UNIVERSITY OF OSLO

FACULTY OF DENTISTRY

Department of Endodontics

Postgraduate Program in

Endodontics

Case Book

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Treatment of Tooth with Apical Periodontitis:

First Visit:

Anesthesia
If required building up the tooth for aseptic reasons
Removal of plaque, caries and leaking fillings
Application of rubber dam
Disinfection of the working area with 0.5% chlorhexidine in 70% ethanol
Access cavity preparation
Localization of canal orifices
Measurement of working length, using apex locator and working length radiograph

- Goal: 0.5-1 mm short of the anatomic apex

Instrumentation to desired apical size (figure 1)

- Frequent irrigation with 1% sodium hypochlorite (NaOCl)
- Final irrigation with 17% ethylenediaminetetraacetic acid (EDTA) and a final flush with 1% NaOCl
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Second Visit:

If the patient is without symptoms and no sensitivity to palpation and percussion test from the tooth, the root canals are filled. (See above description of treatment of tooth without apical periodontitis.)

Time Plan:

Tooth without apical periodontitis:

- One-appointment treatment is the standard (goal)
- When time does not allow or there are other reasons, e.g. difficulty in controlling bleeding in the canal, the canal is filled with $Ca(OH)_2$ and the treatment will be finished at the second appointment, preferably 1-2 weeks later.

Tooth with Apical Periodontitis:

- Two-appointment treatment is the standard (goal)

- 1-3 weeks between first and second appointment is the standard
- Long-term Ca(OH)2 treatment (first for 2-3 weeks, then radiographic and clinical control after 3 months) is to be considered when:
    - A large lesion is present
    - Sinus tract does not close
    - Other symptoms continue

Emergency Treatment:

Acute Pulpitis:

- Eugenol pulpotomy
    - ZOE filling in a deep cavity
- Eugenol pellet in pulp chamber + IRM top filling
- Systemic medications
    - NSAID prescribed when pain is a problem
    - Systemic antibiotics not recommended

Acute Apical Periodontitis:

- Incision of abscess and drainage, if applicable
- In some cases 1-2 mm over-instrumentation with #10 K-file to release pus
- Preparation of canals and Ca(OH)2 treatment is the optimal treatment
- Ca(OH)2 dressing
- Systemic medications
    - NSAID prescribed when pain is a problem
    - Systemic antibiotics when general indications present

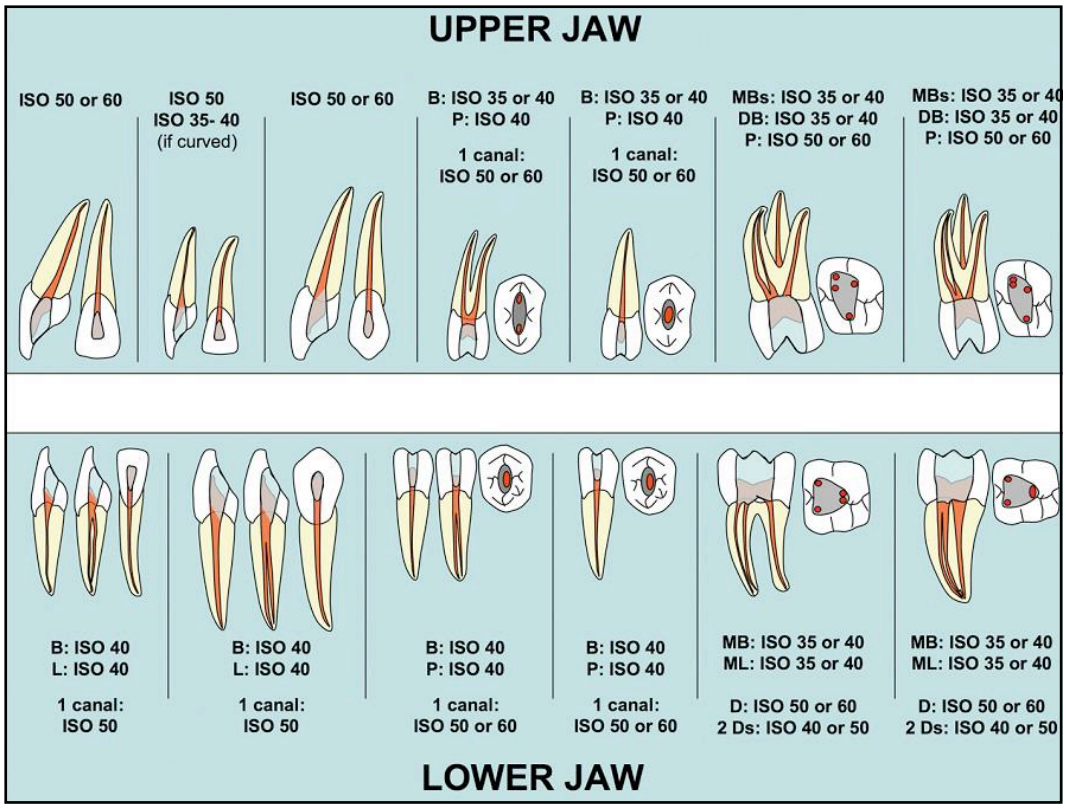

Figure 1: Normative apical sizes for safe and effective disinfection in permanent teeth. The clinician must use his or her clinical judgment in choosing apical sizes for each individual tooth.

Endodontic files for instrumentation of canals

Hand files:

- K-files
- Stainless steel files (SS files)
- Hedstroms files
- Nickel-titanium files (NiTi files)

Engine driven files

- ProTaper® (figure 2)
- BioRace® (figure 3)
- Race®

Figure 2: ProTaper®

Figure 3: BioRace®

Endodontic Surgery

- All relevant radiographs mounted on viewer or screen
- Anesthesia
- 1 minute mouth rinse with Corsodyl® (chlorhexidine 2mg/ml)
- Incision:
    - To provide a clearly defined opening to bone for maximum tissue thickness reflection, and to establish an easily identifiable and accessible border for re-approximation and reattachment.
- Elevation:
    - To gain access to bone by separating a full mucoperiostal flap of tissue and raising it from its underlying hard tissue attachment. The periosteum is retracted as an integral part of the flap.
- Retraction:
    - To hold the flap away from the surgical site, providing maximum access and visibility, without causing harm to the flap or the surrounding tissues.
- Flap design:
    - Intrasulcular flap:
        - Mainly indicated for treatment of cervical resorptions, perforations, and resections of short roots. Also mainly used in posterior apical surgery.
        - Comprises a horizontal incision extending to one or two teeth mesial and distal of the involved tooth and one vertical-releasing incision, usually placed at the mesial end of the flap.
        - If the access is too limited, the triangular flap can easily be converted into a rectangular flap by placing an additional releasing incision at the distal end of the horizontal incision.

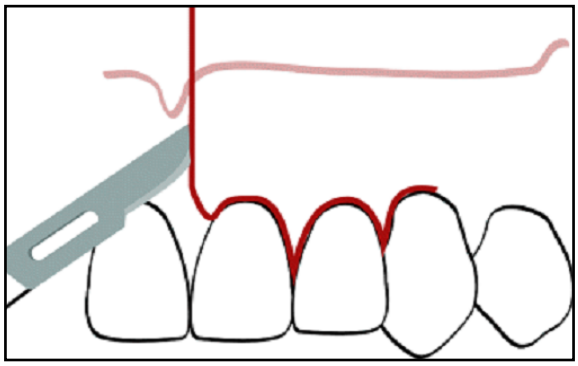

Figure 4: Triangular flap with intrasulcular incision (Velvart et al. 2002)

- Submarginal flap:
    - Fear of even small recessions is the driving force for considering the submarginal flap.
    - When properly planned and performed, the submarginal flap will leave the marginal gingiva untouched and does not expose restoration margins.
    - The submarginal flap design, also referred to as an Ochsenbein–Luebke flap, is similar to the rectangular flap, with the difference that the horizontal incision is placed within the attached gingiva.
    - The two vertical incisions are connected by a scalloped horizontal incision, performed roughly parallel to the marginal contour of the gingiva.
    - The submarginal incision should only be used when there is a broad zone of attached gingiva with a minimum of 3 mm

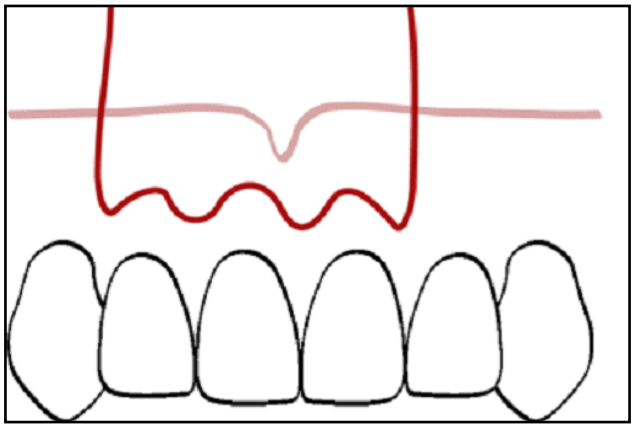

Figure 5: Submarginal flap (Velvart et al. 2002)

- Osseous entry or osteotomy:
  Involves removal of cortical and cancellous bone to gain direct access to the apical portion, and the lateral aspects if necessary, of the root or roots of a tooth where periradicular periodontitis is present. There may be fenestration through the buccal cortical plate, thus providing instant access to the root tip. A periradicular soft tissue lesion may have perforated the cortical plate, in which case curettage of the lesion permits access to the root either without bone removal or minimal extension of the borders of the defect for improved access. Frequently, however, there

will be an intact cortical plate that requires removal to expose the surgical site. This is achieved routinely by using rotary instruments.
3–4 mm of the apical portion of the root should be clearly exposed.
Following resection of the required 3 mm of root tip, there should be good visibility of the resected root surface for the next stage of the procedure.

- Surgical curettage:
  To remove all pathological tissue, foreign bodies, and root and bone particles from the periradicular area.

- Biopsy:
  Although there is agreement in the literature that the vast majority of soft tissue lesions are either granulomas or radicular cysts, any soft tissue lesion removed during the surgical procedure should be submitted for biopsy.

- Root-end resection:
  To expose the foramen/canal for inspection by sectioning the apical segment of the root and/or bevelling it to the line of sight.

- Ultrasonic root-end preparation:
  To provide a clean, well-shaped class I cavity in an apically resected root that is parallel to the long axis of the root, sufficiently centered to offer adequate root wall thickness, and deep enough to receive and retain a non-toxic, biocompatible filling material.

- Hemorrhage control:
  - To maintain a clean, dry and highly visible surgical site, and spontaneously manage and control any abnormal bleeding. This is achieved through use of:
  - Local anesthetic solutions possessing vasoconstrictor properties - Xylocaine Adrenaline® (lidocaine hydrochlorid 10 mg/ml, epinephrine 5 µg/ml), Septocaine® (articaine hydrochloride 4% with epinephrine 1:200,000) or Septocaine® Forte (articaine hydrochloride 4% with epinephrine 1:100,000)
  - Stryphnon gauze (adrenalonchloride 0,33 mg/cm^2)
  - Ferric sulfate ($Fe_2(SO_4)_3$)

- Root-end filling using either IRM or MTA:
  - The surgical site must be aspirated of all fluids and bleeding controlled.
  - The cavity preparation is flushed clean and thoroughly dried with short-cut segments of sterile paper points.
  - The IRM or MTA is carried to the preparation in small semisolid increments with plastic instruments or carvers.

- Use of the MAP system® (Micro-Apical Placement) or the MTA pellet forming block will ease the application of MTA.
- Pluggers of various sizes and angles are used to effectively condense the material to the depth of the preparation.

- Prior to wound closure, the surgical site is irrigated with saline solution to remove debris, and tissue edges are re-approximated in their correct position to promote healing by primary intention. Compression of the repositioned tissue with a saline-moistened gauze will reduce the coagulum to a thin fibrin layer between the repositioned tissue and cortical bone. Tissue margins should rest passively in the desired place before suturing.
- Wound closure using non-absorbable suture material in sizes 4-0 and 6-0.
- Postoperative radiograph is taken for control of procedures and as reference for follow-up
- Postsurgical care:
  - A disposable ice pack is covered with a soft towel, and the patient instructed on where and how to hold the icepack firmly in position against the facial tissues approximating the surgical site.
  - Unless contraindicated for some reason, the patient is instructed to take 400 mg ibuprofen every 4 to 6 hours for the first 48 hours.
  - The patient is advised to rinse with Corsodyl® twice daily until suture removal.
- Suture removal:
  - The epithelial seal at the wound edges is evident within 2 days; suture removal can take place earliest after 48 h but not later than 6-7days.
- Standard prescription of:
  - Analgesics:
    - Ibuprofen 400 mg. No 30. Every 4 to 6 hours in 3 days.
  - Antibiotics (only on indications):
    - Phenoxymethylpenicillin (penicillin V) 660 mg. no 30 (1+1+2 per day for 7 days)

Pulpectomy of a mandibular right first molar

Introduction

A 64-year- old Caucasian female

Figure 1 - Frontal view

Chief complaint

Pain to warm and cold

Medical history

Hypertension

Uses Ramipril (ACE inhibitor)

Dental history

The patient was referred from the Department of Prosthodontics for endodontic treatment of the mandibular right first molar. Previously performed an emergency treatment with Eugenol pellet and IRM due to a deep caries lesion with pulp involvement.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	45	46	47
Cold	+	+	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	Normal	Normal	Normal
EPT	23	67	23

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Dental:

Tooth 47: Occlusal composite restoration.

Tooth 46: Porcelain onlay/crown.
Mesial IRM.

Tooth 45: Normal.

Fig 3- Intraoral view

Radiographic findings:

Figure 4 - Preoperative radiograph of the mandibular right first molar

March 4th 2010

Tooth 45: Normal lamina dura. PAI 1 .
Normal bone level.
Tooth 46: Normal lamina dura. PAI 1 . Radiopaque coronal restoration.
Normal bone level.
Tooth 47: Normal lamina dura. PAI 1 . Radiopaque coronal restoration.
Normal bone level.

Diagnosis

Tooth 46:

Pulpal: Irreversible pulpitis (K04.0).

Apical: Within normal limits.

Marginal: Marginal periodontitis (K05.3).

Problem list

Obliteration of the mesial root canals.

Treatment plan

Tooth 46: Non surgical endodontic treatment. Pulpectomy.

Treatment

March 4th 2010

Clinical examination. 1.8 ml Septocaine® Preparation of the access cavity. Rubber dam. Localized 4 canals.

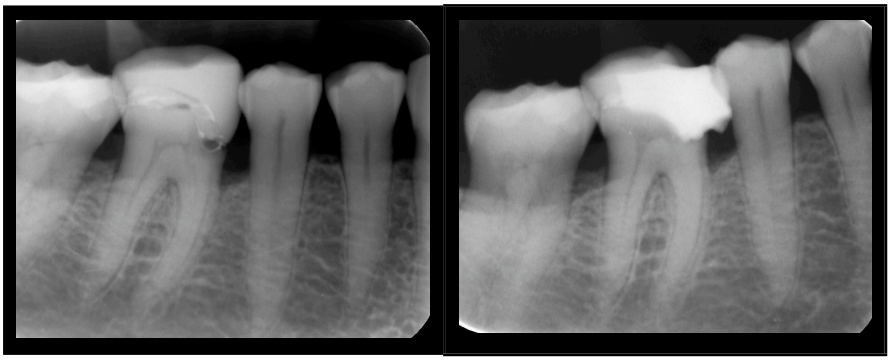

Figure 5 - Before the emergency treatment February 9th 2010

Figure 6 - After the emergency treatment March 4th 2010

The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Bio Race and hand files.

Four canals :

MB canal R:40/22mm
ML canal R:40/22mm
DB canal R:50/22mm
DL canal R:50/22mm

Chemical irrigation with 1% NaOCl and 17% EDTA.
The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

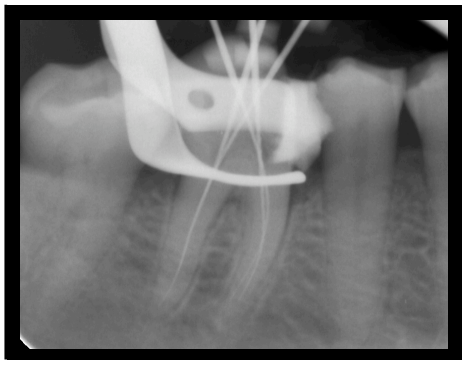

Figure 7 -Working length radiograph.

Mars 18th 2010

The patient was asymptomatic. 1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed with irrigation with 1% NaOCl, 17% EDTA and hand instruments. The canals were dried with sterile paper points and filled with gutta-percha and AH-plus sealer. IRM as a temporary filling.

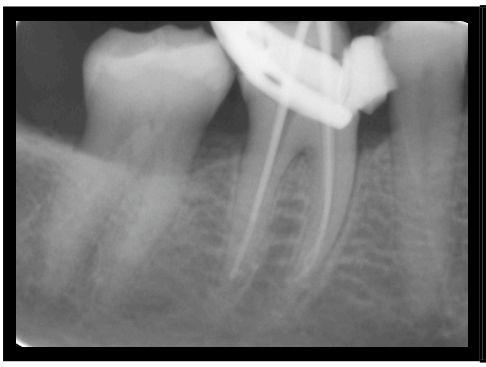

Figure 8 - Master point

Figure 9 - Final radiograph

Results

Evaluation

No complications during the treatment. The root filling seems dense and good .

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination: One year later. Patient was asymptomatic. Normal lamina dura.

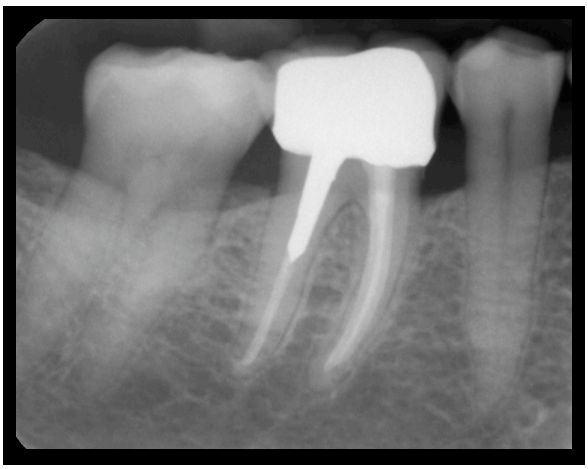

Figure 10 - Follow-up radiograph showing tooth 46 with a post and metal-ceram crown.

