but they can break due to various reasons such as iatrogenic errors, operator overconcentration, or mechanical injuries. The presence of a fractured instrument within the root canal significantly affects the prognosis of the tooth. The removal of the fractured instrument is crucial for the successful outcome of the treatment. Several methods have been described in the literature for the removal of fractured endodontic instruments. The choice of the method depends on the specific situation. The ultrasonic technique is a minimally invasive method for the removal of fractured instruments. This study reports a case of a fractured file that was removed successfully using an ultrasonic technique without any complications.

Case Presentation
Case 1: A 30-year-old male patient presented with anterior pain located in the left upper jaw. The patient reported a recent history of trauma due to a dental injury. The radiographic examination revealed a fracture of the root canal file. The file was located in the mesial root of the upper left incisor. A standard access was performed, and the canal was prepared with NiTi files up to the working length. The fracture was visible on the radiographic examination. A decision was made to remove the fractured instrument using an ultrasonic technique.

Discussion and conclusions
The ultrasonic technique is a minimally invasive method for the removal of fractured endodontic instruments. This method is preferred in situations where the fracture is located at the apical third of the root canal, and the file is too fragile to be removed manually. The ultrasonic technique uses an ultrasonic device to vibrate the instrument, allowing it to be removed without causing damage to the surrounding tissues. The decision to use the ultrasonic technique in this case was made based on the location of the fracture and the condition of the file. The ultrasonic technique was successful in removing the fractured instrument without any complications. The patient reported a significant reduction in pain, and the tooth was maintained without any further complications.

References

Figure 1: Pre-operative Radiograph
Figure 2: Pre-operative radiograph, removed fragment after removed fragment in the root
Figure 3: Preparation and filling of the root canal after 8 months
Figure 4: Pre-operative radiograph, removed fragment after removed fragment in the root
MANAGEMENT OF DIFFERENT TYPES OF C-SHAPE MOLARS
CASE REPORTS SERIES

Anatomical variations are a challenge to the clinician when the conventional protocols for instrumentation, irrigation and obturation are not sufficient to achieve the cleaning and shaping goals of modern endodontics.

INTRODUCTION
There are many publications about anatomical variations. Cooke & Cox (1979) were the first to publish about C shape configurations on lower molars. This is one of the most common variations and consists of an abnormal development of Herbst’s epithelial root sheath, creating a network of interconnected webs in root, fused roots, canals and complex fins. Classifications vary, but the most accepted one was described by Molten (1991) and compiled by Fan (2004). A higher prevalence of this morphology could be found in Asian and Eastern populations when compared with other regions. The radiographic appearance may be considered a predictor of this anatomy. This type of cases requires a complex approach on any step of the endodontic treatment.

CASE PRESENTATION

C1 Type: 21.11%
- PATIENT: MALE 30 years
- DIAGNOSIS: Irreversible pulpitis with apical periodontitis on the 4.7
- TREATMENT PLANNING: Non-surgical root canal treatment
- INSTRUMENTATION: ProFile R15/16 (SybronEndo, Orange, CA)
- OBSTRUCTION: Gold 6% + Gutta Percha (SybronEndo, Orange, CA)
- Endo motor R15/16 (SybronEndo, Orange, CA)

C2 Type: 25.45%
- PATIENT: FEMALE 30 years
- DIAGNOSIS: Irreversible pulpitis with apical periodontitis on the 4.7
- TREATMENT PLANNING: Non-surgical root canal treatment
- INSTRUMENTATION: ProFile R15/16 (SybronEndo, Orange, CA)
- OBSTRUCTION: Gold 6% + Gutta Percha (SybronEndo, Orange, CA)
- Endo motor R15/16 (SybronEndo, Orange, CA)

C3 Type: 38.11%
- PATIENT: FEMALE 17 years
- DIAGNOSIS: Irreversible pulpitis with apical periodontitis on the 4.7
- TREATMENT PLANNING: Non-surgical root canal treatment
- INSTRUMENTATION: ProFile R15/16 (SybronEndo, Orange, CA)
- OBSTRUCTION: Gold 6% + Gutta Percha (SybronEndo, Orange, CA)
- Endo motor R15/16 (SybronEndo, Orange, CA)

C4 Type: 17.23%
- PATIENT: FEMALE 17 years
- DIAGNOSIS: Irreversible pulpitis with apical periodontitis on the 4.7
- TREATMENT PLANNING: Non-surgical root canal treatment
- INSTRUMENTATION: ProFile R15/16 (SybronEndo, Orange, CA)
- OBSTRUCTION: Gold 6% + Gutta Percha (SybronEndo, Orange, CA)
- Endo motor R15/16 (SybronEndo, Orange, CA)

DISCUSSION/CONCLUSION/CLINICAL RELEVANCE
Although the prevalence of mandibular C-shaped anatomy in European populations is low, the results of a recent study showed a higher frequency on Portuguese population (8,5%), specially on female gender. It is very important for the clinician to know the common variations of this type of anatomy as well as the different strategies to complete the treatment successfully.

The use of magnification is mandatory and the combination of techniques is crucial to reach the final goal of disinfection and sealing of the root canal system.

Conventional irrigation protocols are not capable of clearing fines and interconnections, so irrigation and activation techniques, such as PUI (perfused ultrasonic irrigation), manual dynamic activation or negative pressure irrigation are of great importance.

On elaboration, only the combination of different thermoplastic techniques ensures the 3D sealing of the root canal space, which is mandatory for the success of the endodontic treatment.

REFERENCES
MTA RESORPTION – FACT OR FICTION? A LONG TERM ANALYSIS OF CASES

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Aim
Discuss the long term clinical and radiographic changes following unintentional extrusion of Mineral Trioxide Aggregate.

Background
Mineral Trioxide Aggregate (MTA) is established as the material of choice when interfacing with periodontal tissues. Ideally, root filling material should be restricted to the root canal space. Extrusion of any root filling material may have an adverse effect on the outcome of treatment resulting in inflammation, foreign body reactions or neurotoxicity (1). MTA is considered to be a non-resorbable material but this presentation calls that perception into question.

CASE STUDY 1
A 54 year old lady was referred for repair of symptomatic palatal perforation occurred during post preparation of UR1. The perforation (Figure 1A - arrow) was repaired with ProRoot MTA (Dentsply Maillefer).

FIGURES 1A - E: Clinical and radiographic images of perforation, repair, extraction and follow up of the UR1

The post-operative periapical radiograph (Figure 1B) revealed an extensive radiopacity (MTA) in the periradicular tissues surrounding the root of UR1. The tooth was subsequently extracted. At 9 years, periapical radiograph (showed partial resorption of the radiopaque object (Figure 1C) and with total resolution at 13 years (Figure 1D). The only remaining evidence of any residual material is on a CBCT image (Figure 1E) showing a small radiopacity surrounded by a radiolucent rim (arrow).

CASE STUDY 2
A 30 year old girl was referred for the management of her non-vital and immature UR1. It was extirpated and dressed with calcium hydroxide (Figure 2A). On obturation, tooth coloured ProRoot MTA (Dentsply Maillefer) was inadvertently extruded (Figure 2B). On yearly follow-ups (Figures 2C & D), the patient was asymptomatic and the extruded MTA was less discernible radiographically.

FIGURES 2A - D: Radiographic images of Pre obturation & inadvertent MTA extrusion of the UR1 and follow up after 2 years

Discussion
The cases presented show clearly the loss of the radiopaque properties of MTA. Complete resorption of MTA did not occur in case 1 to this time point based on three dimensional imaging. What is uncertain is the aetiology of this resorptive process. A possible explanation for such findings could be due to resorption of the bismuth oxide. This is supported by in-vivo studies which have shown osteoclasts capable of phagocytosing metallic biomaterials (2).

Conclusion & Clinical Relevance
Unintentional extrusion of any material is discouraged due to the possible sequelae it may elicit. Extrusion of MTA has always been perceived as carrying less risk of such sequelae due to its biocompatible nature. Further investigation is required to ascertain the true nature of the clinical presentation and whether this material does resorb or determine the potential systematic repercussion on the patient if it is liberated to other parts of the body.

References
AIM
This case series aims to describe the nonsurgical endodontic treatment of mandibular premolars with three canals.

INTRODUCTION
Knowledge regarding the internal anatomy of teeth and their supporting soft tissues is mandatory for predictable shaping and shaping of root canal systems and the likelihood of successful root canal treatment. Mandibular premolars are probably one of the most difficult teeth to treat endodontically because of the variations in canal anatomy. Several authors suggest that root canal morphology is the most likely reason for the occurrence of endodontic failures and fatalities. Despite the fact that minimal anatomic variations of mandibular premolars have been documented in the anatomic literature, there is still no consensus regarding their variations as it can be extremely complex and highly variable. Previous studies have evaluated the incidence of root canal configurations (Takiguchi, 2012) and of the number of roots (Takiguchi, 2012), and the number of canals (Delany et al., 2014). Factors such as ethnicity, age, gender and methodology (Panagopoulos et al., 2016) may contribute to the differences observed in some of the studies regarding root canal morphology. The occurrence of a multicuspid maxillary incisor is a newly reported condition. This case series aims to describe the nonsurgical endodontic treatment of mandibular premolars with three canals.

CASE 1 - (1-3-3 CONFIGURATION)

CASE 2 - (1-3-2 CONFIGURATION)

CASE 3 - (1-3-1 CONFIGURATION)

CASE 4 - (1-3-2 CONFIGURATION)

CASE 5 - (1-3-2 CONFIGURATION)

DISCUSSION
The variability of root canal systems in mandibular premolars represents a challenge to both endodontic diagnosis and treatment. As such, to identify the internal morphology as precisely as possible is one of the primary goals in successfully planning endodontic treatment. In recent years, cone-beam CT has been used for the detailed study of the anatomic variations of the root canal systems in mandibular premolars. Some studies that have used cone-beam CT in mandibular premolars have reported the presence of a type A or B anatomic configuration of the root canal system (Chafoullis, 2016). A recent study concluded that the incidence of root canal configurations is high, and the presence of multiple canals is crucial in ensuring successful endodontic treatment. This study also highlighted the importance of accurate imaging techniques in diagnosing complex root canal systems.