Discussion

In the case of irreversible pulpitis, the pulp is still vital but is severely inflamed so that healing is an unlikely outcome with conservative pulp therapy(1). With vital pulpectomy, the clinical aim is removal of the entire vital pulp tissue short of the anatomical apex followed by a bacteria tight, biocompatible and stable root filling. With this treatment inflamed tissue is removed to an apical level where the wound surface can be kept to a minimum, the residual pulp tissue is well vascularized and the conditions for healing are optimal, provided the entire treatment can be carried out under aseptic conditions (2). The optimal wound level in teeth with vital pulp appears to be 1-2 mm from the radiographic apex(3). Studies have shown that a distance from radiographical apex to root filling exceeding 3mm reduces the success rate compared to a termination of the filling 0–3mm from the radiographical apex (4). The success rate of pulpectomy, when carried out properly can be very high, that is in the 90% range (4,5).

In this case the tooth was treated under aseptic control, and the distance from the apex was correct. Patient also has good coronal seal (crown). Therefore the prognosis is favorable.

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Endodontic retreatment of a mandibular right first molar

Introduction

A 61-year- old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory.

Medical history

Hypertension.

Uses Aprovel (ACE hemmer) and Nexium.

Dental history

The patient was referred from the student clinic for non surgical endodontic retreatment of the mandibular right first molar. The referring student had started endodontic treatment on the tooth, but did not manage to reach the optimal working length in the mesial canal.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	45	46	47
Cold	-	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	Normal	Normal	Normal
EPT	80	80	25

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Dental:

Tooth 47: Occlusal composite restoration.

Tooth 46: MD composite restoration.
Occlusal IRM.

Tooth 45: MOD composite restoration.
Tooth 44 : OD amalgam restoration.

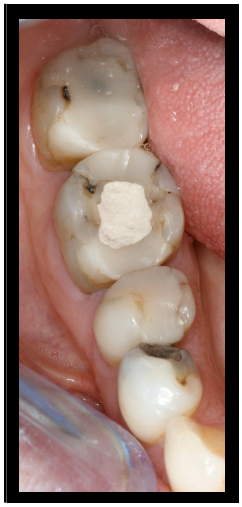

Fig 3- Intraoral view

Radiographic findings:

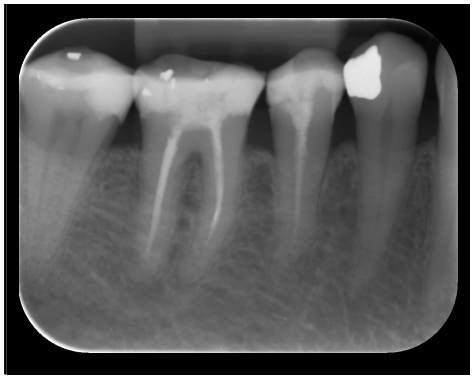

Figure 4 - Preoperative radiograph of the mandibular right first molar before treatment in the student clinic.

Figure 5 - Preoperative radiograph of the mandibular right first molar after treatment in the student clinic.

November 25th 2009

Tooth 45: Normal lamina dura. PAI 2. Radiopaque coronal restoration
Root canals were filled with a radiopaque filling.
material. Normal bone level.
Tooth 46: Discontinued lamina dura . Apical radiolucency. PAI 3.
Radiopaque coronal restoration.
Root canals were filled with a radiopaque filling.
Normal bone level.
Tooth 47: Normal lamina dura. PAI 1 . Radiopaque coronal restoration.
Normal bone level.

Diagnosis

Tooth 46:

Pulpal : Necrotic (K04.01).

Apical: Within normal limits.

Marginal: Normal.

Problem list

Obliteration .

Step in mesial canals.

Treatment plan

Tooth 46: Non surgical endodontic treatment.

Treatment

November 25th 2009

Clinical examination. 1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. Localized 3 canals.

Figure 6 -Working length radiograph.

Removing of root filling material with aid of Gates-Glidden burs, Protaper rotary retreatment files/hand files in conjunction with small amounts of chloroform. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Protaper rotary files and hand files.

Three canals :
MB canal R:40/20mm
ML canal R:40/20mm
D canal R:60/20.5mm

Chemical irrigation with 1% NaOCl ,17% EDTA and 2% CHX . The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM. It was hard to reach optimal length in.the distal canal, so we used Torpan burs iso 30 and hand instruments up to iso 60.

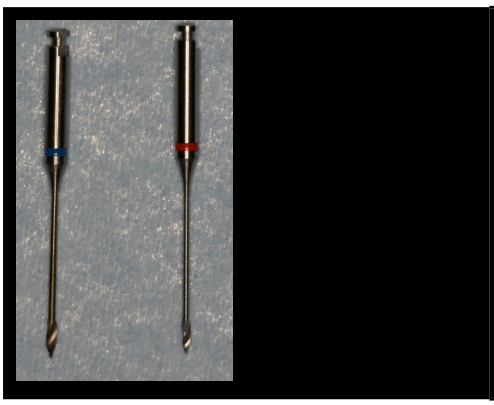

Figure 7 - Gates Glidden burs.

Figure 8 -Working length radiograph.

Figure 9 - Torpan burs no 30.

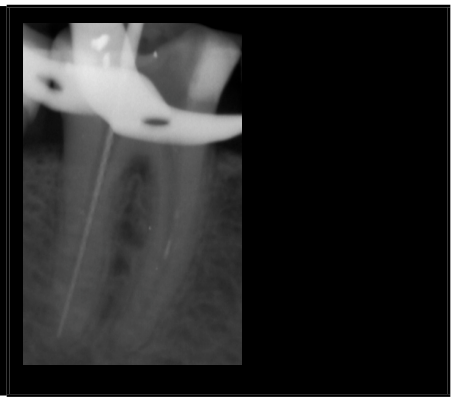

Figure 10 -Working length radiograph.

January 20th 2010

The patient was asymptomatic. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with Resilon and Epiphany sealer. IRM as a temporary filling.

Figure 11 - Master point radiograph.

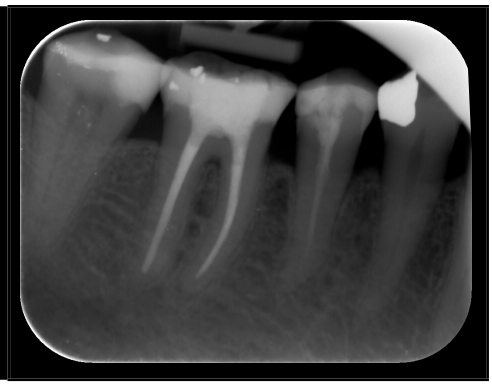

Figure 12 - Final radiograph

Results

Evaluation

No complications during the treatment. The root filling seems dense and good .

Prognosis

Endodontic: Good.

Tooth: Good .

Follow-up examination: One year after treatment. Tooth 46 with a composite filling. Normal lamina dura. Patient was asymptomatic.

Figure 13 - Follow-up radiograph.

Discussion

The critical function of the root canal filling is essentially to act as a barrier to infection or reinfection of both the root canal system and the periradicular tissues. Resilon is a thermoplastic synthetic polymer-based root canal obturation material that was introduced in 2004(1). Resilon contains methacrylate resin, bioactive glass, barium sulphate and bismuth oxychloride. Resilon handles like gutta percha, and is available in the same variety of master cones and accessory cones(1,7). Retreatment of Resilon-filled canals is possible, because the material can be softened and dissolved by chloroform.(7) Epiphany root canal sealant (Pentron Clinical Technologies) is a dual curable dental resin composite sealer(1). Several studies suggest that Resilon reduces leakage more than gutta percha (1,2),but others found no difference (3,4,5). A study by Conner et al. found that the healing rates for Resilon filled teeth were the same as commonly found for teeth with gutta percha(6). Analysis of the literature demonstrated that the bulk of the literature is in vitro in nature, based largely on leakage-type studies and demonstrates a wide variety of methodologies with conflicting findings; as a result meaningful conclusions are difficult (8).

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Endodontic treatment of a mandibular anterior tooth

Introduction

A 42 year old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Hypertension, Mixed connective tissue disease(autoimmune disease) ,Osteoporosis

Medical : Norvasc (calcium channel blocker), Lisinopril/ Hydroklortiazid(ACE inhibitors), Duroferon Duretter(iron preparation), Alendronat (Bone resorption inhibitors).

Dental history

The patient was referred from the student clinic for endodontic treatment of the mandibular right lateral incisor.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	41	42	43
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	5 mm	5mm	5mm
EPT	**43**	**80**	**45**

Table 1 - Clinical findings.

Soft tissue: Within normal limits .

Fig 3- Occlusal view

Dental:

Tooth 31:Attrition
Tooth 41:Attrition
Tooth 42:Attrition
Tooth 43:Attrition

Radiographic findings

February 17th 2011

Tooth 43: Normal lamina dura. PAI 2 .
Reduced bone level.
Tooth 42: Discontinued lamina dura .
Apical radiolucency. PAI 3.
Reduced bone level
Tooth 41: Normal lamina dura. PAI 2 .
Reduced bone level

Figure 4 - Preoperative radiograph .

Diagnosis

Tooth 42:

Pulpal: Necrotic (K04.1)

Apical: Chronic apical periodontitis (K04.5)

Marginal: Chronic marginal periodontitis (K05.3)

Problem list

Obliterated canal**.** Reduced bone level.

Treatment plan

February 17th 2011

Tooth 42: Non surgical endodontic treatment .

Treatment

Clinical examination. 1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. Localized 2 canals. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Protaper rotary files and hand files.

Two canals :

Buccal canal:45/19.5mm.
Lingual canal:45/19.5mm.

Chemical irrigation with 1% NaOCL and 17% EDTA. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM .

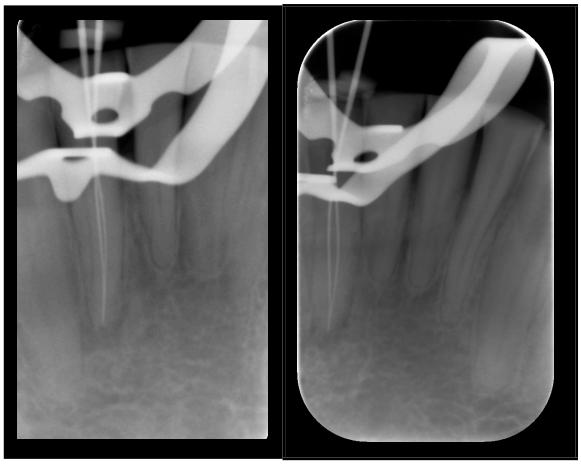

Figure 5 -Working length radiograph.

Figure 6 -Working length radiograph in mesioeccentric periapical view.

March 08th 2011

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with gutta-percha and AH+ sealer. IRM as a temporary filling.

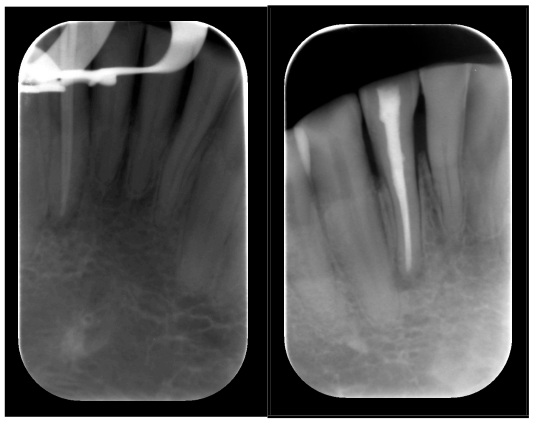

Figure 7 - Master point

Figure 8 - Final radiograph

Results

Evaluation

The patient was asymptomatic . No complication during treatment. The root filling seems dense and good .

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination: Follow up one year after treatment. Patient was asymptomatic. Normal lamina dura. PAI 2.

Figure 9 - Periapical radiograph.

Discussion

Epidemiological studies on adult oral health from the Scandinavian countries have documented high prevalence of apical periodontitis (30–50%) which increases with age (1,2). Previous studies like Sjøgren et al. showed that teeth with no preoperative periapical lesions do not constitute a therapeutic problem as more than 96% of these teeth were treated successfully. On the other hand, teeth with pulp necrosis and periapical lesions and those with periapical lesions undergoing retreatment constitute major therapeutic problems as can be seen from the lower success rates of only 86 and 62%, respectively(3).

There are many factors that may influence the outcome of root canal treatment.The first critical important step in elimination of root canal microorganisms is irrigation with effective bactericidal solutions(4). Concentration of sodium hypochlorite solutions, has been dispute amongst clinicians for a long time.

NaOCl is commonly used in concentrations between 0.5% and 6%. It is a potent antimicrobial agent, killing most bacteria instantly on direct contact. It also effectively dissolves pulpal remnants and collagen, the main organic component of dentin (9).

Clinical tests showe that sodium hypochlorite at 0.5 or 5% concentration has similar antibacterial effect (5,6). From in vitro observations, it would appear that a 1% NaOCl solution should suffice to dissolve the entire pulp tissue in the course of an endodontic treatment session(7). Based on the currently available evidence, there is limited rationale for using hypochlorite solutions at concentrations over 1%(8).

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Endodontic retreatment of a maxillary right first molar

Introduction

A 30-year- old Caucasian male

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

The patient was referred from the student clinic for endodontic treatment of the maxillary right first molar.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	17	16	15
Cold	+	-	-
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	5 mm	5 mm	7 mm

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Dental:

Tooth 17: Normal.
Tooth 16: MO composite restoration.
Tooth 15: MOD composite restoration.
Tooth 14 : MOD composite restoration.

Fig 3- Occlusal view

Radiographic findings:

Figure 4 - Preoperative radiograph of the maxillary right first molar.

November 23th 2011

Tooth 14: Discontinued lamina dura . Apical radiolucency. PAI 3 . Radiopaque coronal restoration. Root canals were filled with a radiopaque filling material. Reduced bone level.
Tooth 15: Discontinued lamina dura . Apical radiolucency. PAI 3 . Radiopaque coronal restoration. Root canals were filled with a radiopaque filling material. Reduced bone level.
Tooth 16: Discontinued lamina dura . Apical radiolucency. PAI 3 . Radiopaque coronal restoration. Root canals were filled with a radiopaque filling. Reduced bone level.
Tooth 17: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Reduced bone level.

Diagnosis

Tooth 16:

Pulpal : Root-filled tooth (K04.19).

Apical: Chronic apical periodontites (K04.5).

Marginal: Chronic marginal periodontitis (K05.3).

Problem list

Apical obliteration /step in the mesial canal.

Treatment plan

Tooth 16: Non surgical endodontic treatment.

Treatment

November 23th 2011

Clinical examination. 1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. Localized 4 canals. MB2 canal had not been instrumented. Removing of root filling material with aid of Gates-Glidden burs, Protaper rotary retreatment files/hand files in conjunction with small amounts of chloroform. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Protaper rotary files and hand files.

Four canals :

MB canal R:40/18mm
MB2 canal R:35/18.5mm
DB canal R:40/18.5mm
P. canal R:55/22mm

Chemical irrigation with 1% NaOCL, 17% EDTA and 2% CHX
The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

Figure 5 -Working length radiograph.

Figure 6 - Mesioeccentric periapical view.

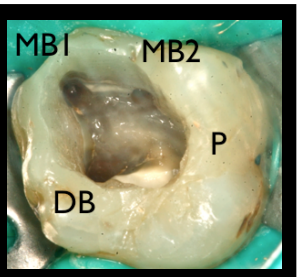

Figure 7 -Photo of access cavity.

December 07rd 2011

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with gutta-percha and AH+ sealer. IRM as a temporary filling.

Figure 8 - Master point

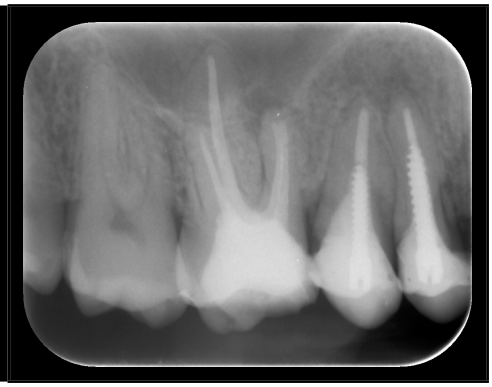

Figure 9 - Final radiograph

Results

Evaluation

No complications during the treatment. The root filling seems dense and good.

Prognosis

Endodontic: Good.

Tooth: Good .

Follow-up examination: No follow-up examination because the treatment was performed december 2011.

Discussion

Microorganisms are the cause of apical periodontitis (1-3). Their elimination from the root canal space during root canal treatment results in predictable healing of apical pathosis (4). Complete elimination of bacteria by instrumentation alone is unlikely to occur (4), and some form of irrigation and disinfection is necessary to kill and remove microorganisms, their by-products and residual tissue, as well as to remove the smear layer and other debris from the canal system. Such chemical (therapeutic) treatments of the root canal can be arbitrarily divided into irrigants, canal rinses, and inter-appointment medicaments; calcium hydroxide is included in this latter group(5). Calcium hydroxide is a strong alkaline substance, which has a pH of approximately 12.5. In an aqueous solution, calcium hydroxide dissociates into calcium and hydroxyl ions. Antimicrobial activity of calcium hydroxide is related to the release of hydroxyl ions(6). In studies that have demonstrated the antimicrobial efficacy of calcium hydroxide, the root canals had been dressed for 1-4 weeks (7- 9).

Several studies have attested to the ineffectiveness of Ca(OH)2 in eliminating bacterial cells. Haapasalo and Ørstaviks´ in vitro study (11) reported that Calasept® failed to eliminate, even superficially, E. faecalis in the tubule. A study by Weiger et al. (12) confirmed various investigations showing that E. faecalis resists calcium hydroxide treatment.E. faecalis is the most frequently detected species in root canal-treated teeth and studies have suggested that they may be important agents in endodontic failure(13). Molander et al. examined the microbiological status of 100 root-filled teeth with periradicular lesions and found that facultative anaerobes predominated, with enterococci isolated from 32% of the teeth (10).

Chlorhexidine (CHX) is a broad-spectrum antimicrobial agent that has been reported to be an effective medicament in endodontic therapy. Basrani B et al. look at the efficacy of chlorhexidine (CHX) and calcium hydroxide, Ca(OH)2, against Enterococcus faecalis in vitro. They concluded CHX was significantly more effective against E faecalis than Ca(OH)2(14). An other study by Zamany A. et al. investgated the effect of chlorhexidine (2%) as an additional irrigant in endodontic disinfection. Their findings demonstrated that an additional rinse with 2% chlorhexidine resulted in enhanced disinfection of the root canal system (15).

In my case I used calcium hydroxide as an inter-appointment medicament and 2% chlorhexidine-di-glucanat as an additional rinse. This procedure has been suggested by Trope and Debellian (16).

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Endodontic treatment of a mandibular right first molar

Introduction

A 78 year old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory.

Medical history

Non-contributory.

Dental history

Referred to the Department of Endodontics, UiO, from dental student clinic, UiO, for examination and treatment of mandibular right first molar.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	45	46	47
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	4 mm	7mm	7mm
EPT	23	80	37

Table 1 - Clinical findings.

Soft tissue: The gingival margin was retracted.

Dental:

Tooth 45: MOD composite filling.

Tooth 46: MOD composite filling.
Buccal amalgam filling.

Tooth 47: MOD composite filling.
Buccal and lingual amalgam filling.

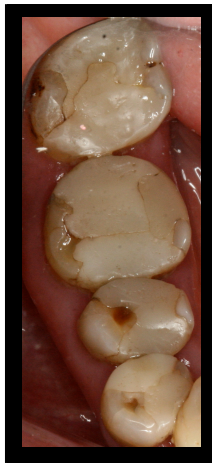

Fig 3- Intraoral view

Radiographic findings:

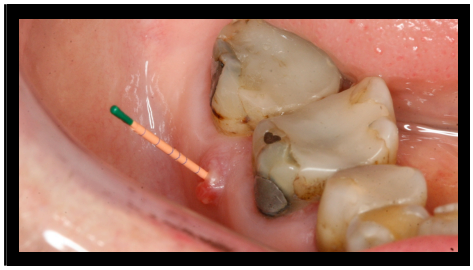

Figure 4 - Preoperative photo of the tooth 46 with a gutta-percha point in the sinus tract.

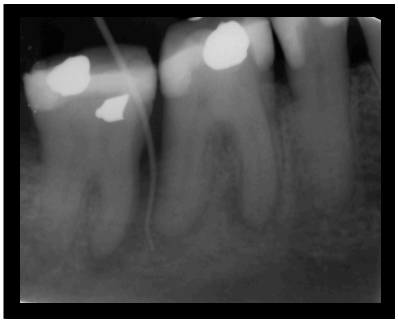

Figure 5 - Preoperative radiograph . The sinus tract originates from tooth 46.

January 19th 2010

Tooth 45: Normal lamina dura. PAI1 . Radiopaque coronal restoration.
Reduced bone level.
Tooth 46: Discontinued lamina dura. Periapical radiolucency. PAI 4.
Radiopaque coronal restoration.
Reduced bone level.
Tooth 47: Widened lamina dura. PAI 3 . Periapical radiolucency.
Radiopaque coronal restoration.
Reduced bone level.

Diagnosis

Tooth 46:

Pulpal : Necrotic (K04.01).

Apical: Periapical abscess with sinus tract (K04.6).

Marginal: Chronic periodontitis (K05.3).

Problem list

Sinus tract.

Reduced bone level.

Treatment plan

January 26th 2010

Tooth 46: Non-surgical endodontic treatment .

Tooth 47 : Observation due to normal EPT and cold test.

Treatment

Clinical examination. 1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. Localized 3 canals. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Bio Race and hand files.

Figure 6 - Preoperative radiograph .

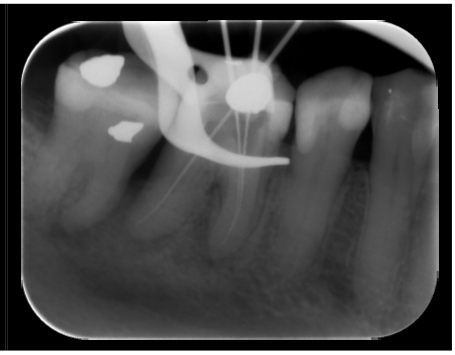

Figure 7 -Working length radiograph.

Three canals :

MB canal R:40/19mm

ML canal R:40/19mm

D canal R:50/19mm

Chemical irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

February 03rd 2010

Sinus tract had closed and patient was asymptomatic.1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with warm Resilon and Epiphany sealer. IRM as a temporary filling.

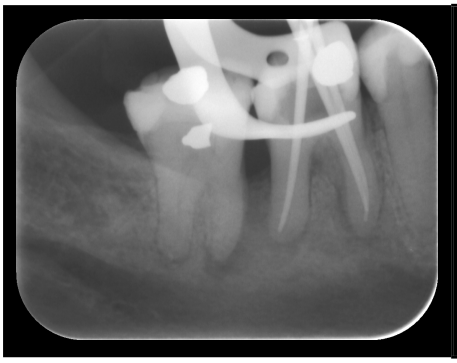

Figure 8 - Master point.

Figure 9 - Final radiograph.

Results

Evaluation

The patient was asymptomatic and the sinus tract had closed. The root filling seems dense and good.

Prognosis

Endodontic: Good.

Tooth: Uncertain due to marginal bone lost .

Follow-up examination: Two years after treatment. Tooth 46 had a porcelain fused to metal crown. The periapical radiograph showed complete healing of the apical periodontitis with intact lamina dura around the entire root. Positive ice test on tooth 47. PPD on tooth 46 and 47 were 5 mm. Patient was asymptomatic.

Figure 10 - Preoperative radiograph .

Figure 11 - Follow up radiograph 2 years recall

Discussion

The function of root canal obturation is to fill the root canal space and eliminate all portals of entry between the canal and the periodontium(1). There are a variety of techniques used to obturate the root-canal system, which can be divided into two basic groups: cold lateral compaction or warm vertical compaction. Lateral compaction offers the advantages of controlled placement of gutta-percha into the root canal and low costs (3).The disadvantage of cold lateral condensation is no homogeneous mass of guttapercha (4) and that lateral condensation may induce vertical root fractures (5,6). Warm vertical condensation provides a greater density of gutta-percha at the apical portion of the filling and obturates lateral canals and foramina(4).This technique may result in the extrusion of gutta-percha into the periapical tissues (1). In this case it was used a modification of warm vertical condensation called the ″continuous wave of condensation″- technique, developed by Buchanan (7). This technique serves as a hybrid of the cold lateral and warm vertical techniques. The technique takes advantage of a well-fit master apical cone of lateral compaction to reduce apical extrusion of gutta-percha and adds the benefits of warm vertical compaction to thoroughly obturate the root-canal system(2).In this case it was used Resilon with a thermoplastic delivery system which also has the ability to undergo thermal plasticization, which is comparable to that of gutta-percha (8).

In 1981 Brenner et al. tested leakage in canals with and without a sealer, using 45-Ca as a radioisotope for radio-autography techniques. Whether a sealer was used or not, no statistical difference was reported between warm vertical and cold lateral techniques (9).

In a meta-analysis by Peng et al.(1) where they compared warm vertical compaction and cold lateral compaction with gutta-percha, they concluded that postoperative pain prevalence, long-term outcome and obturation quality were similar between the two groups.

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Endodontic retreatment of a mandibular left first molar

Introduction

A 45 year old Middle-Eastern male

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

The patient was referred from his general dentist for non surgical endodontic retreatment of the mandibular left first molar. The referring dentist had started retreatment of the distal root.

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	35	36	37
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	4 mm	7mm	4mm
EPT	**33**	**80**	**34**

Table 1 - Clinical findings.

Soft tissue: The gingival margin was retracted .

Dental:

Tooth 35: OD composite filling

Tooth 36: MO temporary filling

Tooth 37: O amalgam

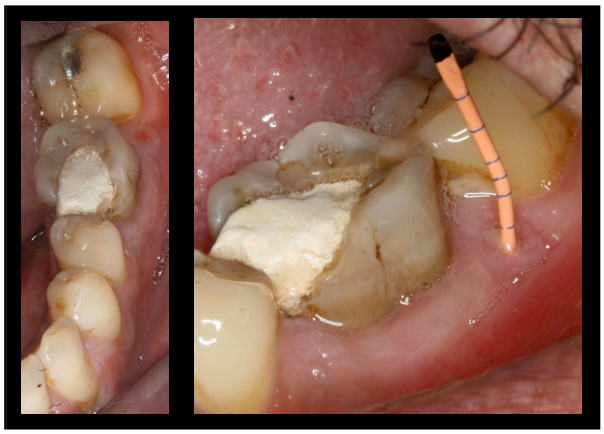

Fig 2- Intraoral view

Figure 3 - Preoperative photo of the mandibular left first molar with a gutta-percha point in the sinus tract.

Radiographic findings:

Figure 4- Preoperative radiograph . The sinus tract is originate from tooth 36.

Tooth 35: Normal lamina dura. PAI 1 . Radiopaque coronal restoration.
Reduced bone level.
Tooth 36: Discontinued lamina dura . Apical radiolucency. PAI 5.
Radiopaque coronal restoration.
Root canals were filled with a radiopaque filling
Reduced bone level.
Tooth 37: Normal lamina dura. PAI 2 Radiopaque coronal restoration.
Reduced bone level.

Diagnosis

Tooth 36:

Pulpal : Previously endodontically treated tooth (K04.19)

Apical: Periapical abscess with sinus tract (K04.6)

Marginal: Chronic periodontitis (K05.3)

Problem list

Vertical root fracture

Periodontal problem

Treatment plan

Tooth 36: Non surgical endodontic treatment.

Treatment

January 06th 2011

Clinical examination. 1.8 ml Septocaine® .Preparation of the access cavity. Rubber dam. Localized 4 canals. Removing of root filling material with aid of Gates Glidden burs and Protaper rotary retreatment files. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Protaper rotary files and hand files.

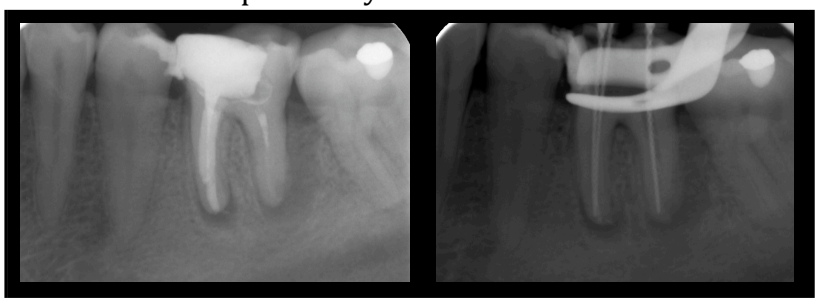

Figure 5 - Preoperative radiograph .

Figure 6 -Working length radiograph.

Four canals :

MB canal R:40/16.5mm

ML canal R:40/16mm

DL canal R:60/15mm

DB canal R:50/16.5mm

Chemical irrigation with 1% NaOCL ,17% EDTA and Chlorhexidin- di-glucanate 2 %. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM

February 03rd 2011

Patient was asymptomatic and the sinus tract was closed. 1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points. Grey Mineral Trioxide Aggregate (MTA) (Angelus, Brazil) was applied with MAP-system®, as an apical barrier to prevent extrusion of gutta-percha during root canal filling . AH Plus was applied to the canal walls. The obliteration was performed with warm vertical compaction of gutta-percha. SybronEndo Elements Obturation Unit® in conjunction with Buchanan hand pluggers were used for this purpose. IRM as a temporary filling.

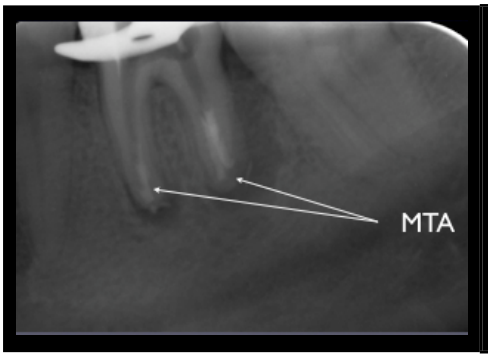

Figure 7 - MTA apically plugs

Figure 8 - Final radiograph

Results

Evaluation

The patient was asymptomatic and the sinus tract had closed.

The root filling seems dense and good .

Prognosis

Endodontic: Good

Tooth: Uncertain due to.marginal bone loss .

Follow-up examination: One year later .The patient was asymptomatic from tooth 36. No palpation or percussion sensitivity from tooth 36. The periapical radiograph showed complete healing of the apical periodontitis with intact lamina dura around the entire roots. Pocket depth 5 mm. The tooth had a porcelain fused to metal crown.

Figure 9 - Preoperative radiograph .

Figure 10 -Periapical radiograph at follow-up examination

Discussion

Pulpal and periodontal problems are responsible for more than 50% of tooth mortality today (3). The interrelationship between periodontal and endodontic disease has aroused much speculation, confusion, and controversy. Some have found that endodontic disease has an impact on the periodontium like the study by Chen et al. their conclusion was; it seems reasonable to believe that, in non-surgical treatment, infectious materials in the canal system may influence periodontal healing through canal ramifications and patent dentinal tubules(3). A study by Jansson et al. concluded that periodontitis-prone teeth run a significantly higher risk of losing periodontal attachment if a root canal infection is also present and evident as a periapical radiolucency (6). Other studies like Miyashita et al. examine the extent to which the marginal alveolar bone may be influenced by the condition of the dental pulp. The study failed to demonstrate a correlation between a reduced marginal bone support and endodontic status(9). The effect of periodontal inflammation on the pulp is also controversial and conflicting. Studies like Seltzer et al. reported substantial pathological change and frequent necrosis in the pulp tissue due to periodontal disease, especially when accessory canals are present. (2) Other studies like Langeland et al. demonstrated that pathologic changes do occur in the pulp when periodontal disease is present; however, the pulp does not succumb as long as the apical foramen is not involved (4).

A lesion involving both periodontal and pulpal tissues can be of primary endodontic, primary periodontal or stem from separate origins (meaning that both the endodontic lesion and the marginal periodontal lesion have developed independently (1).

The perio-endo lesions can be classified due to their pathogenesis after Simon and Colleagues in 1972: Endodontic lesion, periodontic lesion ,endodontic lesion with secondary periodontal involvement, periodontal lesion with secondary endodontic involvement and true combined lesion. In general, assuming the endodontic therapy is adequate, what is of endodontic origin will heal. Thus, the prognosis of combined diseases rests with the efficacy of periodontal therapy(7).

I my case we had a tooth with a.fistula and a deep periodontal pocket. The source of inflammation was identified by tracing the sinus tract. By doing so revealed a tract of endodontic origin. If the etiology is pulpal, it usually responds well to endodontic therapy. If there was a deep solitary pocket in the absence of periodontal disease it could indicate the presence of a lesion of endodontic origin or a vertical root fracture(8) .

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Endodontic treatment of a mandibular central incisor

Introduction

A 16 year old Caucasian male

Figure 1 - Frontal view

Chief complaint

Non-contributory.

Medical history

Medical: X-linked hypophosphatemic rickets

Medicines: Phosphat tabl. and D-vit.

Dental history

The patient was referred to the specialist clinic for treatment of tooth 41 from the Department of Pediatric Dentistry, University of Oslo.
Prior access and instrumentation R:35/23mm.
Antibiotic treatment due to pain and buccal swelling i regio 41.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	32	41	42
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	3 mm	4mm	3mm
EPT	43	80	45

Table 1 - Clinical findings.

Soft tissue: Within normal limits .

Fig 3- Occlusal view

Dental:

Tooth 31: Missing due to extraction.
Tooth 41: Temporal lingual filling.
Tooth 42: Composite lingual filling.
Tooth 43: Composite mesiolingual filling.

Radiographic findings

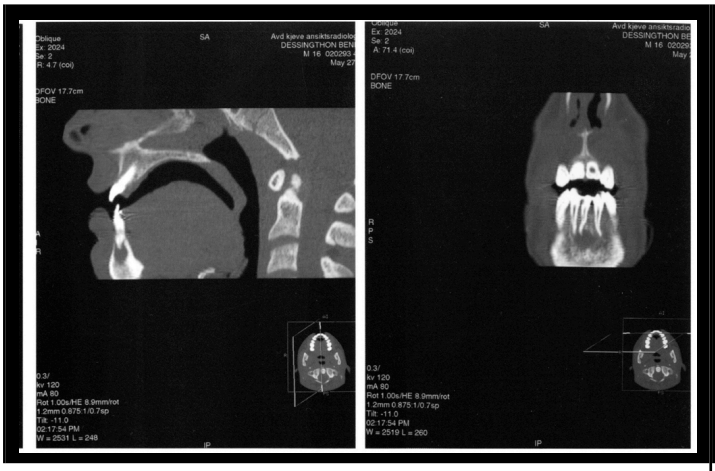

Figure 4 - Sagittal CT-image of tooth 41 .

Figure 5 - Preoperative radiograph .

November 04th 2009

Tooth 43: Normal lamina dura. PAI 1 .
Radiopaque coronal restoration.
Normal bone level.
Tooth 42: Normal lamina dura. PAI 2.
Radiopaque coronal restoration.
Normal bone level.
Tooth 41: Discontinued lamina dura . Apical and lateral radiolucency.
PAI 5. Radiopaque coronal restoration.
Reduced bone level.

Diagnosis

Tooth 41:

Pulpal: Necrotic (K04.01).

Apical: Chronic apical periodontitis (K04.5).

Marginal: Within normal limits.

Problem list

Fracture of tooth.
Strip perforation.

Treatment plan

November 4th 2009

Tooth 41: Non surgical endodontic treatment.

Treatment

Clinical examination. 1.8 ml Septocaine®.Rubber dam. Preparation of the access cavity. Localized 1 canal. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with hand files.