CONCLUSIONS
This case series describes the importance of identifying morphological variations that have been previously reported in the literature, as well as variations that have not been previously reported. This knowledge is essential for the successful planning of endodontic treatment and can help prevent potential treatment failures. The use of cone-beam CT in endodontic diagnosis is particularly useful in identifying complex root canal systems, which can significantly impact the success of endodontic treatment. The integration of advanced imaging technology with clinical decision-making can lead to improved patient outcomes and enhanced treatment success rates.

REFERENCES
Root resection of a fractured mandibular molar: a case report.

S. Inazuma, I. Gasterina, XF. Ruíz, F. Daran-Sinde
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Aim
To describe a case report of a mesial root resection in a right mandibular first molar showing clinical success at 1 year follow-up.

Introduction
Root resection is one of available treatment modalities for extending the functional life span of root fractured molars. The treatment consists of the surgical removal of one or several roots affected at the fracture level, leaving the crown and remaining root(s) in function. Root resection therapy can provide a favorable environment for oral hygiene in periodontally affected molars.

Case Presentation
A 65-year-old male patient was referred to the Endodontic Department of the Universitat Internacional de Catalunya in February 2016 after a radiographic finding in the right mandibular first molar (4.7). Previous medical history was unremarkable. The patient did not report any previous dental trauma or pain in the zone. Intraoral examination revealed an intact clinical crown without the presence of caries. Tooth wear evidenced bruxism as a parafunctional habit. During radiographic examination a fracture of the mesial root in 4.7 was observed. Periapical tissues were healthy. The patient was asymptomatic to percussion and palpation and did not respond neither to thermal nor electric test. Probing was physiological except for a 8 mm periodontal pocket at the mesial part of the. The limited FOV CBCT confirmed the fracture of the mesial root. After patient’s consent, root canal treatment of the distal root was performed. In a second visit, a surgical amputation of the mesial root and guided tissue regeneration with xenograft and a collagen membrane was performed. At 1 year follow-up, patient was asymptomatic, did not present mobility and probing in the mesial zone reduced up to 4 mm. What’s more apical tissues did not presented any radiolucencies and the case was classified as success.

DISCUSSION
Root resection represents a viable treatment option for the survival of molars with fracture involvement at mid-term prognosis. According to Yuh 2013 and Carnavale 1998, root resected molars had more than 90% survival rate over a 10-year period. Comparing its prognosis with implants, Fugazzotto reported 15-year cumulative success rates of 96.8% for root resected molars and 97% for molar implants.

Conclusion & Clinical Relevance
Root resection therapy in molars with fracture involvement can be a good treatment option in a mid- to long-term prognosis, as long as patients maintain a strict oral hygiene and follow regular maintenance appointments.

References
FRIDAY C-29

ENDODONTIC MANAGEMENT OF AUTO-TRANSPLANTED TOOTH: A CASE REPORT

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Also, this study is to demonstrate multidisciplinary management of auto-transplanted maxillary third molar in place of mandibular first molar.

INTRODUCTION

Autotransplantation can be described as transplantation of an impacted or erupted tooth to the toothless region of the same individual. Some of the criteria used to classify a transplant as successful are the absence of progressive root resorption, presence of normal hard and soft periodontal tissues adjacent to the transplanted tooth, and a crown-to-root ratio <1.

CASE PRESENTATION:

A 22-year-old female patient referred to Ataturk University Faculty of Dentistry Oral and Maxillofacial Surgery Department. The clinical and radiographic examination revealed that the mandibular right first molar had been treated endodontically and abjected. There was pericoronal lesion and cavity under restoration (Fig 1). The patient refuse proposed retreatment. The treatment that involved removal of mandibular right first molar and autotransplantation of maxillary right third molar is its place was planned. After atraumatic extraction and socket preparation, tooth placed into socket gently and sutured (Fig 2, 3). Patient was prescribed 2x300mg amoxicillin, 2x500mg paracetamol and chlorhexidine digluconate mouth rinse daily for a week. Teeth was splinted to the adjacent teeth on buccal and lingual surfaces (Fig 4). After four weeks, splint was removed, root canals were chemomechanically cleaned and calcium hydroxide paste was placed into canals for a week. In the next visit canals were obturated with cold lateral condensation technique using gutta percha and Seetopunx (Fig 5). At 6 months follow up, bone healing around tooth, healthy lamina dura and periodontal space was observed on periapical radiograph (Fig 6).

DISCUSSION:

Pulp necrosis is expected and root canal treatment is required when mature teeth are transplanted. Endodontic treatment should be performed within 1-2 weeks before or after autotransplantation if possible. In a study done on dogs by Azeredo et al. revealed that endodontic treatment could be delayed up to 40 days after autotransplantation.\(^5\) We performed endodontic treatment 4 weeks after autotransplantation.

CONCLUSION AND CLINICAL RELEVANCE:

Autotransplantation improves aesthetics; allows normal occlusion and facial growth; maintains arch integrity, phonetics, occlusion and the sense of proprioception which dental implants do not have. It has many advantages. Besides, it is economically viable and fastest way to replacing missing teeth. Autotransplantation has high success rate if the prognostic factors taken into consideration.\(^6\)

REFERENCES:

The contribution of Cone Beam Computed Tomography in diagnosis and management of root resorption: Report of 2 cases

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Aim: To present the contribution of the three-dimensional imaging (CBCT) to the diagnosis, the clinical decision, and the therapeutic management of different types of root resorption.

Introduction: Cone Beam Computed Tomography (CBCT) is a continuously evolving imaging modality which overcomes inherent limitations of intraoral radiographs. This innovation in three dimensional (3-D) imaging appears to offer the potential for improved diagnosis and treatment in complicated endodontic cases such as different types of root resorption.

Case Presentation:

CASE I: Tooth #36
Patient: 19 years old female with free medical history
Dental history: Class II composite resin filling 7 months ago (Fig. a).
Clinical examination: The patient was asymptomatic during clinical examination. Periodontal pocket 8mm on the buccal surface was detected and a fistula with inflammatory lips and pus outflow (Fig. b). The vitality tests (thermal and electrical) was inconsistent and there was no sensitivity on palpation & percussion.
Radiographic examination: Intraoral radiographs have shown a diffuse radiolucency in the bifurcation area and two smaller radiolucencies in the mesial roots (Fig. d). CBCT have shown two small internal resorptions in the mesio-lingual root (Fig. d) and destruction of the buccal alveolar bone (Fig. e & f).
Diagnosis: Asymptomatic apical periodontitis of #36 with internal inflammatory resorptions on mesio-lingual root.
Treatment plan: Root canal treatment (Fig. g). 6 months recall (Fig. h).

CASE II: Tooth #46
Patient: 52 years old female with free medical history
Dental history: Class II composite resin filling 9 years ago and implant placement on the area of #47 3 years ago.
Clinical examination: The patient was asymptomatic during clinical examination. The vitality tests (thermal and electrical) was negative and there was no sensitivity on palpation & percussion.
Radiographic examination: Intraoral radiograph have shown a carious lesion on the distal surface and the impacted #45 in close proximity to the mesial roots (Fig. a). CBCT have shown external root resorption of the mesial root caused by the impacted second premolar (Fig. b & c).
Diagnosis: Pulp necrosis of #46 with external resorptions on mesio-lingual root.
Treatment plan: Root canal treatment (Fig. d). 12 months recall (Fig. e).

Discussion: CBCT helped in diagnosis of root resorption in both cases as conventional radiographs could not determine the presence, the exact position and extend of the lesions. Knowing the above the therapeutic management adjusted concerning the type of root canal preparation and filling in order to achieve the best therapeutic result.

Conclusion: CBCT can be a useful addition to the endodontist's armamentarium for the management of different types of root resorption.

References:
FRIDAY-C-31

Case Report
Retreatment of a Horizontal Intra-Alveolar Root Fracture

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Aim
To present a Retreatment of Horizontal Intra-Alveolar Root Fracture of a Upper Central incisor using MTA.

Introduction
Horizontal intra-alveolar root fractures have a good prognosis with proper diagnosis and treatment [1, 2].

Compared to other dental traumas, root fractures are relatively uncommon. The frequency of root fractures in permanent teeth is only 0.5% to 7%, and in deciduous teeth, just 2% to 4%. Root fractures occur mainly in the central (85%) and lateral (22%) maxillary incisors; in contrast, only 5% of root fractures are found in mandibular incisors [6, 7].

There are possibilities of pulpal or periapical complications in the presence of bacteria contamination, and the sequelae of root fractures can be complex [8, 9].

The frequency of pulp necrosis in intra-alveolar root fractures was between 20% and 21% [10], and the healing rates after endodontic treatment of the coronal fragment ranged from 71% to 84% [11, 12].

Case Presentation

24 year old Male Patient

History of trauma associated with the Anterior Maxillary Incisors.

Previous endodontic treatment performed.

Diagnosed as an intra-alveolar root fracture with previous treatment and asymptomatic apical periodontitis. The fracture line is located in the middle of the root and there is a diastasis 0.5 mm.

Presented a discoloration, without mobility and a periapical pocket (10 mm) was probed in middle palatal side.

It was decided to perform a non-surgical orthograde endodontic retreatment of the coronal fragment.

An Apical Plug was done with MTA (ProRoot MTA, Dentsply/ Tulsa Dental, USA) after which injectable gutta-percha was used to obturate the coronal part of the canal. Irrigation: NaOCl 5.25% rinse.