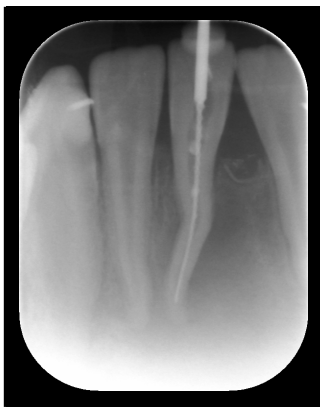

Figure 6 -Working length radiograph.

One canal :

Canal R:40/23mm

Chemical irrigation with 1% NaOCL and 17% EDTA. Ultrasonic tips Irrisafe® was used for further cleaning of the canal. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

November 19th 2009

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canal was dried with sterile paper points and filled with gutta-percha and AH+ sealer. IRM as a temporary filling.

Figure 7 - Master point

Figure 8 - Final radiograph

Results

The patient was asymptomatic . No complication during treatment

Evaluation

The root filling seems dense and good .

Prognosis

Endodontic: Good

Tooth: Uncertain due marginal bone loss .

Follow-up examination: Patient was asymptomatic. The periapical radiograph showed healing of the apical periodontitis with intact lamina dura around the entire root . PAI 1.

Figure 9 - Follow-up radiograph 2 years later

Discussion

The X-linked hypophosphatemic rickets is a rare metabolic disorder characterized by low serum phosphate levels caused by a decreased renal tubular reabsorption of inorganic phosphates. The initial complaints are a delay in the development of walking caused by deformity of the legs. Oral findings include dentinal defects characterized by hypocalcified and interglobular dentin in both dentitions, enlarged pulp chambers and root canals, and periradicular abscesses in caries-free teeth (1).

Reduction of bacteria is achieved by mechanical cleansing, irrigation of the canal with various medicaments and deposition of antibacterial dressings in the canal. After mechanical preparation alone Bystrøm et al. showed in their study that approximately 50% of teeth still harboured detectable bacteria after instrumentation (2). Ørstavik et al. showed that the root canals instrumented to larger-size reamers at the first appointment appeared to render canals bacteria-free more easily (3). Dalton et al. also showed that with increasing file size, there was an

increased reduction of bacteria (4). Yared and Bou Dagher found no statistically significant difference between the size 25 and 40 file groups after instrumentation regarding residual microorganisms (5). Ørstavik et al.concluded in a multivariate analysis of the outcome of endodontic treatment that apical extension (reamer size) and point size showed no impact on treatment outcome (6). Based on a review of the literature Friedman (7) recommended larger apical preparation sizes in combination with abundant irrigation and use of a calcium hydroxide dressing (8).

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Endodontic treatment of a maxillary right second molar

Introduction

A 41 year old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory.

Medical history

Medical: Neurofibromatosis type I

Medicines: Non-contributory.

Dental history

The patient was referred from her dentist at Lovisenberg Diakonale Hostpital for treatment of tooth 17 at Department of Endodontics, UiO.

Clinical findings

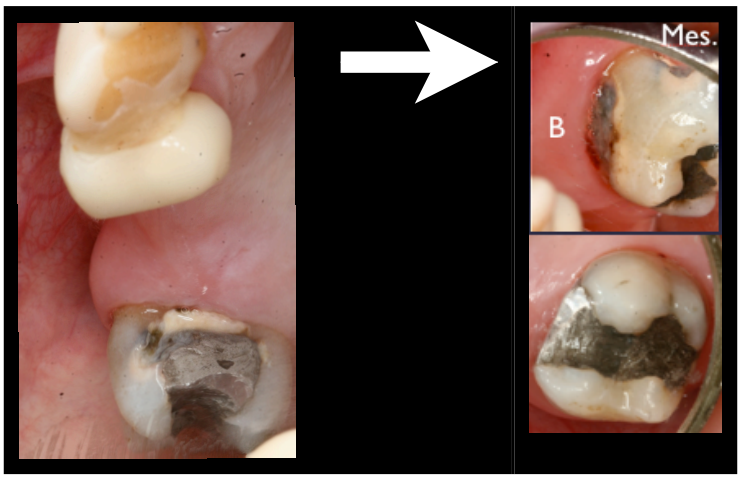

Figure 2 - Occlusal view

Figure 3 Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Dental plaque was observed. Gingivitis.

Tooth	17	26	14
Cold	-	+	-
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	5 mm	4mm	4mm
EPT	80	34	ND

Table 1 - Clinical findings.

Soft tissue: Within normal limits .

Dental:

Tooth 17: MOD Amalgam filling (caries).
Tooth 16: Missing.
Tooth 15 Missing.
Tooth 14: Temporary crown.

Radiographic findings

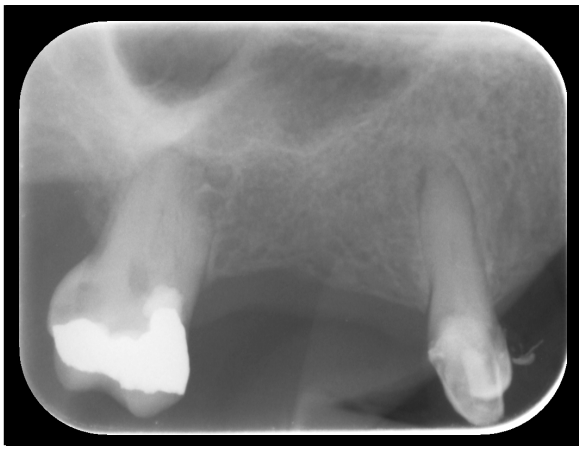

Figure 5 - Preoperative radiograph .

January 06th 2011

Tooth 17: Discontinued lamina dura . Apical radiolucency. PAI 3
Radiopaque coronal restoration.
Reduced bone level.
Tooth 14: Discontinued lamina dura . Apical radiolucency. PAI 3.
Radiopaque coronal restoration.
Reduced bone level

Tooth 17:

Pulpal: Necrotic (K04.01)

Apical: Chronic apical periodontites (K04.5)

Marginal: Within normal limits

Tooth 14 : The dentist at Lovisenberg Diakonale Hostpital has started and will finish the endodontic treatment of this tooth.

Problem list

Loss of tooth substance because of caries

Treatment plan

January 06th 2011

Tooth 17: Remove caries and composite build up.

Non-surgical treatment of tooth 17.

Treatment

January 06th 2011

Clinical examination. 1.8 ml Septocaine®. Removing caries lesion. Composite build- up.

January 19th 2011

Preparation of the access cavity. Rubber dam. Localized 3 canals. No MB2 canal was found. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Protaper rotary files and hand files.

Three canals :

MB canal R:40/16.5mm

DB canal R:40/16mm

P. canal R:60/15mm

Chemical irrigation with 1% NaOCL and 17% EDTA. Ultrasonic tips Irrisafe® was used for further cleaning of the canal. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

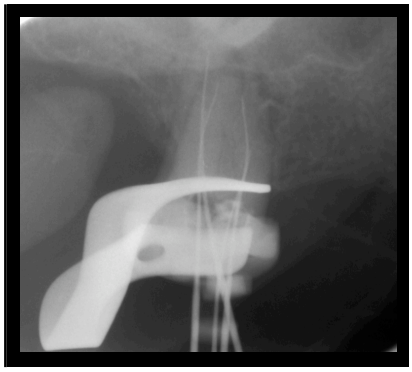

Figure 6 -Working length radiograph.

March 02nd 2011

Patient was asymptomatic .1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with gutta-percha and AH+ sealer. IRM as a temporary filling.

Figure 7 - Master point

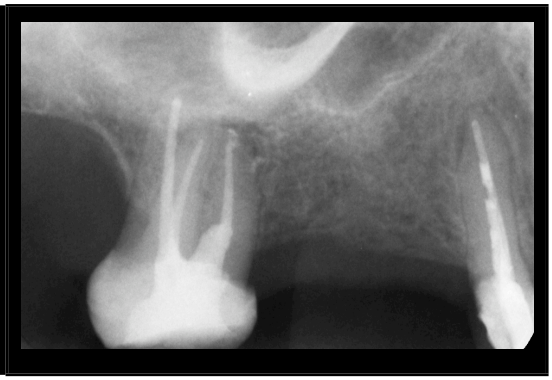

Figure 8 - Final radiograph

Results

Evaluation

The patient was asymptomatic . No complication during treatment. The root filling seems dense and good .

Prognosis

Endodontic: Good

Tooth: Good.

Follow-up examination: Patient did not attend at the follow-up. Her dentist sendt me an OPG taken one year after my treatment. The radiograph shows the tooth 17 with a temporary crown. Normal lamina dura. PAI 1. Patient was asymptomatic.

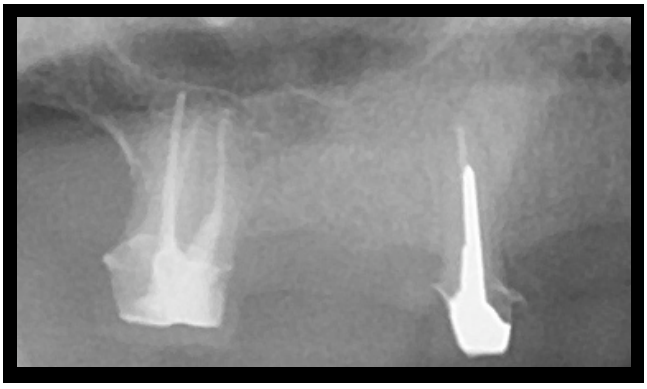

Figure 9 - Follow-up radiograph (OPG).

Discussion

Neurofibromatosis type 1 (NF1), or von Recklinghausen disease, is one of the most common hereditary neurocutaneous disorders in humans with a incidence of 1 : 3000. Although many cases are heritable, approximately 30–50% arise de novo from spontaneous mutations. Clinically, NF1 is characterized by cafe´ -au-lait spots, freckling, skin neurofibroma, plexiform neurofibroma, bony defects, Lisch nodules and tumors of the central nervous system(1) Oral manifestations can be found in almost 72% of NF1 patients. The most common oral finding of NF1 reported in the literature is enlargement of the fungiform papillae of the tongue that occurs in about 50% of cases (2). Another common oral tissue change is the presence of single or multiple neurofibromata(3).

When assessing the retention rate of endodontically treated teeth, it has been found that nonsurgical endodontic treatment is a predictable procedure with excellent long-term prognosis (4, 5). Lazarski et al. studied cohorts of patient populations in Washington State and assessed the outcome of initial treatment in 44,613 patients. They found that about 94% of the teeth remained functional after overall 3.5 yr. (4). Salehrabi et al. found in their study that overall 97% of teeth were retained in the oral cavity 8 years after initial nonsurgical endodontic treatment. Analysis of the extracted teeth revealed that 85% had no full coronal coverage(5). This is in agreement with Aquilino and Caplan who did a retrospective cohort study on the restoration of endodontically treated teeth. They concluded that endodontic treated teeth without crowns were lost at a 6.0 times greater rate than teeth with crowns when tooth type and the presence of caries at access were controlled. Second molars and teeth with caries at the time of access also were lost at a greater rate. The number of proximal contacts at access was significantly associated with survival. Teeth with 2 proximal contacts had better survival estimates than teeth with 0 or 1 proximal contact.(6)

In this case the tooth was the second molar and with a temporary crown after 1 year. It had no proximal contacts. According to the study above this data may influence the outcome in my case. Despite the lack of approximal support , periodontal and successful endodontic treatment point to a favourable prognosis for this tooth.

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Endodontic retreatment of a mandibular left first molar with a separated instrument.

Introduction

A 68-year- old Caucasian female

Fig. 1 Frontal view.

Chief complaint

Non-contributory.

Medical history

Non-contributory.

Dental history

The patient was referred to the specialist clinic for treatment of the mandibular left first molar. The tooth was previously endodontically treated with separated instrument in mesial root. The treatment plan was non-surgical endodontic treatment, post and porcelain fused to metal crown.

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Figure 2- Intraoral view

Tooth	35	36	37
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	3 mm	4 mm	4 mm

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Dental:

Tooth 37: MODB amalgam restoration.
Tooth 36: Temporary crown.
Tooth 35: Porcelain fused to metal crown.

Radiographic findings:

Figure 3 - Preoperative radiograph of the mandibular left first molar

March 16th 2010

Tooth 35: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Normal bone level.
Tooth 36: Discontinued lamina dura . Apical radiolucency on distal root. PAI 3. Radiopaque material in the root canal and coronal area. Normal bone level. Fractured instrument in mesial root.
Tooth 37: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Normal bone level.

Diagnosis

Tooth 36:

Pulpal: Previously endodontically treated tooth (K04.19).

Apical: Within normal limits.

Marginal: Within normal limits.

Problem list

Not being able to move the instrument.

Weakening of the mesial root when trying to remove the fractured instrument.

Treatment plan

Tooth 36: Non-surgical endodontic treatment.

Treatment

March 16th 2010

Clinical examination. 1.8 ml Septocaine®. Removal of the temporary crown and IRM. Build- up in composite as a temporary restoration. Rubber dam. Preparation of mesiolingual canal to the separated instrument by a modified Gates Glidden bur. Because of lack of time, the canals were not instrumented in this session. The mesiolingual canal was dried with sterile paper points and filled with Ca(OH)2. An IRM filling was placed on top.

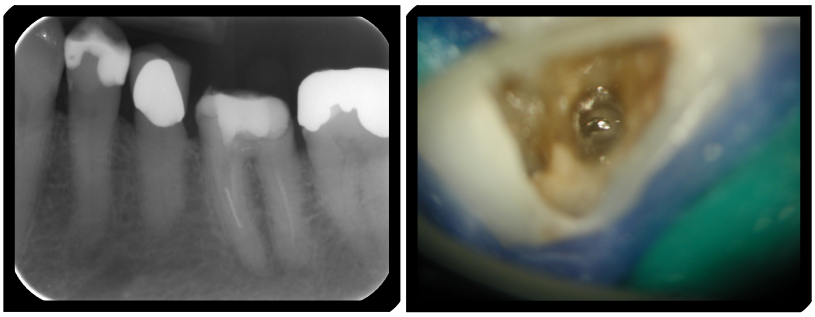

Figure 4 and 5 showing radiographic image and photo of the broken instrument through the dental microscope

March 23rd 2010

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. Localized 3 canals. Fractured instrument was removed with the use of the ultrasonic vibration with a tip K-25 and the IRS system. Gutta-percha removed with the use of Gates Glidden burs and Hedstroms files in conjunction with small amounts of chloroform. The working length was determined with electronic apex locator and radiographic image.

Three canals :

MB canal R:40/16mm
ML canal R:40/18mm
D canal R:55/18mm

Chemical irrigation with 1% NaOCl, 17% EDTA and 2% CHX. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

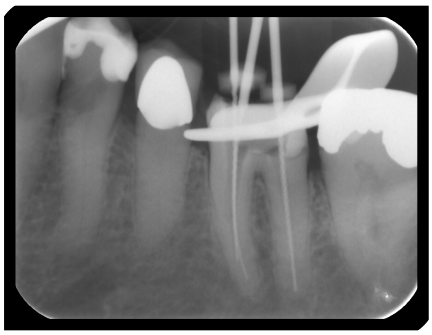

Figure 6 -Working length radiograph.

April 15th 2010

The patient was asymptomatic. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with gutta-percha and AH- plus sealer. IRM as a temporary filling.

Figure 7 - Master point

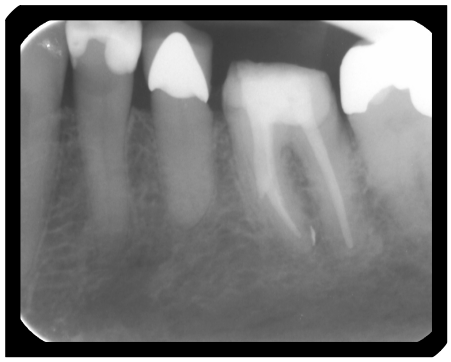

Figure 8 - Final radiograph

Results

Figure 9 - Before treatment

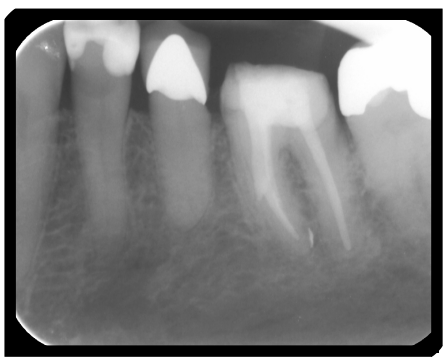

Figure 10 - After treatment

Evaluation

No complications during the treatment. The root filling seems dense and good. Extrusion of root canal sealer apical from the mesial root.

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination:

Six months later

Marginal gap

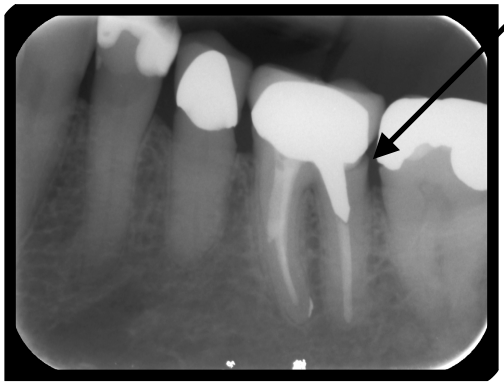

Figure 11 - Follow-up radiograph showing tooth 36 with a post and porcelain fused to metal crown .Normal lamina dura.

Two years recall after the treatment : Normal lamina dura. Patient was asymptomatic. PAI 1. A new crown has been made .

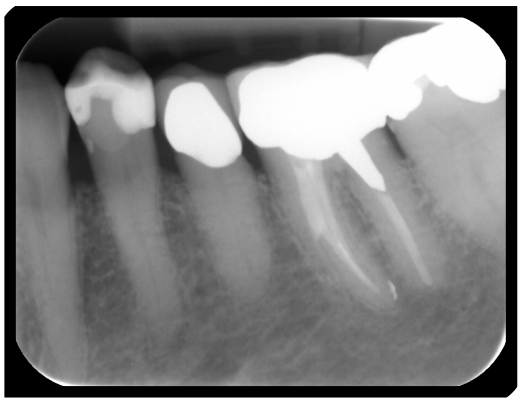

Figure 12 - Follow-up radiograph two year after treatment.

Discussion

When an instrument separates during treatment, the best option is to remove it, if possible. Only then the canal can be negotiated, cleaned and shaped optimally.

The incidence in the literature for instrument separation of stainless steel hand instruments has been reported between 2-6 % (1,2). Nickel-titanium endodontic instruments were introduced to facilitate instrumentation of curved canals. Nickel-titanium instruments are superelastic and will flex far more than stainless-steel instruments before exceeding their elastic limit. This flexibility is an important property that allows preparation of curved canals while minimizing transportation. Nickel-titanium instruments can unexpected give broken instruments, especially with rotary instruments. Rotary nickel-titanium instruments have an incidence of separation that is 2-7 times higher than with hand instruments (3). A review of the literature done by Parashos et al. reveal that the mean prevalence of retained fractured endodontic hand instruments (mostly stainless steel files) is approximately 1.6%, with a range of 0.7 to 7.4%. The mean clinical fracture frequency of rotary NiTi instruments is approximately 1.0% with a range of 0.4 to 3.7%. According to Parashos et al. based on the best available clinical evidence, the frequency of fracture of rotary NiTi instruments may actually be lower than that for stainless steel hand files.(4) The primary cause of instrument separation has been attributed to torsional and fatigue failure. Torsional fracture occurs when the tip or any part of the instrument is locked in a canal while the shaft continues to rotate; the instrument exceeds the elastic limit of the metal and shows plastic deformation followed by fracture. Cyclic fatigue can occure when the instrument is freely rotated in a curved canal. At the point of curvature, the instrument flexes until fracture occurs at the point of maximum flexure. It is generally believed that this mode of failure is an important factor in the fracture of nickel-titanium rotary instruments used clinically (5). According to Grossman (6), the prognosis of teeth with remaining fragments mainly depends on the preoperative condition of the periapical tissue. Crump and Natkin found that in most instances a broken file does not have an adverse effect on tooth prognosis(7). Suter et al. found that a decrease in success rate was evident with increasing treatment time. In this study, they were able to remove 87% of the fractured instruments.

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Endodontic retreatment of a maxillary left second premolar

Introduction

A 71-year- old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Rheumatoid arthritis

Psoriasis

Dental history

The patient was referred to the specialist clinic for treatment of the maxillary left second premolar. The tooth was previously endodontically treated with a post in the root canal. The treatment plan was to remove the post followed by a non-surgical endodontic treatment, post and porcelain fused to metal bridge from 23-26 .

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	23	25	26
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	3 mm	3 mm	3 mm
EPT	33	80	ND

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Figure 3- Intraoral view

Dental:

Tooth 23: Normal.
Tooth 24: Missing.
Tooth 25: Composite MODBP restoration.
Tooth 26: Porcelain fused to metal crown.
Tooth 27: Metal crown.

Radiographic findings:

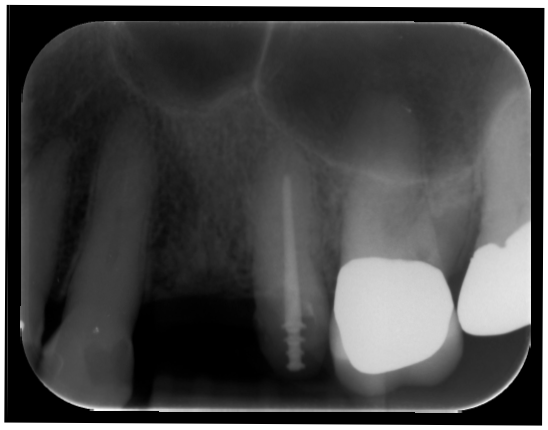

Figure 4 - Preoperative radiograph

April 14th 2010

Tooth 23: Normal lamina dura. PAI 1. Radiopaque coronal restoration.
Normal bone level.
Tooth 25: Normal lamina dura. PAI 1 . Radiopaque coronal restoration.
Root canal was filled with a radiopaque filling.
Normal bone level.
Tooth 26: Normal lamina dura. PAI 1. Radiopaque coronal restoration.
Normal bone level.

Diagnosis

Tooth 25:

Pulpal : Necrotic pulp (K04.1).

Apical: Within normal limits.

Marginal: Within normal limits.

Problem list

Remove dental post.

Remaining dentin structure.

Treatment plan

Tooth 25: Non surgical endodontic treatment.

Treatment

April 14th 2010

Clinical examination. Anaesthesia with 1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. A Sybronendo CT4 ® ultrasonic tip was used with water coolant in continuously movement around the post until it was removed. The working length was determined with electronic apex locator and radiographic image. Preparation of the canal with Protaper rotary files and hand files.

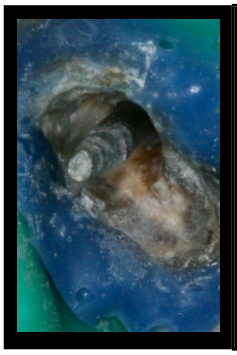

Figure 6 - Photo of the post in the canal

Figure 7 - Photo of the post after removal

Figure 5 -Working length radiograph.

One canal :

Canal R:50/15.5 mm

Chemical irrigation with 1% NaOCL and 17% EDTA.
The canal was dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM .

April 28th 2010

The patient was asymptomatic. 1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canal was dried with sterile paper points. The obliteration was performed with warm vertical compaction of gutta-percha with AH- plus sealer (continuous wave of obturation technique). IRM as a temporary filling.

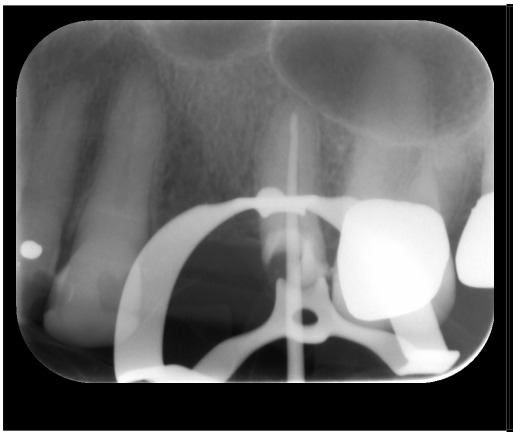

Figure 8 - Master point

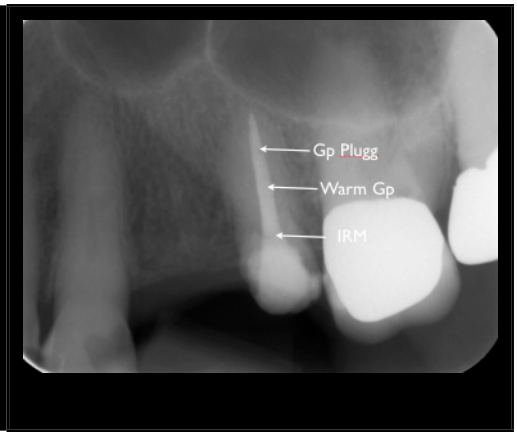

Figure 9 - Final radiograph

Results

Evaluation

No complications during the treatment. The root filling seems dense and good .

Prognosis

Endodontic: Good.
Tooth: Good .

Follow-up examination: One year after treatment. The patient was free of symptoms. Tooth 25 with a post and metal-ceram bridge. Normal lamina dura. PAI 1.

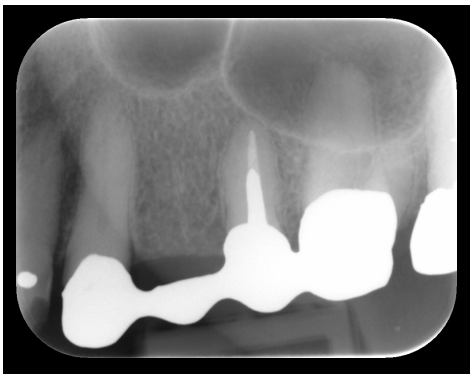

Figure 10 - Follow-up radiograph.

Discussion

Removing a post in order to gain access to the root canal system and still leaving a restorable tooth is no easy task. There are many factors that influence post removal such as operator judgement, training, experience, and choice of technologies and techniques.(2)The degree of difficulty will vary according to the post type (cast or prefabricated), design (conical or parallel, flat or serrated), post length and cementing agent (zinc phosphate, zinc polycarboxylate, glass ionomer or resin cements)(4) The use of ultrasonics has been suggested by some authors to facilitate post removal, reducing the possibility of fractures or root perforations(5) Ultrasonic vibration transfers intense mechanical waves to the cementing layer between the metallic post and the root canal walls, dislodging the post as a result(6). Gomes et al. studied the influence of ultrasonics on the removal of cast posts cemented with three different agents zinc phosphate cement, glass ionomer cement and resin cement. Their conclusion was that ultrasonic vibration reduced the retention provided by zinc phosphate and glass ionomer cements by 39% and 33%, respectively, but had no influence on the retention of cast posts cemented with resin cement.(4) When ultrasonic procedures are performed, especially at higher energy levels for longer periods and against larger and more conductive posts, heat is generated (7). Eriksson et al. found in their study of implant heating in rabbit bone that 47° C for 1 minute was the threshold for bone survival. At this threshold, fatty necrosis of bone occurred without regeneration (8). Risk of thermal injury to the surrounding periodontium and bone is potentially minimized when ultrasonic instruments are used with irrigation (9). In a study by Horan et al. they found that with irrigation the external root surface was maintained near baseline temperature in most samples, no significant relationship was found between temperature increase and dentin thickness during ultrasonic activation of cemented posts(10).

In this case it was used an ultrasonic instrument with irrigation around the post circumferentially until the cementing layer broke down .The post was dislodged successfully.

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Endodontic treatment and perforation repair of a mandibular right second molar

Introduction

A 31-year- old Caucasian male

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

The patient was referred from student clinic UIO to the specialist clinic for treatment of tooth 47 due to strip perforation and perforation lingual of the mesial root. The tooth had been instrumented and the canals were filled with Ca(OH)2 and temporary sealed with IRM .

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Lingual lesion in region 47.

Fig 2- Intraoral view

Tooth	45	46	47
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	Normal	Normal	Normal
EPT	23	80	23

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Dental:

Tooth 45: Composite OD restoration.

Tooth 46: Composite OD restoration.

Tooth 47: Composite MO restoration
IRM occlusal

Fig 3- Intraoral view

Radiographic findings:

Figure 4 - Preoperative radiograph of the mandibular right second molar

March 4th 2010

Tooth 45: Normal lamina dura. PAI 1 . Radiopaque coronal restoration. Normal bone level
Tooth 46: Normal lamina dura. PAI 1 . Radiopaque coronal restoration. Normal bone level.
Tooth 47: Normal lamina dura. PAI 2 . Radiopaque coronal restoration. Radiolucency in the middle third of the mesial root. Normal bone level

Diagnosis

Tooth 47:

Pulpal : Necrotic pulp (K04.1)

Apical: Within normal limits

Marginal: Within normal limits (K05.3)

Problem list

Perforation

Treatment plan

Tooth 47: Non-surgical endodontic treatment of the tooth 47 and repair of perforation

Treatment

September 9th 2010

Clinical examination. 1.8 ml Septocaine® Preparation of the access cavity. Rubber dam. Localized 2 canals and two perforations in mesial root. The lingual and strip perforation was sealed with grey MTA (Angelus, Brazil).

-Figure 7 - Periapical radiograph of the perforation

Figure 7 - After placement of MTA in the perforation

Figure 8 - Working length radiograph.

The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Bio Race and hand files.

Two canals :

M canal R:45/18.5mm
D canal R:60/18mm

Chemical irrigation with 1% NaOCL and 17% EDTA.
The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM

October 14th 2010

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl, and 17% EDTA. The canals were dried with sterile paper points and the distal canal was filled with gutta-percha and AH-plus sealer. In the mesial canal the MTA was used in the whole length of the canal. IRM as a temporary filling.

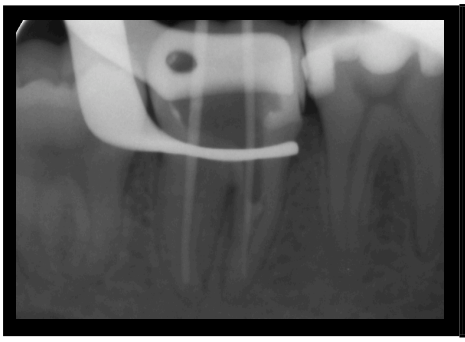


Figure 9 - Master point

Figure 10 - Final radiograph

Results

Evaluation

The root filling seems dense and good. Patient was asymptomatic.

Prognosis

Endodontic: Good.

Tooth: Uncertain .

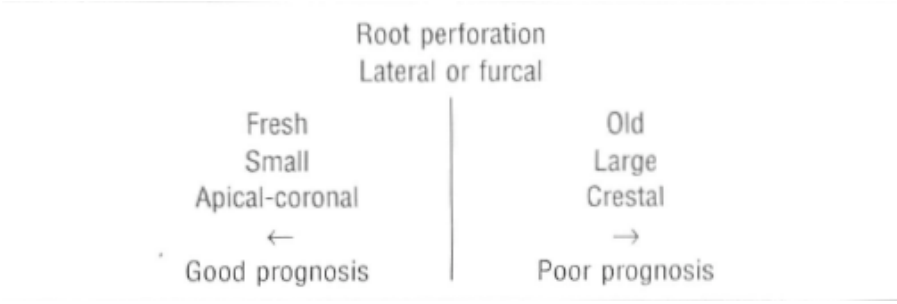
Follow-up examination: Two years later. Periapical radiograph showed normal lamina dura. PAI 1. Pocket depth 3 mm. Patient had no symptoms.

Figure-11 - Follow-up radiograph .

Discussion

Root perforations are common complications of endodontic treatment or post preparation and often lead to tooth extraction (5). Iatrogenic root perforations occur in approximately 2% to 12% of endodontically treated teeth(4). Different procedures that may lead to perforations such as access opening, search for orifice, excessive dentin removal in the danger zone, misdirected files during canal negotiation, unsuccessful attempts to bypass separated instruments and misaligned instruments during post-space preparation(1-3). Prognosis is depending on the prevention or treatment of bacterial infection of the perforation site. The most important of which are: time between occurrence and treatment, size, and location of the perforation. In addition, the use of a non-irritating material which seals the perforation will limit periodontal inflammation. Fuss Z. and Trope M. classified root perforations according to prognostic factors (5).

Classification of root perforations according to factors which affect prognosis. To the left of the horizontal line are predictors suggestive of a good prognosis while to the right are factors suggestive of a poor prognosis



Fuss Z, Trope M Endod Dent Traumatol 1996: 12: 255–264.1

Different materials have been used to seal perforations but mineral trioxide aggregate (MTA) has received particular attention as a perforation repair material. MTA is composed of calcium, silica, and bismuth. It has a long setting time, high pH, and low compressive strength. It possesses some antibacterial and antifungal properties, depending on its powder-to-liquid ratio(7). MTA provides an effective seal of root perforations and shows promise in improving the prognosis of perforated teeth that would otherwise be compromised (6).

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Endodontic treatment of a mandibular left first molar

Introduction

A 78 year old Caucasian male

Figure 1 - Frontal view

Chief complaint

Non-contributory.

Medical history

Rheumatism, Psoriasis , artificial hips (10 years ago).

Medical use : Albyl -E (0.75mgx1), Betnovat (Psoriasis cream).

Dental history

Referred from the dental student clinic, UiO, to the Department of Endodontics, UiO, for examination and treatment of mandibular left first molar.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	35	36	37
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	4 mm	4mm	4mm
EPT	40	80	60

Table 1 - Clinical findings.

Soft tissue: The gingival margin was retracted.

Dental:

Tooth 35: OD amalgam filling.

Tooth 36: Occlusal caries

Tooth 37: MODB amalgam filling

Fig 3- Intraoral view

Radiographic findings:

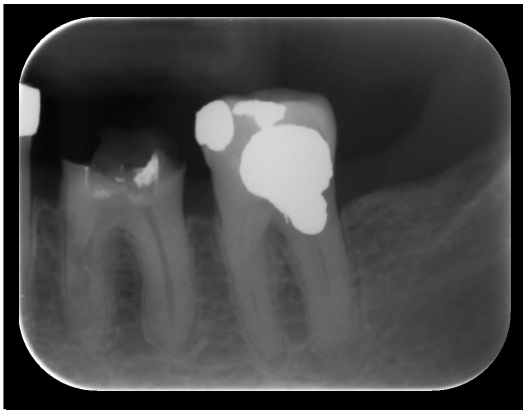

Figure 4 - Preoperative radiograph .

February 10th 2010

Tooth 35: Normal lamina dura. PAI 2 . Radiopaque coronal restoration.
Reduced bone level.
Tooth 36: Widened lamina dura. PAI 3. Periapical radiolucency.
Radiolucency middle third of the mesial root .
Radiopaque coronal restoration.
Reduced bone level
Tooth 37: Widened lamina dura. PAI 3 . Periapical radiolucency
Radiopaque coronal restoration.
Reduced bone level

Diagnosis

Tooth 36:

Pulpal : Necrotic (K04.01).

Tooth: Pathological resorption of tooth (K03.3).

Apical: Chronic apical periodontitis (K04.5).

Marginal: Chronic periodontitis (K05.3).

Problem list

Cervical tooth resorption.

Loss of tooth substans.

Treatment plan

February 18th 2010

Tooth 36: Extraction of the tooth was no alternative for the patient. He wanted to keep the distal root.

Non-surgical treatment of the distal root of tooth 36.

Root resection of mesial root due to excessive destruction of the root.

Treatment

Clinical examination. 1.8 ml Septocaine®. Composite build up. Preparation of the access cavity. Rubber dam. Localized 2 canals in the distal root. The working length was determined with electronic apex locater and radiographic image. Preparation of the canals with Bio Race and hand files.

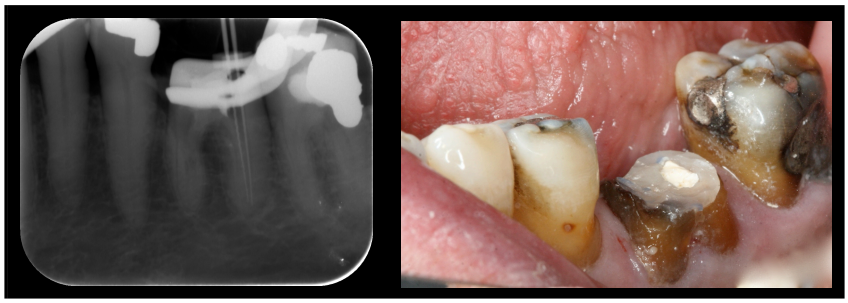

Figure 5 -Working length radiograph.