No Intracanal medication was used.

Internal Bleaching (Partescelest, Endo-Solutions, Inc. South Jordan, USA) and a Composite Restoration (Exco EvoCare, Acudent, Annandale, USA) were done.

Follow-up: 34 months: no signs or symptoms associated, a good esthetics was achieved, the apical periodontitis and the periodontal pocket were resolved.

Discussion
According to the Classification of Andreasen and Hjalmar-Hansen [13], in this particular case we achieved healing with interposition of connective tissue. The classification is further complete with healing with calcified tissue. Interposition of connective tissue and bone, interposition of granulation tissue without healing [14].

Andreasen et al. [15] analyzed the long term survival of root-fractured teeth and assessed the influence of the type of healing and location of the root fracture. All teeth with hard tissue healing survived during the observation period (100% survival). Teeth healed with connective tissue healing, the location of the fracture was shown to have a significant influence on tooth loss. The estimated 5-year survival of apical and middle root fractures was more than 80%, whereas the estimated survival of cervical fractures was 25%.

When the pulp becomes necrotic, endodontic treatment of a root-fractured tooth should be performed only in the coronal fragment because the pulp of the apical fragment usually remains vital [16, 17].

However, it is difficult to seal the coronal fragment because it is often impossible to obtain an apical stop, such as in an immature tooth with an open apex [18].

Regarding the drawbacks of using CoC(2+): In Aequilification, it has been proposed that MTA could offer an alternative treatment because of higher success of inducing apical closure [19] and greater amount of hard tissue formation with the use of MTA compared with CoC(2+): [5]. MTA has some clinical problems, such as a decontamination potential and the difficulty of its removal after setting [20].

Conclusion & Clinical Relevance
In the presented case, the retreatment of the coronal fragment with MTA of a Horizontal Intra-Alveolar Root Fracture showed a positive outcome after 34 months.

References
Aim: To evaluate the in vitro clinical performance of new glide-path rotary instruments in molar cases.

Introduction: Since the use of Niti rotary glidepath instruments has become popular [1-2], a new instrument has been recently commercialized (One G, MM, Besancon, France), with innovative features (anti-breakage control). In the present study two sequences (with or without One G) were tested to assess the importance of glide-path files to improve or facilitate the ability to reach full working length with no iatrogenic errors, instruments failure or deformations.

METHODOLOGY: 20 Extracted human mandibular first and second molars were collected. To ensure the anatomical standardization of the samples, the teeth were scanned by means of digital x-rays to determine the angles and radii of curvatures of each canal, and divided into two similar groups of 30 canals each. After access cavity, root canals were instrumented following two different techniques (see table), following manufacturer's instructions in terms of speed (350 rpm) and torque (2.5 N).

All the experimental procedures were performed by same practitioners, using new instruments for each molar case and same amount of irrigation. Pre- and post-instrumentation optical inspection of instruments using x5 magnification [Oroscopic Loops] was performed to check any signs of deformation or fracture before and after usage. In case we find problems encountered during instrumentation, as distortion of the instruments, breakage or failure to negotiate full working length were recorded. Data were collected and analyzed.

Group A: One Flare, 10 K-file, One G (03.14, 15 K-file, Two Shape (04.25 and 06.25)
Group B: One Flare, 10 K-file, 15 K-file, Two Shape (04.25 and 06.25)

RESULTS: Deformed instrument
Group A: 04.25 (1) 04.25 (0) One G (0)
Group B: 04.28 (8) 06.25 (0)

Discussion: In group A all instruments reached apex and only one Two Shape (25.04) was deformed. In Group B all instruments reached the apex but deformations were present in 80% of the shaping instruments (Two Shape 25.04). No fracture or deformation of 25.06 was recorded in both groups. No fracture or deformation were found in One G files.

Conclusions:
Due to manual glide path both sequences allowed shaping instruments (Two Shape) to reach the apex without fracture. However, the use of One G significantly reduced instrumentation stress, with a minimal percentage of deformed shaping instruments.

Clinical Relevance: the use of One G instrument in the sequence is recommended for an easier and safer root canal preparation.

References:
1 "Use of nickel-titanium rotary PathFile to create the glide path: comparison with manual prefiling in simulated root canals". Berutti et al J ENDOD 2009 Nov; 35[11]:1606
Aim
To explain the non-surgical endodontic treatment of a case of a fusion between a maxillary right central incisor and a supernumerary tooth is reported.

Introduction
Occasionally, orthodontists and general dentists encounter patients with macrodontia of anterior teeth as result of fusion or gemination of maxillary incisors (1, 3, 4). Fusion and gemination are anomalies with close similarity inherited by different etiologies. Fusion is believed to be a union between dentin and/or enamel of two separately developing teeth, leading to a reduced total number of teeth. Fusion may be total or partial and may also occur between a normal and a supernumerary tooth. Gemination is an aborted attempt by a tooth bud to divide. As with fusion, gemination occurs mainly in the incisor area, but unlike fusion, the root and root canal systems are undivided. These two distinct entities may be associated with various other dental anomalies, such as dimids, clefts, macrodontia, hypodontia, and supernumerary teeth, and non-dental anomalies, such as syndactyly and nail disorders (2). In this paper, a fusion between a maxillary central incisor and a supernumerary tooth which required non-surgical endodontic treatment is presented.

Case Presentation
A 16-year-old boy referred to our clinic with macrodontia of a right maxillary central incisor because of esthetic complaints (Figures 1-2). The total mesiodistal width of the fused right crown was 11.5 mm compared with 8.5 mm of the left (normal) central incisor crown. Endodontic treatment was initiated due to the pulpal chamber floor perforation during the excavation of a deep buccal-palatal decay in tooth 11. Clinical examination of the anatomy of the teeth as follows: 2 roots in the buccal root (MB, DB) and 1 root in the distal-palatal root (Figures 3, 4). Exploration of the canals with files revealed that DB and distal-palatal canals fused in the form of a separate root having a single foramen and the MB is a separate single canal too. The actual working length was measured by inserting #2 K-file. Biomechanical preparation of the canals was performed using hand K-file files under irrigation with 3% sodium hypochlorite solution. The system were obturated with gutta-percha points and a resin based sealer (Adseal, Meta Biomed, Korea) using the lateral compaction technique (Figures 5, 6). The access opening was then restored with composite resin (Figure 7).

Discussion
This case report presents the endodontic treatment of a maxillary incisor tooth, which was fused with a supernumerary tooth. Fusion and gemination are morphological anomalies, which are difficult to distinguish (4). There are different treatment plans of fused teeth in the literature (1, 3, 4, 5). Some of the authors prefer to remove while others recommend to extract these teeth (2). In our case, we decided to perform endodontic treatment to save this anomalous tooth in dental arch.

Conclusion & Clinical Relevance
These morphological dental anomalies have specific treatment needs due to the abnormal morphology and need various radiologic diagnosis (3).

References
Use of colorimetric assessment to estimate the bleaching efficacy of severely discoloured teeth.

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Aim
This case report presents a combination of clinical perception and objective assessment to estimate the bleaching efficacy of long term discoloured teeth using the walking bleach technique.

Introduction
Teeth subjected to intracoronal bleaching are at risk to suffer from tooth fractures due to the bleaching procedure itself, an increased substance loss during endodontic treatment and a possible traumatic history [1]. The bleaching period therefore should be limited to a minimum.

Case
A 62-year-old female patient exhibited clinical and radiological signs of apical periodontitis (Fig. 1-4) and severe discolouration of her lower central incisors 31/41 with pronounced substance loss of tooth 41 (Fig. 4B5; arrow). She reported a history of trauma at the age of 15 followed by primary endodontic therapy and apical surgery due to cystectomy at the age of 21. The patient’s desire was to avoid any surgical intervention and improve the appearance of her lower front teeth. Endodontic retreatment was successfully completed within three appointments at weekly intervals using the warm vertical compaction technique after apical MTA placement (Fig. 5). Intracoronal bleaching was performed over a period of 4 weeks with sodium perborate tetrahydrate while exchanging the bleaching agent every week. Finally, the teeth were restored with adhesive composite resin. Colorimetric measurements were taken with a spectrophotometer to quantify and evaluate the bleaching process (Fig. 6-12).

Discussion
The present case demonstrates a clinical acceptable bleaching outcome regarding the initial severe discoloration. Still, both teeth exhibit an increased yellow appearance visually and objectively (Fig. 9 & 10b* value). The small colour change between week 3 and 4 (Fig. 12; ΔE), however, led to the assumption, that no significant improvement could be achieved with another bleaching session.

Conclusion & Clinical Relevance
A combination of clinical perception, patient satisfaction and colorimetric assessment may be used to maximize the bleaching efficacy while reducing the risk of adverse effects like tooth fractures.

References
FRIDAY C-35

INTENTIONAL REPLANTATION OF PERIODONTALLY COMPROMISED AND VERTICALLY FRACTURED TOOTH WITH PLATELET RICH FIBRIN

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AIM

The aim of this case report is to present the root canal treatment and the replantation of a partially exposed maxillary central incisor tooth with vertical root fracture.

INTRODUCTION

According to the American Association of Endodontists, a vertical root fracture (VRF) is "a longitudinally oriented fracture of the root that originates from the apex and propagates to the coronal part. This presence of VRFs after root canal treatment varies between 3.1% and 36.8%. Moreover, VRFs can also be caused by physical and occlusal trauma, pathological resorption and restorations or traumatic injury. The most common complication during and after endodontic treatment is the root crack, which is a horizontal crack in the root. Root cracks are often associated with root resorption. In the current literature, there is no consensus regarding the management of VRFs. Some practitioners recommend extraction of the tooth, while others recommend endodontic treatment followed by cementation of a fixed dental prosthesis. However, in cases of VRFs, there is a need for additional treatment to prevent root fracture. This report describes a successful treatment for a maxillary central incisor tooth with a vertical root fracture.