Figure 6- Intraoral view after composite build-up .

Two canals :

DB canal R:50/15mm

DL canal R:50/15mm

Chemical irrigation with 1% NaOCL and 17% EDTA. The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

February 25th 2010

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points. AH Plus was applied to the canal walls. The obliteration was performed with warm vertical compaction of gutta-percha. SybronEndo Elements Obturation Unit® in conjunction with Buchanan hand pluggers were used. IRM as a temporary filling. Hemisection of mesial root.

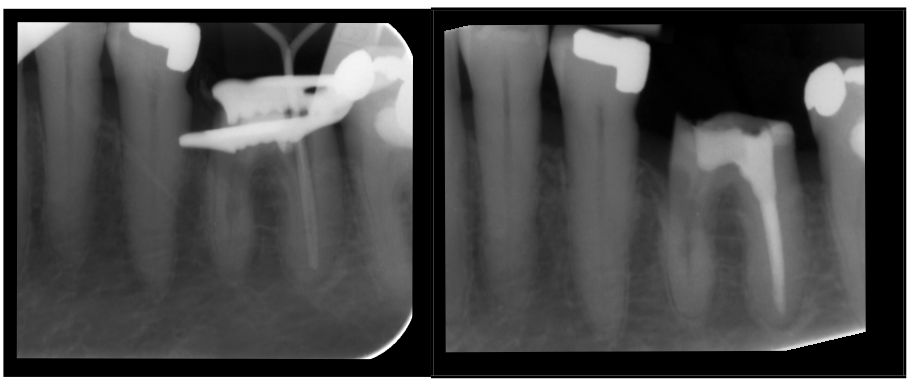

Figure 7 - Master point

Figure 8 - Final radiograph

After the hemisection of the mesial root

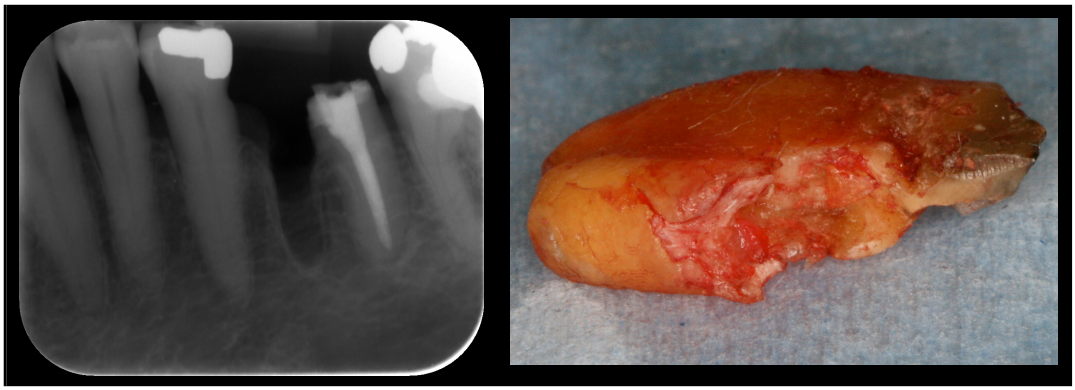

Figure 9- Periapical radiograph after hemisection

Photo 10- Resected mesial root.

Results

Evaluation

The patient was asymptomatic. The root filling seems dense and good .

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination: Two years later. Follow-up radiograph showing tooth 36 distally root with a porcelain fused to metal crown. Normal lamina dura. PAI 1. Patient was asymptomatic.

Figure 11 - Periapical radiograph at follow-up examination.

Discussion

In this case the mesial root had an excessive destruction of the mesial root due to the invasive external root resorption. According to Heithersay´s classification of invasive external root resorption, this was a class 4: A large invasive resorptive process that has extended beyond the coronal third of the root canal. In Heithersay´s study the success rate in class 4 lesions was only 12.5% .(1) According to Buhler, hemisection is a relatively simple, inexpensive treatment with a good chance of success (given appropriate case selection). It should always be considered as an option before molar extraction.(2)Published literature has demonstrated an adequate prognosis for hemisected teeth. Bergenholtz et al (3). reported a failure rate of 7% in a study with follow up to 1-7 years and the study by Carnevale et al. of 10 years duration, the incidens of failure was 7%. (4). Langer (5) and Buhler (6)on the other hand reported less favorable 10 year outcome.of root resection therapy with a failure rate of 38% and 32%.

In this case the periapical, periodontal and prosthetic conditions appear favorable for long-term prognosis.

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Endodontic treatment of mandibular left first molar in conjunction with surgery repair of cervical root resorption

Introduction

A 33-year- old Caucasian female.

Figure 1 - Frontal view.

Chief complaint

Pain to cold drinks.

Medical history

Non-contributory.

Dental history

The patient was referred to Department of Endodontics for examination of mandibular left first molar and possible cervical resorption.

Clinical findings

Figure 2 -Occlusal view

Figure 3 - Buccal view. Gingival pocket.

Extra-oral examination:

Non-contributory.

Intra-oral examination:

No visible “pink spot” tooth 36. Communications from the oral cavity to cervical root resorption. Good oral hygiene.

Tooth	35	36	37
Cold	+	+	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	3 mm	5mm	3mm
EPT	43	46	43

Table 1 - Clinical findings.

Soft tissue: within normal limits .

Dental:

Tooth 34 :Intact tooth
Tooth 35: Intact tooth
Tooth 36: Intact crown, buccal resorption lesion.
Tooth 37: Intact tooth

Radiographic findings:

Figure 4 - Preoperative radiograph of tooth 36.

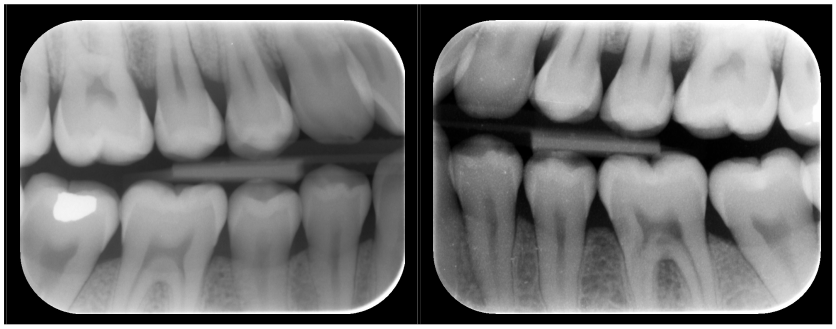


Figure 5 -Bite-wing radiographs

September 20th 2010

Tooth 35: Normal lamina dura. PAI 1 .
Normal bone level.
Tooth 36 :Normal lamina dura. PAI 1 .
Normal bone level. Radiolucent area in the cervical part of the tooth.
Tooth 37: Normal lamina dura. PAI 1 .
Normal bone level.

Diagnosis

Tooth 36:

Tooth: Cervical root resorption (K03.3).
Pulpal : Within normal limits.
Apical: Within normal limits.
Marginal: Within normal limits.

Problem list

Extend of the cervical resorption.

Treatment plan

Patient was informed about the severity of the cervical resorption and the reduced prognosis. Patient was willing to try the treatment for keeping the tooth as long as possible.

Tooth 36: Non- surgical endodontic treatment in conjunction with surgery repair of cervical root resorption.

Treatment

November 10th 2010

Clinical examination. Tooth 36 diagnosed with cervical root resorption. Communication on buccal side of the tooth between the oral cavity and the resorption. Referral to Cone Beam CT of tooth 36.

November 25th 2010

Cone Beam CT showed extensive resorption in the cervical area of tooth 36. The tooth had an uncertain prognosis. The patient was informed. Patient was willing to try the treatment that was planned.

Figure 6 -CBCT scan showing buccal resorption tooth 36

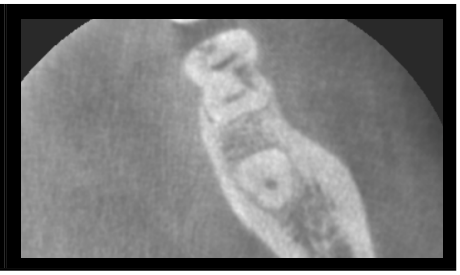


Figure 7 -CBCT scan showing buccal and mesial resorption tooth 36

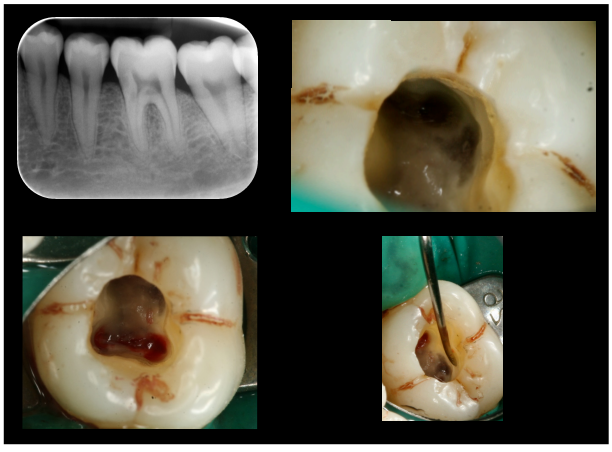


Figure 8 -Radiograph and photo of the resorption.

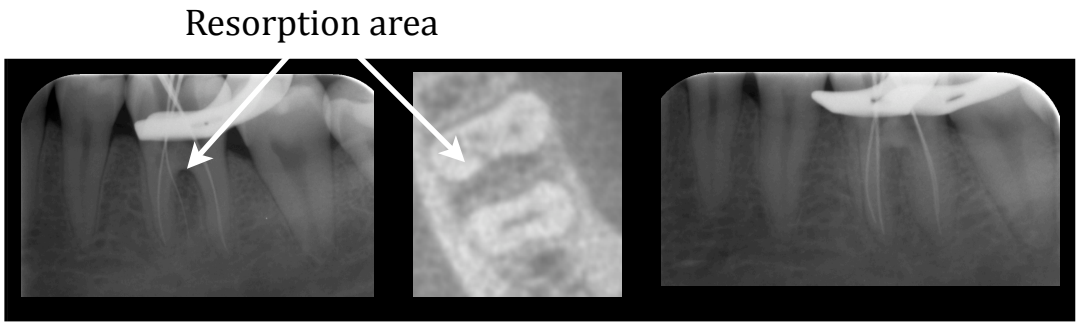


Figure 9 -Working length radiograph with perforation due to resorption in the lingual canal.

Figure 10 -CBCT scan showing resorption in the lingual canal.

Figure 11 -Working length radiograph.

1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. Localized 4 canals. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Bio Race and hand files. During working length determination we discovered a perforation in ML canal due to resorption.

Four canals :

MB canal R:40/20mm
ML canal R:40/19mm
DB canal R:50/20.5mm
DL canal R:50/20mm

Chemical irrigation with 1% NaOCl and 17% EDTA.

The canal was dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

December 1st 2010

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and 3 of the canals were filled with Resilon and Epiphany sealer. ML canal was filled with MTA due to the perforation in the canal. Wet pellet in the pulp chamber and IRM as a temporary filling.

Figure 12 -Master point radiograph.

Figure 13 - MTA in the mesiolingual canal.

Figure 14 -Final radiograph.

February 8th 2011

Removal of the granulation tissue and resorption lacunae in the mesial aspect of the tooth.

Figure 15 -Radiograph after removal of granulation tissue (Gp in the former resorption lacunae for indication of depth).

March 16th 2011

Surgery repair

1.8 ml Septocaine®. Marginal incision 33 M-38M. Mobilization of the flap revealed a large resorption defect on the mesiobuccal aspect of the distale root. Osteotomy, removal of cervical lesion on the buccal surface of tooth 36. Stryphnon gauze and ferric sulfate for hemorrhage control. A composite filling was applied. (35% phosphoric acid, Adper™ Scotchbond™, Filtek™ Z250 A2). The filling was polished. The operation site was inspected and rinsed with sterile saline. Suturing with five 5-0 sutures. Post-operative instructions.

Figure 16 -Photo before, during and after removal of buccal resorption.

Follow-up examination: One week later after surgery Suture removal.
No discomfort after surgery.

Figure 17 -Final radiograph

Results

Evaluation

Cervical composite filling appears satisfying. The root filling seems dense and good.

Prognosis

Endodontic: Uncertain.

Tooth: Uncertain.

Follow-up examination: One and a half year later.
Furcation defect. Asymptomatic. Periodontal probing depth of 5 mm on the buccal surface of tooth.

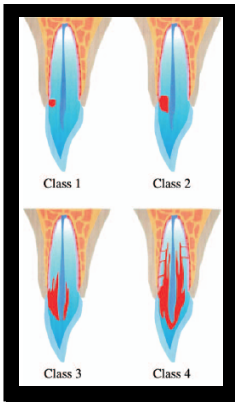
Figure 18 -Follow up radiograph.

Figure 19 -Follow up radiograph.

Discussion

Root resorption is the loss of hard dental tissue (ie. cementum and dentine) as a result of odontoclastic action (1). Invasive cervical resorption (cervical resorption) is a relatively uncommon form of external root resorption. It is characterized by its subepithelial location and invasive nature, sometimes presenting a pink discoloration (pink spot) of the tooths´ clinical crown (3).

The underlying pathogenesis of invasive cervical resorption is poorly understood. In an article by Fuss et al. they describe that in a cervical root resorption, infection originates from the periodontal sulcus and stimulates the pathological process. As adequate infection control in the sulcus is unlikely, removal of granulation tissue from the resorption lacuna and sealing are necessary for repair (2). The histologic appearance of the resorption site is characterized by highly vascular fibrous tissue with multinucleated osteoclastic cells along the dentinal surface. The infective microorganisms are seldom found in such tissues. It is unclear whether the nature of this process is solely inflammatory (4,5). Several potential predisposing factors have been identified. Heithersay investigated the potential predisposing factors in 257 invasive cervical resorption lesions in 222 patients. He concluded that a history of orthodontic treatment, dental trauma or bleaching were the most commonly associated predisposing factors(7). He developed a clinical classification (4 classes) according to the severity of the resorption.



Class 1 –Denotes a small invasive resorptive lesion near the cervical area with shallow penetration into dentine.

Class 2 – Denotes a well-defined invasive resorptive lesion that has penetrated close to the coronal pulp chamber but shows little or no extension into the radicular dentine.

Class 3 – Denotes a deeper invasion of dentine by resorbing tissue, not only involving the coronal dentine but also extending into the coronal third of the root.

Class 4 – Denotes a large invasive resorptive process that has extended beyond the coronal third of the root.

Overall success rate for class 3 : 77.8 %

Overall success rate for class 4 : 12.5 %

Radiological appearance: The radiographic appearance generally shows an irregular mottled or 'moth-eaten' image in the main lesion area and the outline of the root canal can be seen as a radiopaque line demarcating the root canal from the adjacent irregular radiolucency, the latter being indicative of resorbing tissue (7).

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Multiple cervical root resorptions

Introduction

A 44-year- old Caucasian male

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

1980's: The patient went through orthodontic treatment at the Department of Orthodontics, Faculty of Dentistry, UiO.
2007- 2009: Previously history of multiple cervical resorptions. Teeth 11, 21,23 and 13 have been endodontically treated due to cervical resorptions at the specialist clinic, Department of Endodontics. Teeth 16 and 26 have cervical resorption, but no treatment was initiated. Observation of tooth 16 and 26 was based on the likelihood that the teeth would be severely compromised if treated. There was also no communication between the oral cavity and the resorption, and the teeth were asymptomatic. It was detected new development of cervical resorption in 2009. The patient was referred to the specialist clinic for examination and treatment of tooth 33.

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	32	33	34
Cold	+	+	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	3 mm	4mm	3mm
EPT	28	27	28

Table 1 - Clinical findings.

Soft tissue: Soft tissue: within normal limits.

Dental:

Tooth 33 :Communication between the oral cavity and the cervical resorption.
Tooth 34: Intact tooth.
Tooth 35: Intact tooth.
Tooth 36: Intact tooth.

Radiographic findings:

Previously.

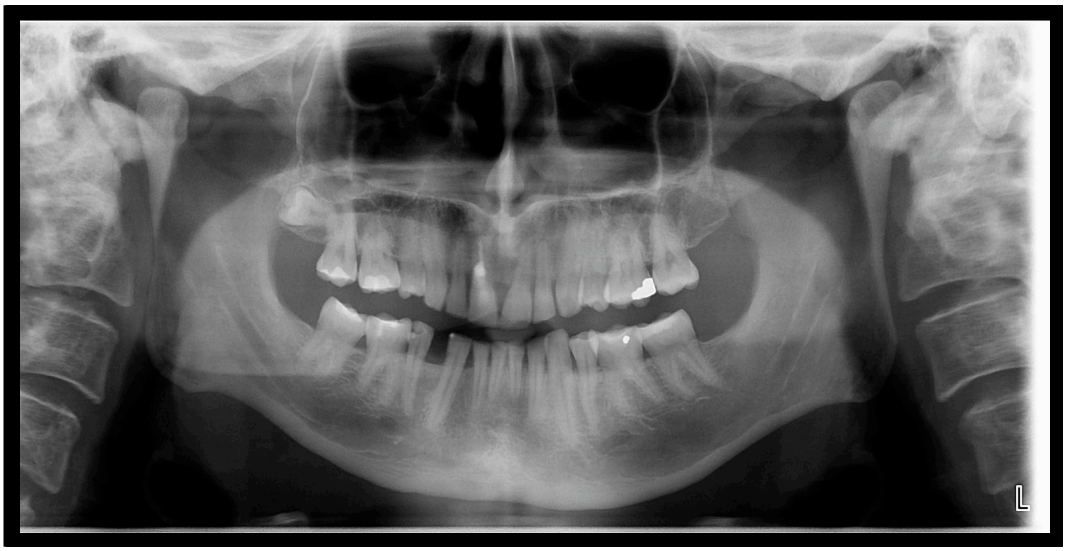

Figure 2 - OPG radiograph year 2009

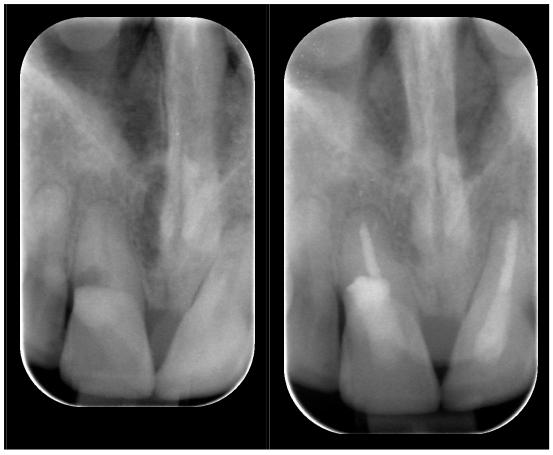

Figure 3- Periapical radiographs before treatment year 2007

Figure 4 - Periapical radiographs after treatment year 2009

Teeth 11 and 21. Endodontically treated teeth. Normal lamina dura. No apical radiolucency. PAI 1. Reduced marginal bone level .