CASE REPORT

We present a case report of a 45-year-old female patient with periodontal disease with maxillary central incisor tooth with vertical root fracture and bone loss extending beyond the root apex. The tooth was endodontically treated with a crown lengthening procedure. After the endodontic treatment, the tooth was replaced with a custom-made crown, and the patient was monitored for 6 months. During this period, the tooth remained asymptomatic, and the periodontal condition improved. The patient was satisfied with the result.

CONCLUSION & CLINICAL RELEVANCE

VRF is a complicated condition that requires a multidisciplinary approach. The importance of VRF in endodontics is emphasized in this case report. The use of platelet-rich fibrin (PRF) in this case report was to prevent root fracture and to promote bone healing. The results of this case report support the use of PRF in the treatment of VRF.

REFERENCES

Management of Type II Dens Invaginatus: A case report

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Aim
The aim of this case is to report the treatment of a Type II DI (Dens Invaginatus) in a maxillary lateral incisor tooth.

Introduction
Dens invaginatus, also known as ‘dens in dente’, is a rare anomaly resulting from invagination of the enamel organ into the dental papilla during the development stage of soft tissue. Its prevalence is the highest in permanent lateral incisor, central incisor, premolars, canines and molars in a descending order. DI is categorized into 3 main types according to the depth of invagination (classified by Oehler). Type I: the invagination is limited to the crown. Type II: the invagination has extended beyond the cemento-enamel junction. It may or may not communicate with the dental pulp and Type III: the invagination extends into the root and perforates the apical and lateral surface of the root without communicating with the pulp.

Case Presentation
A 14-year-old male patient was referred to our clinic with the chief complaint of localized swelling in the buccal mucosa above the maxillary left lateral incisor. No discoloration was present and the crown morphology was normal. Parallel radiography revealed periapical radiolucency associated with the root of the maxillary left lateral incisor. (Fig. 1) For better examination of the internal morphology, CBCT was performed. Tomographic examination demonstrated a type II invagination extending from the crown to the middle of the root with no apparent communication to the main canal. (Fig. 2) Following the rubber-dam isolation, access was gained to the main canal and to the invaginated portion as a second canal. (Fig. 3) To isolate the infection in the main root canal, the invagination was successfully removed by using a fissure bur. Working length was determined with an apex locator and confirmed by radiography. (Fig. 4) Cleaning and shaping of the lumen was done with the mister apical file set at #60 and #2 and #3 Gates Glidden drills were used in a descending order followed coronal flaring. The canal was then dressed with calcium hydroxide paste for two weeks. Obturation was done with cold lateral compaction of gutta-percha and resin based sealer. The final restoration of the tooth was completed using composite. (Fig. 5)

Discussion
Endodontic treatment in the teeth with ‘dens invaginatus’, generally involves complicated procedures that require accurate diagnosis and appropriate treatment planning. According to Oehler’s categorization, the case was ‘dens in dente’ Type II in which the invagination invades the root but remains combined within it as a blind sac and may communicate with the main canal. Although the case had a periapical lesion, since the root was well formed and had an apical constriction, a conservative orthograde approach was chosen. In our case, we successfully used short term CH treatment to achieve disinfection.

Conclusions and Clinical Relevance
Information about the 3D anatomy of the tooth especially those with an abnormality is necessary for a successful treatment.

References
SATURDAY C-37

Management of External Root Resorption
A Case Report
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Aim
The aim of this case is to evaluate the treatment outcomes of an external root resorption occurred in a maxillary incisor tooth.

Introduction
External apical root resorption (EARR) is a relatively common undesirable effect that may occur during orthodontic treatment. Orthodontic movement can cause degenerative and/or inflammatory responses to dental pulp of teeth with complete apical formation leading to resorption. Individuals vary in their susceptibility with various factors such as root morphology, root length, genetics and age. Also, there are a number of reported orthodontic treatment related risk factors such as treatment duration, magnitude of applied force and the amount of apical movement.

Case Presentation
An 18 yr-old patient ongoing orthodontic treatment was referred to our department with the information of a resorption occurred on upper left incisor during orthodontic therapy. Previous radiographs were not present in faculty database therefore, not possible to determine the origin of the resorption. Palpation, percussion, mobility were negative, no sinus tract was recorded. Vitality test was negative. Radiographic examination revealed resorption involving the apical third of the tooth. Access cavity was shaped with a round bur under isolation. Working length was determined radiographically. Canal was shaped slightly by K-files under 2.5% sodium hypochlorite irrigation. Calcium hydroxide was placed inside the canal and patient was reappointed after a week. Medication was removed and MTA was inserted to 3mm of the apex, patient was reappointed to next day. After MTA plug was assured to be set, the canal was obturated with lateral condensation. Patient was recalled every 3 months up to one year. Follow-up visits showed no pathological signs or difficulty in biting and no additional resorption. Orthodontic force restarted after 3 months following the root canal treatment.

Discussion
Mild to moderate EARR is considered to be anything less than 1/3 of the original root length and it was reported that the majority of teeth experienced mild to moderate resorption following orthodontic treatment. Severe resorption exceeding 4mm, often classified as the loss of one-third of the original root length was reported in 1% to 10% of teeth. In this case an orthograde MTA placement was chosen to close the apical portion followed by lateral condensation due to approximately one-third loss of the original root length.

Conclusion
Early diagnosis is vital to sustain apical resorption in such cases. Orthodontic forces can restart following 3 months after the completion of endodontic treatment. Radiographic follow-up is necessary to determine any further resorption.

References
MANAGEMENT OF INTERNAL ROOT RESORPTIVE DEFECT WITH MINERAL TRIOXIDE AGGREGATE: REPORT OF 4 CASES

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Aim: To present outcome assessment of treatment of four cases that exhibited pulpal necrosis leading to periapical lesion and internal root resorption.

Introduction: Many etiologic factors such as trauma, periodontal disease, and orthodontic treatment have been suggested for internal root resorption. Internal root resorption involves destruction of inner root canal wall that generally presents through routine dental radiographic examination. Periapical radiographic revealed smooth, clearly defined with distortion of the root canal outline (1,2). Various materials have been offered for the management of these defects, but MTA is commonly used due to its biocompatibility, sealing ability, and potential of inducing hard tissue repair (3).

Case Presentation: Four cases that were referred our clinic with no symptoms were presented. All cases exhibited pulpal necrosis leading to periapical lesion and internal root resorption. For each case, access cavity was prepared and chemo-mechanical debridement was performed. Root canal was dressed with calcium hydroxide medication for two weeks. At the next appointment, intracanal dressing was washed-out under copious amount of 2.5% NaOCl and root canal was dried with paper points. Root canal obturation was performed using hybrid technique which involved using apical root section with gutta percha and resorative defect with MTA (Angelus, Londrina, PR, Brazil). Wet cotton pellet placed in the canal to promote setting. After one day, rest of root canal was obturated with gutta-percha by using lateral condensation technique. Post endodontic restorations were carried out with composite resin.

Discussion: Root canal treatment is a challenge in case of occurrence of root resorption. In such cases, root canal treatment should be considered in order to remove the granulation tissue and blood supply to the resorbing cells. For disinfecting root canal system, calcium hydroxide is a beneficial intracanal dressing.

Conclusion: The present case series showed treatment of internal root resorption defects with MTA and 6-month follow-up period of healing.

References:
Surgical and Endodontic Treatment of External Cervical Root Resorption: A Case Report

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Aim:
To report on a case of external cervical root resorption treatment, that combined surgical and endodontic techniques.

Introduction:
Root resorption is related to multinucleated cell colonization on denuded mineralized tissue after injury of non-mineralized precementum or predentin. Resorption can be classified as external, internal or cervical with regard to establishing a treatment plan and requiring a combined approach. Cervical root resorption can begin and progress asymptomatically. When resorption begins, it can destroy dentine rapidly.

Case Presentation:
A 37-year-old male patient was referred for the management of cervical resorption in maxillary left canine. There was no caries or restoration present. The tooth responded positively to vitality tests. During radiographic examination, cervical root resorption was detected. The resorptive area was at palatal side of the tooth and could be probe. CBCT can be used for better evaluation of external cervical resorption cases but the patient did not accept for reducing the radiation dose. Rubber dam could not be used during therapy because of patient’s cooperation. Root canal system was instrumented and calcium hydroxide paste was used as an intracanal medicament. On the second appointment, root canal system was obturated with gutta percha and resin based root canal sealer and the tooth restored with resin composite. Then mucoperiosteal flap was elevated, the inflamed granulation tissue was removed, the cavity was obliterised, shaped mechanically with help of curettes and steel round bur and MTA was applied into the perforated resorptive cavity. No signs and symptoms were detected in the case during one year of clinical and radiological observation.

Discussion:
Cervical root resorption can be difficult to diagnose and manage and these lesions are usually painless. The defect is often discovered coincidentally during radiographic examination. Orthodontic extrusion-endodontic treatment combination was not preferred because of difficulty of reaching the resorption area.

Conclusion:
Considering this case report, cervical root resorption treated with MTA revealed good clinical and radiographic results.

References:
SODIUM HYPOCHLORITE DENTAL ACCIDENTS: TWO CASE REPORTS

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Aim

The aim of this case report is to emphasize the prevention and appropriate management of sodium hypochlorite (NaOCl) accidents.

Introduction

NaOCl is the most commonly used irrigation solution because of its antibacterial capacity and the ability to dissolve vital pulp tissue, necrotic tissue, and the organic component of debris and biofilm. Various concentrations of NaOCl (5%, 10%, 20%, 30%) are used for root canal irrigation. 5.25% NaOCl (in optimal concentration to eliminate bacteria present in the canal) is recommended. The concentration of NaOCl is not only toxic and irritating. Potential complications during root canal irrigation with NaOCl can be: patient/surrogate complications, immediate, delayed, extraradicular, and allergic reactions.