Figure 5 - Periapical radiographs before treatment year 2007

Figure 6 - Periapical radiographs after treatment year 2009

Figure 7 - Periapical radiographs before treatment year 2007

Figure 8 - Periapical radiographs after treatment year 2009

Teeth 13 and 23. Endodontically treated teeth. Normal lamina dura. No apical radiolucency. PAI 1. Marginal bone level was within normal limits.

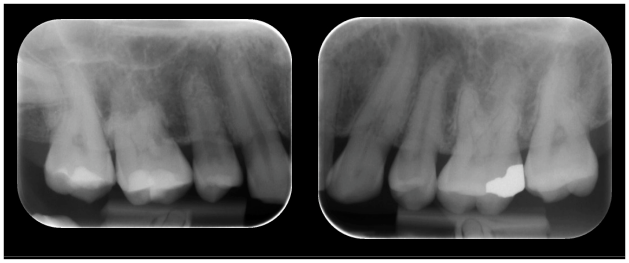

Figure 9 - Periapical radiographs year 2010

Figure 10 - Periapical radiographs year 2010

Teeth 16 and 26: No change since examination June 2008. No communications from the oral cavity to cervical root resorptions teeth 16 and 26 could be found.

Radiographic findings: 2010 tooth 33
May 26th 2010

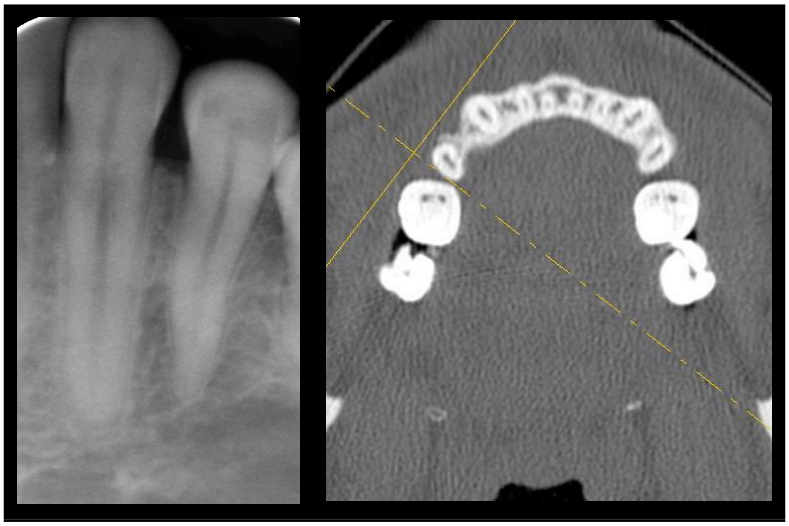

Figure 12 - Periapical radiographs.

Figure 13- Axial CT-image in the CEJ of mandibular teeth.

Tooth 32: Normal lamina dura. PAI 1 .
Normal bone level.
Tooth 33 :Normal lamina dura. PAI 1 .
Normal bone level. Radiolucent area in the cervical area which.is extending apically for the enamel-cement junction of the tooth
Tooth 34: Normal lamina dura. PAI 1 .
Normal bone level

Diagnosis

Figure 14 - Buccal view.

Figure 14 - Lingual view.

Tooth 33:

Tooth: Cervical root resorption (K03.3).

Pulpal : Within normal limits.

Apical: Within normal limits.

Marginal: Within normal limits.

Problem list

Extend of the cervical resorption. According to Heithersay´s classification this was a class 3

Treatment plan

Tooth 33: Non surgical endodontic treatment and surgery repair.

Treatment

May 26th 2010

Clinical examination. Tooth 33 diagnosed with cervical root resorption on the lingual aspect. Communication between the oral cavity and the resorption, and the tooth was asymptomatic. 1.8 ml Septocaine® Preparation of the access cavity. Rubber dam. Located 1 canal. The working length was determined with electronic apex locater and radiographic image. Preparation of the canal with Protaper rotary system and hand files .

One canal :

Canal R:60/24mm

Chemical irrigation with 1% NaOCL and 17% EDTA. The canal was dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM

June 02th 2010

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling.The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and the canals were filled with Resilon and Epiphany sealer. A temporary IRM filling was applied.

Figure 15 -Working length radiograph.

Figure 16 - Masterpoint radiograph.

Figure 17 -Final radiograph before surgery.

November 17th 2010

Surgery repair.

1.8 ml Septocaine®. Marginal incision 31 M-37M. Mobilization.of the flap revealed a resorption defect on the lingual aspect of the root. Osteotomy. With the use of round bur the resorptive tissue was removed. Stryphnon gauze and ferric sulfate for hemorrhage control. A composite filling was applied. (35% phosphoric acid, Adper™ Scotchbond™, Filtek™ Z250 A2). The filling was polished. The operation site was inspected and rinsed with sterile saline. Repositioned the flap and sutured 5 sutures. Postoperative information.

Figure 18 -After mobilizing of the flap. Resorption defect .

Figure 19 - Composite filling.

Figure 20 -Final radiograph after surgery.

Results

Evaluation

The root filling seems dense and good. Cervical composite filling appears satisfying. No complications during treatment . Patient was asymptomatic.

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination: One week later after surgery.

Figure 21 -Postoperative photo one week later before suture removal

Figure 22 -Postoperative photo one week later after suture removal

Follow-up examination: One and two years after surgery. Normal lamina dura. PAI 1. Patient was asymptomatic. Teeth 11,21,13,23,16 and 26 unchanged since examination in 2010.

Figure 23 -Periapical radiograph at follow-up examination one year later.

Figure 24 -Follow-up photo one year later.

Figure 25 -Periapical radiograph at follow-up examination two years later.

Discussion

It appears that all types of dental resorption share common cellular mechanisms. Resorption of teeth results from the activation of clastic cells, termed odontoclasts, which are morphologically similar, if not identical, to osteoclasts(1,2). Certain features of dental resorption appear to be common to all the different types. Over recent years, there have been significant advances in the understanding of osteoclast differentiation and activation. The osteoclasts represent a syncytium of stimulated macrophage progenitor cells. This stimulation is under the control of the RANK-RANKL OPG system (receptor activator of nuclear factor κβ and receptor activator of nuclear factor ligand and OPG =Osteo-protegerin). It serves as an on-off system for osteoclast activity, where downregulation of OPG system and upregulation of new osteclasts and the opposite regulation may downregulate osteoclastic activity(5).

Treatment prognosis depends mainly on the extent of the resorptive process (6). The literature describes several treatment options for solving this pathologic process (7, 8). The extent of resorption serves as a guide for the clinician in selecting the correct treatment, also on the basis of the patient's esthetic needs and demands.

The choice of a restorative filling for.the cavity remaining would differ according to the recommendation for each specific case. Glass ionomer cement, composite resin, amalgam, and mineral trioxide aggregate (MTA) have been suggested as possible restoratives.(4) This recommendation is based on the position of the remaining resorption cavity. If it is supragingival, the material needs to be restorative, aesthetic, and functional; if it remains subgingival and supra-osseous, the glass ionomer may be indicated. When the resorption lacunae remain sub-osseous, the most appropriate material will be the MTA.

Based on the very small number of cases reported to date, generalized cervical root resorption does not appear to demonstrate any gender, age, familial or ethnic predilection, and most commonly is not associated with any systemic condition (9)

In this case it was used composite filling due to subgingival and supra-osseous lesion. According to Heithersay´s study the success rate in class 3 lesions were 75%. In this case the prognosis seems favorable.

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Orofacial pain

Introduction

A 71-year-old Caucasian female

Figure 1 - Frontal view

Medical history

Epilepsy and hypertension Uses Albyl-E, Persantin, Lamictal and Simvastatin.

Dental history and chief complaint

The patient was referred to the specialist clinic for evaluation and possible treatment of chronic orofacial pain related to the upper right central and lateral incisor (tooth 11 and 12) and upper right first molar (tooth 16). The problems started in January 2009 after endodontic treatment of teeth 11 and 12 and crowns 11, 12, 16 and 17 due to trauma after epileptic fall. Duration of pain was two years.

Figure 3 - Occlusal view region 14-17 and lower jaw.

Figure 4 - Occlusal view upper jaw.

Clinical findings

Extra-oral examination:
Non-contributory.

Intra-oral examination:
Non-contributory.

Tooth	11	12	13	16
Cold	-	-	+	+
Percussion	+	+	-	+
Palpation	+	+	+	+
Mobility	Normal	Normal	Normal	Normal
PPD	Normal	Normal	Normal	Normal
EPT	ND	ND	24	ND

Table 1 - Clinical findings.

Soft tissue: within normal limits.

Dental:

Tooth 11: Porcelain fused to metal crown.
Tooth 12: Porcelain fused to metal crown
Tooth 14: Composite MOD restoration.
Tooth 15: Normal.
Tooth 16: Porcelain fused to metal crown.
Tooth 17: Porcelain fused to metal crown.

Radiographic findings:

November 24th 2010

Tooth 11 and 12: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Root canals were filled with a radiopaque filling material. Normal bone level.
Tooth 14: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Normal bone level.
Tooth 15: Normal lamina dura. PAI 1. Normal bone level.
Tooth 16 and 17: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Normal bone level.

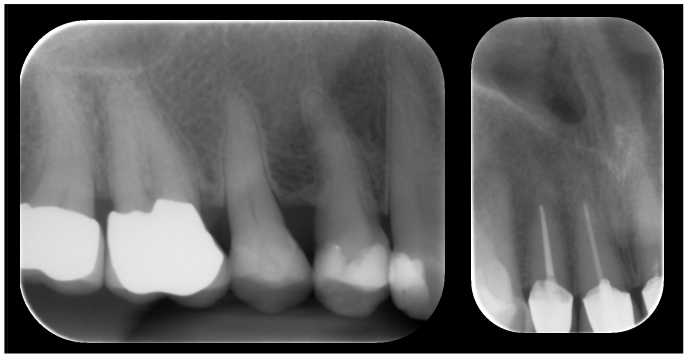

Figure 5 - Preoperative radiograph of teeth 14-17.

Figure 6 - Periapical radiograph of teeth 11 and 12.

November 24th 2010

Clinical examination: Positive ice-test teeth 14-17. Some tenderness to percussion on teeth 11, 12 and 16. Tenderness to palpation buccal to teeth 11-17. Clicking sounds in the temporomandibular joints on both sides when opening and closing the mouth. Normal ability to open or close the mouth. No pain to palpation of the muscles of mastication.
The patient described the pain as a pulsation. Pain persisted during most of the day, and it did not keep her awake during nighttime. Normal radiographic findings.

Diagnosis

Tooth 11 and 12:

Pulpal : Previously endodontically treated tooth (K04.19).
Apical: Within normal limits.
Marginal: Within normal limits.

Tooth 16 :

Pulpal : Within normal limits.
Apical: Within normal limits.
Marginal: Within normal limits.

Problem list

Possible persistent idiopathic facial pain.

Treatment plan

Observation.

Treatment

March 31st 2011

Clinical examination. Intensive pain with stimulation of cold on tooth 16. Lingering pain for several minutes after ended stimulation of cold. Previously described pain was unchanged.

Diagnosis

Tooth 16:

Pulpal :Irreversible pulpitis (K04.0).
Apical: Within normal limits.
Marginal: Within normal limits.

Treatment

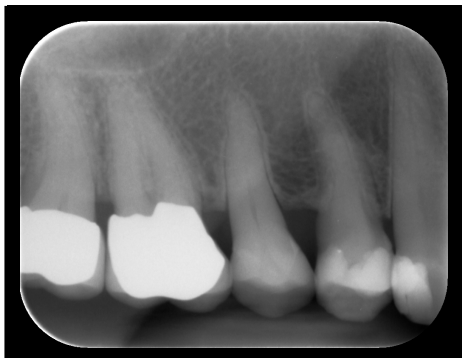

Figure 7-Preoperative radiograph.

1.8 ml Septocaine®. Preparation of the access cavity. Rubber dam. Localised 4 canals. The working length was determined with electronic apex locator and radiographic image. Preparation of the canals with Protaper rotary files and hand files.

Four canals :

MB canal R:40/18.5 mm
MB2 canal R:40/15 mm
DB canal R:50/18 mm
P canal R:50/21mm

Chemical irrigation with 1% NaOCL and 17% EDTA.
The canals were dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

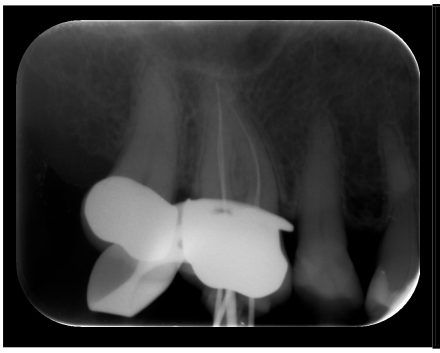

Figure 8 -Working length radiograph.

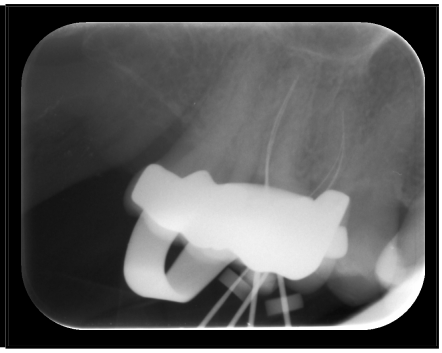

Figure 9 -Working length radiograph.

May 19th 2011

Asymptomatic tooth 16, but still pain in regio 11 and 12. 1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl and 17% EDTA. The canals were dried with sterile paper points and filled with gutta-percha and AH-plus sealer. IRM as a temporary filling.

Figure 10 - Master point

Figure 11 - Final radiograph

Results

Evaluation

No complications during the treatment. The root filling seems dense and good. Patient still has the same dull pain, but she has not the intensive pain with stimulation of cold.

Prognosis

Endodontic: Good.
Tooth: Good.

Follow-up examination: Six months later.

Tenderness to percussion, tooth 11,12 and 16.
Tenderness to palpation, regio 11-17.
The pain in upper jaw in the region 11 and 12 is the most severe. Recommended referral to a pain clinic through her general practitioner.

Figure 12 - Follow-up radiograph Normal lamina dura.

Discussion

Diagnosis is by far the most difficult aspect of managing a patient's pain problem(6). Atypical odontalgia (AO) is defined by the International Headache Society (IHS) as a subgroup of persistent idiopathic facial pain, also including atypical facial pain (AFP). AO and AFP share the definition of persistent facial pain that does not have the characteristics of the cranial neuralgias and is not attributed to another disorder (2). AO is a continuous pain in the teeth or in a tooth socket after extraction in the absence of any identifiable cause (at least six months duration) (1). Neuropathic pains are commonly reported as a burning sensation and may be associated with other neurologic symptoms, such as burning, hyperalgesia, paresthesia, and even sometimes anesthesia (6). When neuropathic pain conditions become more chronic, they can present with additional clinical signs and symptoms such as extreme allodynia, tissue erythema, temperature and trophic changes and swelling(6). AO is usually thought of as being a rare disorder. It has been estimated to occur in 3–6% of patients undergoing endodontic treatments (3,4). Most of the accepted management of these conditions is based on expert opinion and case reports. Of the few randomized controlled trials, one of the treatment of AO comparing local anesthesia versus a placebo of normal saline showed some but not complete pain relief with the anesthetic (7). Randomized controlled trials performed with AO patients have not been performed systematically and this makes it very difficult to make an evidence-based treatment decision(5).

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Endodontic treatment in conjunction with apical surgery of a maxillary right canine

Introduction

A 64-year- old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory.

Medical history

Hypertension, asthma and allergy to penicillin.
Use Albyl-E 75 mg x 1 per day.

Dental history

The patient was referred from the Department of Periodontology for a non-surgical endodontic treatment of the maxillary right canine.

Clinical findings

Figure 2 - Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	11	12	13
Cold	+	+	-
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	6 mm	6mm	6mm

Table 1 - Clinical findings.

Soft tissue: The gingival margin was retracted .

Dental:

Tooth 11: Abutment in a metal-ceramic bridge.

Tooth 12: Abutment in a metal-ceramic bridge.

Tooth 13: Abutment in a metal-ceramic bridge.

Incisal IRM filling.

Radiographic findings:

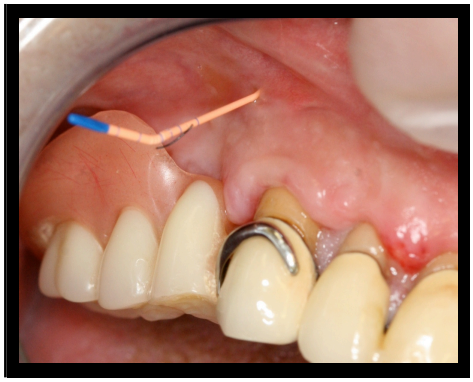

Figure 3 - Preoperative photo of the tooth 13 with a gutta-percha point in the sinus tract.