Case Presentation

Case 1

- A 30-year-old female patient
- An acute burning pain on the upper right side of her face
- The dental history was written by her general dentist. During the endodontic treatment of her maxillary right second premolar tooth, the patient had a maxillary right side sensitivity and a sharp, acute pain on the root canal procedure, while the operator was irrigating the canal. Next day, the pain on the maxillary right side was relieved.
- The cause of the symptoms was sodium hypochlorite. The treatment was completed, and the patient was relieved.

Discussion

Injury associated with NaOCl irrigation is rare. However, if NaOCl is used improperly, it can cause severe tissue damage. The use of NaOCl for irrigation should be performed with caution. In case 1, the NaOCl irritation was caused by improper use of the irrigating solution. In case 2, the use of NaOCl for irrigation was not performed properly.

Conclusion & Clinical Relevance

Proper safety precautions should be taken to prevent the extraction of sodium hypochlorite into the percutaneous tissues due to its well-known side effects.

References

A. Aim
The appraisal of the potentials, limitations and results of non-surgical retreatment of teeth that had been previously treated surgically (apicoectomy).

B. Introduction
The primary objective of endodontic treatment is the prevention and management of apical periodontitis. When previous attempts of non-surgical and surgical endodontics have failed to provide a desirable outcome, non-surgical retreatment constitutes an alternative treatment plan besides apical resection or extraction, on the basis that the persistence of intracanal infection is the main cause of periapical pathosis.

C. Case presentation
Five cases referred for endodontic evaluation due to the persistence of periapical pathosis after conventional endodontic treatment and apicoectomy are presented. The patients had a clear medical history and manifested clinical and radiographic signs of chronic inflammation. All cases had undergone surgical treatment on the subjected teeth two or more, years ago. An access cavity was prepared, the filling material was removed and the chemomechanical preparation of the root canal system was carried out with a standard protocol (Crown-down preparation using hand and rotary files – sodium hypochlorite 3% for irrigation. Pulp I – EDTA 17% prior to obturation). Calcium hydroxide paste was placed at an intracanal medicament between visits. During the second visit the root canal system was obturated either using an epoxy-resin sealer and gutta-percha or performing an apical barrier with MTA. Clinical and radiographic follow-ups were performed at 3 and 12 months and up to 2 years, depending on the case. The post-treatment follow-up of the patients reveals a positive outcome. All cases remained asymptomatic and showed radiographic signs of healing or healed periapical lesions.

Case 1 (Vertical condensation of gutta-percha)

(a) Pre-operative radiograph (b) Pre-operative clinical photograph (c) Guta-percha point inserted through the sinus tract leading to the apex. (d) Working length determination radiograph. (e) Preoperative radiograph (f) Pre-operative radiograph (g) (h) and 12 month follow-up.

Case 2 (Apical barrier with MTA)

(a) Pre-operative radiograph with a gutta-percha point in the sinus tract (b) Working length determination radiograph. Filling material placed into the periapical tissues. (c) Photograph of a clean tooth with gutta-percha point inserted through the sinus tract. (d-e) Pre-operative radiograph. (f) Pre-operative radiograph (g) 3 month follow-up (h) 12 month follow-up.

D. Discussion
The acute apical bavior, the size of the periapical lesion and the presence of retracted filling materials with insufficient marginal adaptation are factors which may have a potentially negative impact on the success rate of non-surgical retreatment. However, strict compliance to the protocol of root canal treatment, the use of bocompatible materials like MTA and magnification (operating microscope) might lead to favorable outcome.

E. Conclusions
Within the limitations of this case series, non-surgical retreatment of teeth with persistent apical pathosis previously treated with apicoectomy seems to be a viable, less invasive, alternative treatment to surgical endodontic retreatment and/or extraction.

References:
### SATURDAY C-42

**Endodontic microsurgery and guided tissue regeneration therapy in the management of a combined endodontic-periodontal lesion on tooth 2.5**

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**Aim:** To present a successful case of periodontal surgery and guided tissue regeneration (GTR) therapy in the management of an endo-perio lesion. **Introduction:** Combined endo-perio lesions are challenging. Endodontic microsurgical management with concurrent bone grafting and membrane barriers techniques are reported to have 77.5% of success. **Case Presentation:** Mele, 47 years old, presenting a combined Kim’s class F, asymptomatic chronic apical periodontitis with a 10 millimeters wide apical lesion on 2.5 (Fig1). Endodontic microsurgery procedure was performed concomitant with GTR therapy and followed for 9 years.

**Discussion:** After the elevation of a triangular flap (Fig.2) an apico-marginal defect with complete fenestration of the buccal plate (Fig.3) was found. After conservative osteotomy, root sectioning and ultrasonic apical root preparation, retrograde obturation (Fig.4) was conducted with white mineral trioxide aggregate (MTA) and a resorbable collagen membrane (Bio-Gide/Geistlich) was used to stabilize the autogenous bone graft (Fig.5). Patient was seen at 7 and 30 days after surgery for monitoring of healing and annually for a period of 9 years. Complete healing was observed 12 months after surgery. X-rays show bone formation and total remission of periapical lesion, including regeneration of the periodontal apparatus (Fig8).

Kim and Kratchman classified periodontal lesions into categories A–F. Lesions types D, E, and F represent lesions of combined endodontic-periodontal origin and may present serious difficulties, representing a challenging that can be overcome with gold-standard materials, instruments and techniques.

**Conclusion & Clinical Relevance:** It is possible to accomplish successful outcomes when treating combined endodontic-periodontal defects despite of challenges related to bone regeneration in the area.

Endodontic microsurgical treatment combined with GTR can lead to good long-term survival.

INCIDENCE OF FENESTRATIONS IN YOUNG PATIENTS: A CBCT STUDY

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AIM: The aim of this study was to evaluate the in vivo incidence and the location of fenestrations in a young Italian population ranging from 18 to 30 years old.

INTRODUCTION: Nearly all previous researches about fenestrations have been conducted on skulls. Since age, dental therapies and extractions may affect bone structure in old/adult patients, an in vivo study was performed on a young population who never underwent dental treatment by using CBCT to evaluate their incidence.

CASE PRESENTATION:

METHODOLOGY: 50 patients who had previously performed CBCT for planning 3d molar extraction or orthodontic therapy were selected for the study. Overall 1395 teeth were evaluated. Root fenestration was identified according to the definition of Davies and the American Association of Endodontists. Data were collected and statistically analyzed.

DISCUSSION: Fenestrations were present in 159 teeth out of 1395, corresponding to the 11%. In the lower jaw we found 68 fenestrations (5%), in the maxilla 91, corresponding to the 6.5%. Incisors and canines teeth were with the highest incidence of fenestrations: 90 fenestrations (56%) were found in incisors, 50 in the maxilla (31%) and 40 in the lower jaw (25%); 36 cases (22%) were found in canines, 22 in the maxilla (13%) and 14 for the lower jaw (8%). 31 (19%) fenestrations were found on premolars, 10 in the maxilla (11%) and 13 on the lower jaw (10%). The lower proportion was found in molar with the only 2 cases, 1 in the maxilla (0.1%) and 1 in the lower jaw (0.06%).

CONCLUSION: The relative common finding (11%) of fenestrations supports the need for a CBCT exams before any endodontic surgical or implant treatment to avoid possible iatrogenic risks related to the initial presence of fenestrations. CBCT was found an effective and convenient tool for diagnosing fenestration.

REFERENCES:

SATURDAY C-44

Treatment of a Class IV invasive cervical resorption: 2 case reports
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Aim: Restoring a tooth with a Class IV invasive cervical resorption is usually impossible. However, in some cases treatment of the tooth to avoid extraction can be considered.

Introduction: Holzheyrey et al. described a classification of the invasive cervical resorption (OCR) (Holzheyrey 2009). Invasive cervical resorption class IV is a contra-indication for tooth preservation and extraction is the suggested treatment. Class I, II and III should be preserved by an endodontic treatment. This treatment includes filling of the resorption lesion with bioincompatible materials e.g., MTA, after etching and curettage of the lesion (Makoudi 2014).

1. Case report: A 27-year-old woman without contributing medical condition was diagnosed with a CR class IV on the left lateral incisor (Fig. 1). No parafurcation were detected. The first treatment planning was replacement by an implant.

A CBCT of the region revealed a narrow process alveolaris and a thin cortical plate (Fig 2). Because of these complicating factors, in combination with a thin gingival biotype, the placement of an implant was not the preferred treatment. Nevertheless, if endodontic treatment would fail, implant placement would still be possible. Thus, treatment of the Class IV CR was decided by the patient and the clinician in order to try to keep the tooth.

The endodontic treatment of tooth 21 was performed in two appointments (Figs 3 & 4). During the endodontic treatment, the soft infiltrated dentin was removed with a long neck bur (Munroe Discoveries, USA, Engineering, IS) (Fig. 1). The apical part of the root canal was instrumented with F1 file (VDW, Munich, Germany). The root canal was irrigated with 3% sodium hypochlorite for over 45 minutes and a final rinse 10% Citric Acid. The apical 3 mm of the root canal was filled with Gutta Percha and ZOE (warm vertical condensation technique). The resorption lesion was filled with Biodentine (Septodont, Saint-Maur-des-Fossés Cedex, France) according to manufacturer's guidelines. The coronal part of the root canal was filled with composite.

12 months follow-up: a CBCT was taken after one year. No pathology was detected. The periradicular lesion of tooth 21 was still intact (Fig 5).

18 months follow-up showed a successful treatment. No clinician radiographical pathology is observed (Fig 6).

2. Case report: A 15-year-old woman presented in general dental practice with a vague complaint of pressure pain in the lower right molar area. The medical history of the patient was non-contributory. The tooth was diagnosed with symptomatic irreversible pulpitis and containing perforation caused by a CR class IV lesion on the distal root (Fig 1).

Because the lesion was located on just one root of a multirooted tooth and the patient wanted to preserve the tooth, it was decided to try to save the tooth.

The therapy was carried out in two visits. At the first appointment the tooth was purified from decay and the root canals were cleaned and shaped using ProTaper Next (Maillefer, Ballaigues, Switzerland) and NC-1 (NSK). The resorption defect, which had a connection with the pulp chamber was debrided using a long neck bur (Munroe Discoveries, USA, Engineering, IS) (Fig. 1). Because of continuous bleeding at the resorption the NaviDiag was placed as an intracanal dressing.

The second appointment, the tooth was without symptoms. The root canals were cleaned a second time using an irrigating regimen of NaOCl (3%) – Citric Acid (10%) – NaOCl (3%) – alcohol. The root canals and perforation defect were filled respectively with Gutta Percha and ZOE (warm vertical condensation technique) and Biodentine (Septodont, Saint-Maur-des-Fossés Cedex, France) according to manufacturer instructions (Fig 3 & 4). The crown was restored biomimetically using Evert Posterior (GC Corporate, Tokyo, Japan) and Majesty Posterior A2 (Durey, New York, USA) (Fig 5).

Although the defect seemed large on the radiographic image, clinically the dimensions of the lesion were surprisingly small. This proves that the decision making should not be based on radiographic imaging alone because overlap can cause misjudgment of the extentiveness of the lesion.

Discussion:
In these two cases, endodontic treatment to preserve the teeth were performed, whereas extraction would be the most common treatment option based on literature. The second case suggests that decision making should not be based on radiographic imaging alone because overlap can cause misjudgment of the extentiveness of the lesion (2D image of 3D object).

Conclusions and key learning points:
- Always consider a treatment for a Class IV CR.
- Inform your patient about treatment possibilities.
- Follow-up is necessary to prevent further damage when the root is treated.

References:
RETREATMENT OF C-SHAPED MANDIBULAR SECOND MOLAR
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Aim
To discuss the effect of C-shaped root canal configuration on the success of root canal treatment and to determine the retreatment of failed root canal therapy due to C-shaped canal configuration.

Introduction. C-shaped root canal configuration is an unusual root canal morphology and one of the most often anatomical variations in root canal systems of second mandibular molars. Knowledge of the C-shaped canal configuration is essential to achieve success in endodontic therapy. Radiographic and clinical diagnosis can aid in identification and negotiation of the fan-shaped areas and intricacies of the C-shaped anatomy.

Case presentation. A 50 years old male with a non-contributory medical history was referred to our clinic with severe spontaneous pain in the right second molar. The patient reported that the tooth had been endodontically treated 2 years ago. He had experienced localized pain since then. Tooth was sensitive to palpation and percussion. Radiographically incomplete obturation and apical periodontitis associated with incomplete root canal was observed (fig. 1). Therefore, endodontic retreatment was indicated. C-shaped canal was observed after access cavity opened. The previous root canal preparation and obturation was inadequate, there were untouched areas in the root canal system. Inspection of the root canal system revealed C-shaped distal-mesial canal communication (fig. 2,3). Root filling materials were removed from the root canals with Gates Glidden drills and H-files. The working length was determined with an apex locator (Mini Root ZK, Morita, Japan) and radiographically confirmed. The canals were cleaned and shaped with EDTA gel and ProTaper files (Dentsply Maillefer, Ballaigues, Switzerland) supplemented with alternate 2.5% sodium hypochlorite irrigation. Also circumferential filing was applied with K and H files. Afterwards, the root canals were dressed with calcium hydroxide paste and coronal sealed with a temporary filling material. At the next appointment (after 10 days), the tooth was asymptomatic. After completion of the chemomechanical preparation, the root canals were dried with paper points and obturated with thermoplastic filing material (Thermaprep 2, Dentsply, Maillefer, Switzerland) and AH Plus (Dentsply, Maillefer, Switzerland) sealer (fig. 4-6).

Discussion. Anatomical variations in root canal system should be considered when exploring the floor of the pulp chamber. According to Ingle the most significant cause for endodontic failures is incomplete canal instrumentation and incorrect canal obturation. Angled preoperative radiographs using parallel technique, are essential in providing clues such as the number of existing roots. The likely reason of endodontic flare-ups and failures are considered as variations in root canal morphology. Hoen and Pink concluded that the clinical application of a thorough knowledge of canal anatomy and meticulous attention to treatment details are essential to minimize the failure rate and the need for subsequent endodontic retreatment.

Conclusions and Clinical Relevance. Successful root canal treatment requires adequate knowledge regarding morphologic variations in root canal system of teeth. The possibility of atypical morphology and additional canals should never be overlooked.


Endodontic Management of Maxillary First Molar with Five Canals: A Report of Two Cases

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AIM To present endodontic treatments of two maxillary first molars with five canals including two mesial canals, two distal canals and a palatinal canal show uncommon morphological variations.

INTRODUCTION

Anatomical complexities, such as number and type of root canals, presence of accessory canals, isthmuses have a significant effect for success of root canal treatments. In a wide range of anatomical variations of mesiodistal roots of maxillary permanent first molars are one of the main causes of poor long-term prognosis after root canal treatment commonly the distal and palatinal root usually have one canal in these teeth. In very few cases, six canals have been shown the incidence of second mesiobuccal canal is ranging from 10% to more than 80% and second distobuccal canal is approximately 8% maxillary permanent first molars. This may partly be attributed to ethnic differences. Additionally, the age and gender influence frequency of extra canals. Second mesiobuccal and distobuccal canals observed less in higher age to progressive calcification and obturation and more incisions of these canals in elderly patients.

CASE PRESENTATION

Case 1
A 27-year-old patient that had medical history was non-contributory, arrived to the Ankara University Department of Endodontics with the complaint of pain particularly at night and on drinking anything cold in the upper right back region of jaw. Clinical examination revealed that tooth maxillary first molar had discocentric deep caries. The tooth was tender to percussion and gave positive response to pulp vitality tests (electric, cold). There was no sinus tract present in the involved tooth that had normal periodontal status. A preoperative intraoral periapical radiograph of the affected tooth showed a deep carious lesion involving the distal pulp horn and widening of apical periodontium (Fig. 1a). Hence, a clinical diagnosis of symptomatic irreversible pulpitis with apical periodontitis was made and root canal therapy was planned. Following local anesthesia with Articaine (4%) (Mepivacaine-Hydrochloride, Field) and 4% amitriptyline with aspirin/paracetamol (1:1) (Hoechst-Maron), Germany an endodontic access cavity was prepared under rubber dam isolation (tooth 16). Initial inspection of the pulpal floor revealed five canal openings with two mesial canals, two distal canals and a single palatinal canal. Presence of the extra canals, achieved preoperative radiographs between canals (Fig. 1b). Initial canal negotiation was carried out with numbers 13, 10, 11 and 10 mm files. Working length was estimated with an apex locator (Procare, Dentsply, Switzerland) and confirmed with digital radiograph. Then cleaning and shaping was done by ProTaper NiTi rotary instrumentation (Dentsply Maillefer, Switzerland) up to file number F2 for mesiobuccal and distobuccal canals and F3 for palatinal canal, irrigation between each instrument was performed using 5.25% sodium hypochlorite (NaOCl). After final rinse with 2.5% NaOCl, 17% ethylenediaminetetraacetic acid (EDTA) and saline, canals were dried with absorbent points and filled with gutta-percha (Rootfil, Dentsply, Switzerland) and AH Plus sealer (Dentsply, Germany) using the cold lateral condensation technique (Fig. 1c). The crown was restored with composite.

Case 2
A 17-year-old male that had medical history was non-contributory was referred to the Antakya University Department of Endodontics with pain and buccal swelling. On clinical examination, a little swelling was observed on the buccal aspect of the maxillary first molar. The tooth was tender on percussion and palpation (Fig. 2a). Deep apical carious lesion in relation to the root, extensive amalgam restoration was shown on this tooth. Pulp vitality tests were negative (electric, cold). Radiographic examination revealed presence of periapical radiolucency on the tip of the mesial and palatal canals (Fig. 2b). Based on the above clinical and radiographic findings, left maxillary first molar was diagnosed as having necrotic pulp and acute apical abscess.

The procedures in case 1 were followed. In addition, wide canals were shaped usinglegacy F8-15 rotary instrumentation (FGD, Switzerland) until 4% tapered, 35 apical sizes for mesiobuccal and distobuccal canals, 30 apical sizes for second mesiobuccal and distobuccal canals and 40 apical sizes for palatal canal (Figs. 2c, 2d). Also canals were placed with calcium hydroxide paste to achieve the environment for two weeks before canals were filled (Fig. 2e).

DISCUSSION

The maxillary first molars anatomy are complex. Untreated canals result in leakage of bacteria that cause periapical inflammatory and create a primary reason for re-treatment in as many as 19% of cases.

The use of magnification devices (microscope or magnifying loops) for the detection of extra canals are helpful. One of these studies showed that the MB2 was detected in 21.7% of maxillary first molars when using a microscope, in 62.5% of these teeth when using dental loops, and only in 17.2% of these teeth without any magnification.

Imaginative techniques are significantly important in investigating the anatomy of teeth. Conventional radiographs may be taken from different directions. Also CBCT is a good diagnostic tool for its detection and visualization.

CONCLUSION & CLINICAL RELEVANCE

Together with diagnostic and treatment planning, a better knowledge of the root canal system and its frequent variations is very important for a successful root canal treatment.

REFERENCES

SATURDAY C-47

MANAGEMENT OF INVASIVE CERVICAL RESORPTION WITH THERMOPLASTICISED GUTTA-PERCHA

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Aim: This case report presents management of right lower canine that have invasive cervical resorption related to loss of alveolar bone and presence of pocket because of periodontal inflammation, using continuous wave obturation (Elements® Free) as warm gutta-percha technique.

Introduction:
Invasive cervical resorption (ICR) is uncommon and often aggressive form of external tooth resorption, which may involve any tooth of the permanent dentition. Invasive cervical resorption occurs because of chronic pulpitis, trauma, orthodontic treatment or other unknown etiologic factors. Usually it is asymptomatic and it is identifiable with routine radiographs. A hermetic seal is crucial for successful root canal treatment, which should attempt to eradicate as many microorganisms as possible, in order to leave no voids for bacteria to populate and proliferate. Various obturation techniques and materials have been used for this purpose. Current obturation techniques include warm gutta-percha obturation, cold lateral compaction and single-cone, techniques. Warm gutta-percha obturation technique improves adaptation of gutta-percha and the spread of obturators into accessory canals.

Case Presentation
A 32-year-old male patient arrived at periodontology clinic for routine controls. Invasive cervical resorption in the right lower canine was observed. The patient was directed to endodontic clinic. Clinical examination revealed greyish discoloration in tooth coronal side of close to gingiva (Fig 1). A radiograph of the affected tooth showed an irregular enlargement of the root canal coronal space (Fig 2). The tooth exhibited tenderness on percussion and a probing depth of 5 mm on the distal aspect. Radiographic investigation revealed the presence of oval-shaped radiolucency of pulp canal space to periodontal space, perforating in the coronal third of the root on the distal aspect. The diagnosis of Invasive cervical resorption was proposed. Firstly, after local anesthesia and rubber dam placement, an access cavity was prepared. The root canal was negotiated with a size 15K file and a radiograph was recorded to establish the working length. During preparation, severe bleeding was encountered when the file approached the coronal third of the canal. The canal was thoroughly irrigated with normal saline. Root canal cleaning and shaping were performed with both stainless steel files (Dentsply Maillefer, Tulsa, OK, USA) and NITI files (Ribe, FKG Dentaire, Switzerland) until 4% taper. 45 apical size. After each instrument, the root canal system was carefully irrigated 2.5% sodium hypochlorite. Then, calcium hydroxide paste was placed into the root canal for to alkalize the environment and control to bleeding. A recall visit was scheduled after 2 weeks and the calcium hydroxide paste was removed and was placed again. Patient was called after 2 weeks again. Totally after 4 weeks, patient had no clinic symptom and it was decided to root canal filling.

Firstly, calcium hydroxide was removed and then, root canal was carefully irrigated with 5% EDTA, followed by 2.5% sodium hypochlorite irrigation and 2% chlorhexidine. Root canal was dried with paper points. After the root canal was obturated using continuous wave obturation (Elements® Free, Fig 3). Then, the coronal cavity was restored by using composite.

Discussion
Invasive cervical resorption is required a multidisciplinary approach to understand the etiology, pathogenesis, diagnosis and treatment. In resorptive cavities, it is difficult to remove all bacteria and their products from the dentinal tubules. If gutta-percha close less voids to dentinal tubules, this may obstructed leaking of microorganisms. It is generally accepted that root fillings should contain more gutta-percha and less sealer. All condensation techniques were found to be more successful than core techniques in the filling of resorptive cavities and warm lateral and warm vertical condensation gutta-percha techniques are supposed have more gutta-percha and less voids content.

Conclusion & Clinical Relevance
Root resorption is a complex process and is defined as the loss of hard dental tissue as a result of odontoclastic action. Resorptive defects can be challenging to diagnose and correct diagnosis is important for prognosis to be successful.

References
SATURDAY C-48

Metronidazole neuropathy in a dental patient: a case report
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2Department of Oral Surgery, School of Dental Medicine, Zagreb
Private Psychiatric Practice, Zagreb

Aim of the presentation was to describe a clinical case of metronidazole neuropathy.

Introduction
Metronidazole is routinely administered in a number of dental indications. Due to its effect on anaerobic microorganisms it is often coadministered with amoxicillin in severe or resistant cases. However, seldom, a number of neurological side effects can occur during metronidazole therapy.

Clinical case presentation
Female patient, 20 years old, arrived at the Department of Endodontics and Restorative Dentistry with chief complaint on “pain that irradiated from lower jaw to the ear”. Amnesia revealed that patient was under neurological supervision due to multiple sclerosis diagnosed in 2000, and was in remission for the last 4 years. Patient was treated with corticosteroids (2006) and never received pammaglutin. Patient was also taking Cingolite etrex 1 tablet (10 mg) and required all allergies. Clinical examination revealed absence of extrapyramidal symptoms, healthy teeth with adequate oral hygiene and initial periodontitis of the teeth with slight submandibular and retromandibular lymphadenopathy. Perioral oedema was cleaned with ultrasonic scaler under local anaesthesia and curettage inside.

Anamnesis revealed that patient had been on amoxicillin and metronidazole therapy for 2 months. The third post-op day control examination revealed signs of supranation – patient had a fever (38 °C), diffuse oedema of left buccal region and unilateral lymphadenopathy of submandibular, retromandibular and jugular lymph nodes.

The patient was observed daily on the fifth post-op day and remained stable, but was also observed on side effects that followed administration of metronidazole. Side effects were increasing in intensity during drug usage. Finally, patient experienced mild somnolence and dizziness after taking a metronidazole. Following symptoms was anxiety and irritability. At the day of recall patient reported impaired motor function of right leg and generalized paresthesia, with increased affection of palms and feet.

However, no ophthalmological symptoms were observed. No skin rashes were observed and patient didn’t report any effects during depilation. Also, patient had no ophthalmological symptoms. Metronidazole therapy was immediately halted and patient was referred to the Department of Emergency Medicine. Retro hospital of Zagreb Clinical Hospital Centre, where she received Simpon 1 amp. 20 mg/2 ml and Cadum Sandoz 10% 1 amp. Serum analysis and complete blood count were performed. Values outside referent ranges are shown in Table 1. Complete blood count revealed signs of microcytic anemia. All other values were in referent ranges and ECG showed no pathological readings. Also, Cintone 1 tablet (10 mg) was prescribed for the following 10 days.

Patient continued taking amoxicillin until the ninth post-op day, when recall was scheduled. Sutures were removed, oral symptoms also resolved and there was no sign of inflammation. Patient later reported that symptoms fully resolved during a period of 7 days after discontinuation of metronidazole.

Table 1. Isolated values of serum and blood tests

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine</td>
<td>51 μmol/l</td>
</tr>
<tr>
<td>Sodium</td>
<td>138 mmol/l</td>
</tr>
<tr>
<td>γ-glutamyltranspeptidase</td>
<td>51 IU/l</td>
</tr>
<tr>
<td>Haemoglobin</td>
<td>105 g/l</td>
</tr>
<tr>
<td>Erythrocyte volume</td>
<td>0.327 L/L</td>
</tr>
<tr>
<td>Mean corpuscular volume</td>
<td>76.4 f.L</td>
</tr>
<tr>
<td>Mean corpuscular haemoglobin</td>
<td>25.5 pg</td>
</tr>
<tr>
<td>Polymorphonuclear neutrophils</td>
<td>83.1%</td>
</tr>
</tbody>
</table>

Discussion
Neuropathic toxicity of metronidazole is rare and includes peripheral neuropathy, cerebellar toxicity, headache, dizziness, syncope, vertigo, and confusion. (1, 2) Common MS symptom – ataxia was reported in patients treated with metronidazole as a consequence of cerebellar toxicity. The proposed mechanism by which this occurs was acetylating, likely a result of localized neurogenic edema. (3) Peripheral neuropathy has also been reported as an unfeasible event upon retromandibular intake, and pathological investigation showed a major degree of nerve degeneration resulting in mostly distal sensory neuropathy, as it was in the case we present. (4) The exact mechanisms that underlie metronidazole’s neurotoxicity remain unclear. Several mechanisms have been suggested: 1) metronidazole’s intermediate metabolites modulate inhibitory neurotransmitter gluta receptor especially in the cerebellar and vestibular systems, and 2) the reactions with catecholamine neurotransmitter generate semicarbazones and nitro-oxazone neurotoxic radicals. (5)

Conclusion & Clinical Relevance
The peripheral neuropathy was clinically presented with mild to moderate symptoms, and full recovery occurred or stopped the medication. Nevertheless, it should be noted that the symptoms did not develop after prolonged metronidazole therapy nor did the dosage exceed the declared safe dosage. Despite the fact that symptoms our patient presented could not be related to her primary illness (i.e. MS), metronidazole should be used carefully in patients with history of neurological disorders, even if they are in a long remission phase of the disease and awareness of its possible neurological side effects should be increased.

References
SATURDAY C-49

NON-SURGICAL MANAGEMENT OF PERIAPICAL LESION WITH CORTICAL PERFORATION

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INTRODUCTION. Non-surgical retreatment is generally the preferred treatment for failed root canal therapy. It is most effective in cases when the etiology can be addressed through an orthograde approach. Treatments with poor obturation, missed canal spaces, and coronal leakage should be addressed nonsurgically first.

AIM. The aim of this presentation is to report a non-surgical endodontic retreatment with a large periapical lesion fully repaired.

CASE REPORT. Patient attends our clinic referring paraesthesia pain. Previous RCT on tooth 12 is found with 1 year of evolution. Trauma’s background dates back 8 years. CBCT imaging reveals perforation of both buccal and palatal cortical plates with a 25mm and 20mm diameter respectively.

METHODOLOGY. obturation material was removed from tooth 12 on the first appointment using Gates Glidden drills and distraction files,,nasal filling with a 56 K file. Conventional root Canal Therapy was realized on tooth 12 using TruRoot File technique with TruAdhesive ABC (50:50). 2% Sodium Hypochlorite was used on both cases with 1:5 ratio of 20 seconds each activation cycle. Both teeth were filled with calcium hydroxide as intracanal medication, Teflon and gutta percha were placed. 4-monthly appointments were later used to remove the intracanal medicament. Due to absence of symptoms and satisfactory evolution, final obturation was realized with thermoplastic technique, coronal seal with composite was placed and follow on CBCT scan was performed.

TOOTH 11: PREVIOUSLY TREATED WITH SYMPTOMATIC APICAL PERIODONTITIS.

TOOTH 12: PULP NECROSIS WITH ASYMPTOMATIC APICAL PERIODONTITIS AND EXTERNAL RESORPTION.

CLINICAL RELEVANCE. Root canal-treated teeth may continue to function for a considerable period of time even though they may be lacking one or two root canal systems. The decision for treatment may be due to more severe than a cause of the periodontal tissues to heal.

REFERENCE.
SATURDAY C-50

Spontaneously Healed Horizontal Root Fracture: a case report

Bibião, Rita; Monteiro, Ana; Corby, Stephanie; Marques Ferreira, Manuel

SPOTO, Lisbon, Portugal; FEDER COMPETE, DCOPA-41245/FEDER-02417 and MSCC-01015 FEDER-02417.

Objectives: To report a case of a spontaneously healed horizontal mid-root fracture on a maxillary left canine tooth of a 17-year-old male patient that suffered a dental trauma.

Introduction: Dental trauma can lead to injuries in teeth and their supporting structures, which occur most commonly in young patients. Horizontal root fractures (HRF) are uncommon among dental traumas.

Case Presentation: In this report, we present a clinical case of a 17-year-old male patient who suffers a traumatic dental injury diagnosed with a horizontal mid-root fracture on the maxillary left canine and intrusive luxation affecting maxillary central and lateral incisors (Figure 1a, b). The diagnosis of root fracture was accomplished with clinical examination showing low mobility, presence of tenderness and pain to palpation of the soft tissues and percussion of the teeth involved. The cold and electric pulp testing was positive on the canine but negative response was obtained on central incisors. Fractured fragments with radiolucent lines were noted on intraoral radiographs (Figure 1c). The treatment plan included 4 weeks of semi-rigid splinting on the canine tooth (Figure 1d), reconstruction of fractured crown and teeth and follow-up at 3, 6 and 12 months later. The incisors endodontic treatment was performed on the 6 months follow-up consult as pulp examined remains on vitality and confirm its necrotic state. A Cone beam computed tomography (CBCT) revealed helpful on the management of the HRF (Figure 1e, f, g). After a 12 months follow-up period the teeth with the HRF has had spontaneously healed. The healing process of root fracture was characterized by the formation of calcified tissue (Figure 1h). After 15 years follow-up period the teeth continues present as asymptomatic.

Discussion: Many factors may have influenced the healing that occurs for HRF injured teeth such as the length of time between the trauma and the treatment (two days after the injury), the stage of root development (mature tooth with closed apex), rigids and symptoms associated with mobility and pain (low). In this clinical case the healing process occur with formation of a hard tissue callus around the fracture and root fragments that reatttached, which is the most favorable type of healing of a HRF characterized by the formation of calcified tissue. The pulp of the HRF tooth affected remained healthy and its mobility within physiological limits. Limitations of 2D imaging were overcome by CBCT which had improving properly diagnose on HRF and helped defining the treatment plan.

Conclusion & Clinical Relevance: A tooth diagnosed with HRF may heal without endodontic treatment and complications. CBCT may offer considerable advantages over intraoral radiographs in the management of HRF. CBCT has been suggested as an adjunct imaging tool when the true nature of dental injuries cannot be confidently diagnosed from a conventional examination and radiographs.

References:
SATURDAY C-51

Endodontic Treatment of An Upper Lateral Incisor with Two Root Canals Under Orthodontic Treatment

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Hacettepe University Faculty of Dentistry Department of Endodontics Ankara,Turkey

Aim:
This case report presents disappearance of periapical radiolucency of upper lateral incisor under orthodontic forces after endodontic treatment.

Introduction:
Success rate of an endodontic treatment is over 90 %. Common reasons of failure after endodontic treatment are microleakage and insufficient debridement. But the orthodontic forces may also reduce healing capacity of periradicular tissue or lead to failure.

Case Presentation:
A 21-year-old woman patient referred for endodontic treatment for upper-right lateral incisor with sinus track on the attached gingiva. Radiological assessment revealed periapical radiolucency and Vertucci Type IV root canal configuration. Root canals located mesiodistally were determined (fig.1). Response to electrical pulp test was negative.

Cavity access was prepared wider than usual. Working length (WL) determination carried out using periapical radiography and electronic apex locator. WL of mesial root canal was found shorter when electronic apex locator was used. Coronal third of the mesial canal was obviously narrow than apical part. Ni-Ti rotary file was separated during initial shaping of the coronal third and removed successfully (fig.2 and fig.3). Separated instrument was removed using Gates Glidden drills for coronal enlargement and ultrasonic activation.

Instrumentation was completed with H-file (Besancon Cedex,France) using step-back technique up to #60 under constant irrigation with 2.5 % NaOCl (Wizard, Turkey). Sinus track was healed after a 2-week Ca(OH)2 intracanal medication and no clinical symptoms were observed (fig.4).

Root canals were obturated with gutta-percha and AH Plus sealer (Dentsply/Maillefer,DiekaJSA) using lateral condensation (fig.5). After 6 months there was no clinical symptoms and a slight healing of the periapical tissue was observed due to orthodontic forces (fig.5).

Discussion:
Anatomical challenges of the root canals may complicate endodontic treatments. Resorptive forces during orthodontic treatment may be the reason of delayed periapical healing.

Conclusion and Clinical Relevance:
Precise healing of this tooth may take more time than that which is not under orthodontic treatment.

Managing curved canals: Clinical case reports

INTRODUCTION

Anatomical variations of the root canal system such as severe canal curvatures of dilacerated teeth may compromise the objectives of canal preparation.

CASE DESCRIPTION

INTRODUCTION

A thorough knowledge of root canal morphology is essential to enhance the clinical success of any root canal therapy. Curved canals are still challenging because they present an increased risk for transportation. When a curvature, a rotary NiTi instrument is subjected to constant changes in compression and tension, eventually leading to material fatigue and subsequently to fracture without previous signs of clinical deterioration. The more severe the curvature and the less complicated the canal curvature, the greater the risk of transportation and unexpected instrument fracture, especially when larger NiTi preparations are targeted.

The authors suggested that considering the angle of curvature, according to the Schwarz method, is combined with the status of the curve in terms of the ease of transportation, allowing better decision-making in planning the case scenario. This type of cases require a complex approach at any step of the endodontic treatment.

CONCLUSION / DISCUSSION

Is severely curved canals, clinicians often tend to reduce the apicocentrification size of canal preparations. Clinicians should be aware that double curvatures in many cases are not visible in the conventional radiographic examination. Instrumentation time should be limited inside complex curvatures and other alternatives that are susceptible to tricky endodontic situations.

The cross-sectional configuration seems to be the predominant factor affecting the bending properties of rotary nickel-titanium instruments. If the curve is extreme, the bending may lead to the ovalization of the curvature, the more extensive the curve, the higher the radius of curvature, the more extensive the ovalization. Extreme curvature usually results in increased bending moment and therefore more energy is required for movement of the canal wall. Therefore, the opposite way to approach the problem of severe angulation is to reduce the movements of the instrument in order to avoid transportation.

Further, curved canals are highly sensitive to double-curved canals. As a result, the clinical management of the canal wall, reduced the engagement and consequently a reduced motility for the expression of osteocutaneous effects, and avoid excessive force will result in more predictable and fatigue resistant constructions. Area study of the canal preparation during instrumentation. In particular, canal transportation may result in inadequately cleaned root canals, harboring debris and residual micro-organisms, or even reduction of sound dentin with the possible outcome of failing the treatment. Nevertheless, careful preparation of the beams, canals, and any degree of curvature of the root walls, as well as any step perforation, can significantly increase the risk of perforation. In these cases, the preoperative approach should be revised, considering minimally invasive techniques, and will result in accurate canal transportation or even intraradicular perforation.

REFERENCES

MANAGEMENT OF C-SHAPED CANAL CONFIGURATIONS IN MOLAR TEETH: A CASE SERIES

Cantano L., Freitas V., Fernandes V., Neio-Ferreira A., Miller P.

Anatomical variations are a challenge to the clinician when the conventional protocols for instrumentation, irrigation and obturation are not sufficient to achieve the cleaning and shaping goals of modern endodontics.

INTRODUCTION

C-shaped canal configuration was described for the first time in 1979 by Cooke and Cox. This denomination is due to the morphology of the horizontal section of the root and can show variations in both the number and location of the canal(s). A higher prevalence of this morphology was found in Asian and East European populations. Even though this anatomical variation is more frequently found in second mandibular molars, its presence was also reported in maxillary molars. In 2002, DemirGöke stated an incidence of 0.091% on first maxillary molars. The purpose of this poster is to report the incidence of this anatomical variation and to propose a clinical approach.

CASE PRESENTATION

Due to the complexity of their morphology, C-shaped root canal systems may hinder endodontic interventions. A deep understanding of root canal morphology is imperative for diagnosis and treatment planning. The use of magnification is mandatory and the combination of techniques is crucial to achieve the final goal of disinfection and sealing of the root canal space. Irrigation with activation techniques are of great importance and when it comes to obturation, only the combination of thermoplastic techniques can guarantee the 3D sealing. Despite the difficulties in shaping, cleaning and sealing these type of canals, these teeth have a good prognosis when appropriate techniques are used.

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