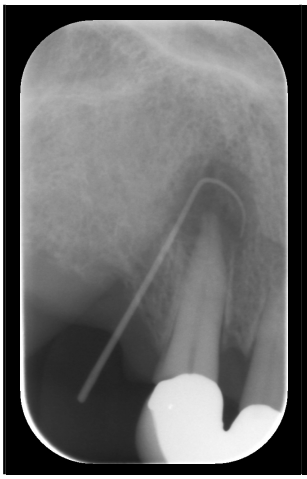

Figure 4 - Preoperative radiograph . The sinus tract originate from tooth 13.

Figure 5 - Preoperative radiograph of the tooth 13.

November 19th 2009

Tooth 12: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Reduced bone level.
Tooth 13 :Discontinued lamina dura. Apical radiolucency. PAI 4. Radiopaque coronal restoration. Reduced bone level.

Diagnosis

Tooth 13:

Pulpal : Necrotic (K04.01).

Apical: Periapical abscess with sinus tract (K04.6).

Marginal: Chronic periodontitis (K05.3).

Problem list

Persisting infection .

Treatment plan

Tooth 13: Non surgical endodontic treatment.

Treatment

February 9th 2010

Clinical examination. 1.8 ml Septocaine®. Preparation of the access cavity ,removed the caries lesion inside the crown. Rubber dam. Localized 1 canal.

The working length was determined with electronic apex locator and radiographic image. Preparation of the canal with Protaper rotary files and hand files.

Canal R:60/24.5mm.

Chemical irrigation with 1% NaOCl and 17% EDTA. Used ultrasonic vibration during irrigation (Irrisafe tip).

The canal was dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

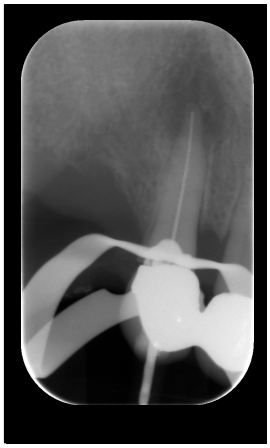

Figure 6 -Working length radiograph.

February 23th 2010

Persisting sinus tract.

Rubber dam.Chemical irrigation with 1% NaOCl and 17% EDTA. Used ultrasonic vibration during irrigation (Irrisafe tip). The canal was dried with sterile paper points, filled with Ca(OH)2 and temporary sealed with IRM.

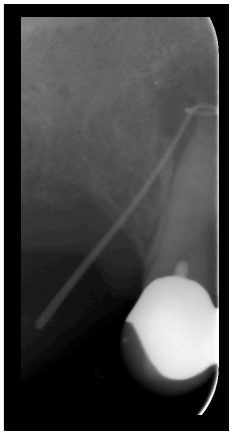

Figure 6 - Persisting sinus tract.

April 20th 2010

Figure 7 - Persisting sinus tract

Figure 8 - Master point

The patient was asymptomatic but the sinus tract persisted. After informing the patient about the prognosis ,it was decided to finish the root filling and perform an apicoectomy on tooth 13.

1.8 ml Septocaine®. Rubber dam. Removal of the IRM filling. The Ca(OH)2 was removed using hand files and irrigation with 1% NaOCl, and 17% EDTA. The canals were dried with sterile paper points and filled with gutta-percha and AH-plus sealer. IRM as a temporary filling.

Figure 9 -After root canal filling.

Figure 10 - Final radiograph.

Results

Evaluation

Persisting sinus tract. The root filling seems dense and good, but because of a persisting sinus tract, an apical surgery was planned.

Prognosis

Endodontic: Uncertain.

Tooth: Good .

September 30th 2010

1.8 ml Septocaine®. Marginal incision 15 -22M with a vertical releasing incision 15. Mobilised the flap and located the lesion. It was a pathological fenestration in the bone. Osteotomy. Curettage of granulation tissue. Root-end resection and retrograde preparation with ultrasonic instruments. A retrograde filling of white MTA was applied. The root was inspected under a dental operating microscope, but no fractures were found. Six sutures.

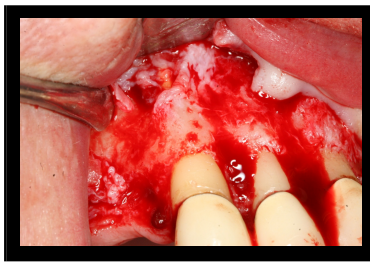

Figure 11 -Elevated flap. Notice the apical fenestration .

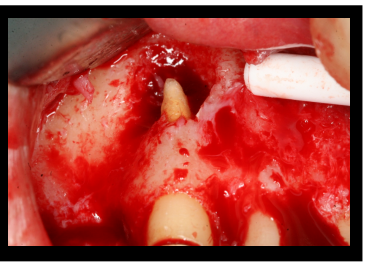

Figure 12 -Osteotomy.

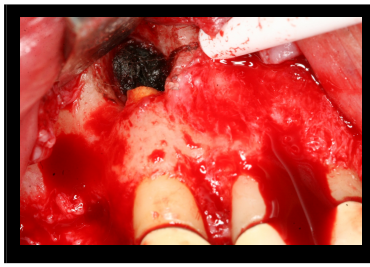

Figure 13 -Apical root resection (3 mm).

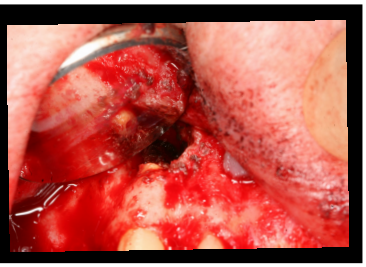

Figure 14 -Retrograde preparation.

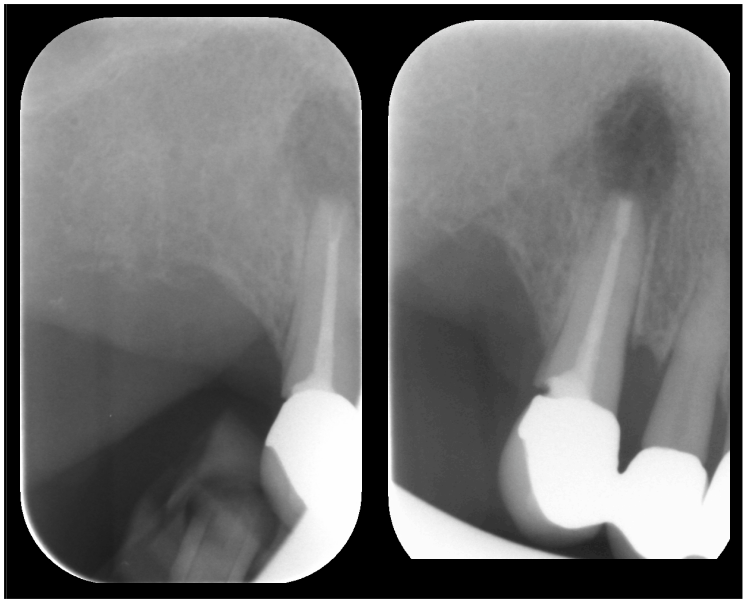

Figure 15 -Retrograde preparation.

Figure 16 -Retrograde filling.

Follow-up examination: One week later after surgery .

Figure 17 -One week later before suture removal.

Suture removal. The patient was asymptomatic and the sinus tract had closed. Recommended the patient a new bridge since tooth substance in the crown of the abutment had been lost due caries .

Results

Evaluation

The persisting sinus tract had closed. The retrograde filling seems dense and good .

Prognosis

Endodontic: Good.

Tooth: Good .

Follow-up examination: One year after surgery. The periapical radiograph showed healing. Patient still had a temporary filling .

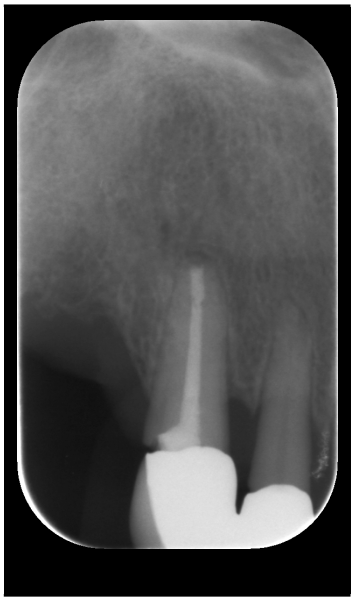

Figure 18 - Final radiograph

Discussion

Persistent endodontic infections are caused by microorganisms that participate in a primary or secondary infection and that persist in the canal after antimicrobial treatment. Secondary infections are caused by microorganisms that were not present in the primary infection, but that were introduced in the root canal at some time after professional intervention(1). In this case we had a persisting infection with fistula. We also have other biological factors that lead to asymptomatic radiolucencies persisting after root canal treatment such as extraradicular infection, generally in the form of periapical actinomycosis, extruded root canal filling or other exogenous materials that cause a foreign body reaction, accumulation of endogenous cholesterol crystals that irritate periapical tissues, true cystic lesions and scar tissue healing of the lesion(2). Actinomyces species are normal inhabitants of the oral cavity, but they have been reported to cause endodontic infections.(3,4). Actinomyces species have also been found in association with unhealed periapical lesions (2,5). Apical actinomycosis, which is caused by Actinomyces species or P. propionicum, has been claimed to be a form of extraradicular infection independent of the intraradicular infection in the sense that even if the treatment succeeds in eradicating intraradicular bacteria, the lesion may not heal because the causative agents are already beyond the reaches of intracanal procedures (6,7,). However, clear direct evidence is lacking as to whether or not apical actinomycosis actually comprises an independent form of extraradicular infection (8).

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Apical surgery of a maxillary right lateral

Introduction

A 24-year- old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

The patient was referred to the specialist clinic for treatment of the maxillary right lateral. Previously endodontically treated tooth in year 2009 at the Department of Endodontics, UIO. Persisting apical infection of maxillary right lateral.

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Fig 2- Frontal view

Tooth	11	12	13
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	3 mm	3mm	3mm
EPT	24	80	26

Table 1 - Clinical findings.

Soft tissue: Within normal limits

Dental:

Tooth 13: Normal

Tooth 12: Composite filling MDPB

Tooth 11: Composite filling MD

Radiographic findings:

Figure 3 - Preoperative radiograph of tooth 12 before root canal treatment in year 2009.

Figure 4 -Recall radiograph of tooth 12 in year 2011 .

Figure 5 -Recall radiograph of tooth 12 in year 2012.

February 15th 2012

Tooth 11: Normal lamina dura. PAI 2 . Radiopaque coronal restoration.
Normal bone level.

Tooth 12: Discontinued lamina dura. Periapical radiolucency. PAI 5 .
Radiopaque coronal restoration.
Root canals were filled with a radiopaque filling .
Normal bone level.

Tooth 13: Normal lamina dura. PAI 1 .
Normal bone level.

Diagnosis

Tooth 12:

Pulpal : Previously endodontically treated tooth (K04.19).

Apical: Chronic apical periodontitis (K04.5).

Marginal: Within normal limits.

Problem list

Gingival recession.

Treatment plan

Tooth 12: Surgical endodontic treatment.

Treatment

Clinical examination. 3x1.8 ml Septocaine®. Submarginal incision 11D-23d with a vertical releasing incision 23D. Elevation of the mucoperiostal flap and located the lesion. It was a pathological fenestration in the bone . Osteotomy. Curettage of granulation tissue. Biopsy . Root-end resection and retrograde preparation with ultrasonic instruments. A retrograde filling of white MTA was applied. The operation site was inspected and rinsed with sterile saline Suturing with seven 5.0 Supramid sutures. Post operative instructions.

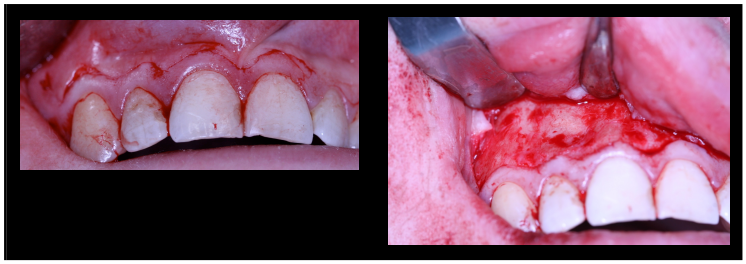

Figure 6 - Photo after submarginal incision

Figure 7 - Photo after elevation of the flap

Figure 8 - After the osteotomy.

Figure 9 - Biopsy

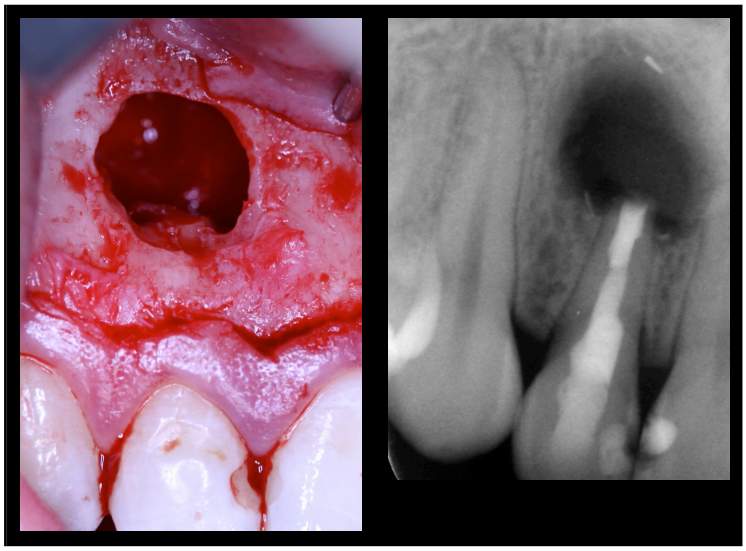

Figure 10 - Root-end resection and preparation

Figure 11 - Post treatment radiograph

Follow-up examination: One week after surgery.

Suture removal. Good soft tissue wound healing. Patient had experienced some discomfort after the surgery. The patient was asymptomatic now. Patient had bruises under her right eye and on the right side of her face after the apicoectomy.

Figure 12 - Follow up photo before suture removal.

Results

Evaluation.

Biopsy diagnosis : Radicular cyst.

The retrograde filling seems dense and good . No complications during treatment .

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination: Two weeks after surgery. Patient was asymptomatic and the bruises had disappeared. Good soft tissue wound healing.

Figure 13 - Follow up photo two weeks after surgery.

Discussion

The surgical flap design is variable and depends on a number of factors. These include the size of the periradicular lesion, periodontal status, state of coronal tooth structure, the nature and extent of coronal restorations and operator's choice. The submarginal flap design, also referred to as an Ochsenbein–Luebke flap, was suggested (Luebke 1974) to prevent marginal recession of gingiva. This incision is made within the attached gingiva parallel to the marginal contour of the gingiva(1). The submarginal incision should only be used when there is a broad zone of attached gingiva with a minimum of 2mm (2). In addition, the underlying apical lesion or surgical bony access must not extend to the flap margins. This flap design has the advantage of leaving the marginal gingiva untouched and it does not expose any restoration margins . Possible scar tissue formation is a disadvantage of the submarginal flap(3). Von Arx et al. found that the type of incision had a significant (P = 0.0013) influence on scar formation; that is, submarginal incisions and papilla-saving incisions produced more scarring than intrasulcular and papilla-base incisions(4).

Von Arx et al. did a study in 2009 about gingival recession 1 year following apical surgery of 70 maxillary anterior teeth (central and lateral incisors, canines, and first premolars). The submarginal incision showed considerably less gingival recession compared with the intrasulcular incision, papilla-base incision or papilla-saving incision(5).

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Apical surgery of a maxillary right first premolar

Introduction

A 68-year- old Caucasian female

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

Referred from her general dentist to the Department of Endodontics, UiO, for examination and treatment of the maxillary right first premolar.

Clinical findings

Fig 2- Occlusal view

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	14	15	16
Cold	-	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	4 mm	4mm	4mm

Table 1 - Clinical findings.

Soft tissue: Retracted gingiva on tooth 14,15 and 16

Dental:

Tooth 14: Porcelain fused to metal crown.

Tooth 15: Composite filling MODPB

Tooth 16: Composite filling MODPB

Radiographic findings:

Tooth 14: Discontinued lamina dura. Periapical radiolucency. PAI 4 . Radiopaque coronal restoration. Root canals were filled with a radiopaque filling. Posts in the canals. Normal bone level.

Tooth 15: Normal lamina dura. PAI 1 . Radiopaque coronal restoration. Root canal were filled with a radiopaque filling . Normal bone level.

Tooth 16: Normal lamina dura. PAI 1 . Root canals were filled with a radiopaque filling Normal bone level

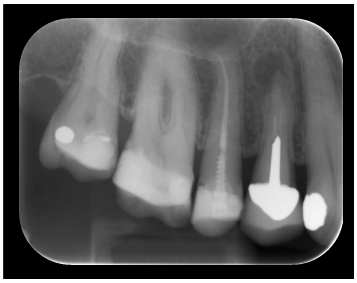

Figure 3 -Preoperative radiograph of tooth 14

Diagnosis

Tooth 14:

Pulpal: Previously endodontically treated tooth (K04.19).

Apical: Chronic apical periodontitis (K04.5).

Marginal: Within normal limits.

Problem list

Vertical root fracture .

Treatment plan

Surgical treatment of the tooth 14.

Treatment

Clinical examination. 3x1.8 ml Septocaine®. Marginal incision 13M-16d with a vertical releasing incision 13M. Elevation of the mucoperiostal flap and located the lesion. It was a pathological fenestration in the bone. Osteotomy. Curettage of granulation tissue. Root-end resection and retrograde preparation with ultrasonic instruments. A retrograde filling of white MTA was applied. The operation site was inspected and rinsed with sterile saline Suturing with seven 5.0 Supramid sutures. Post operative instructions

Figure 4 -Preoperative photo of the planned incision 13-16.

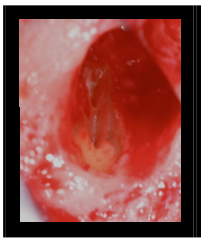

Figure 5 - Root-end resection and retrograde preparation

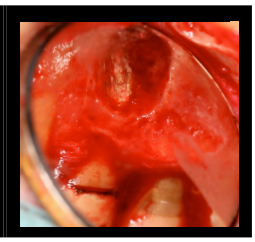

Figure 6 - Retrograde filling of white MTA

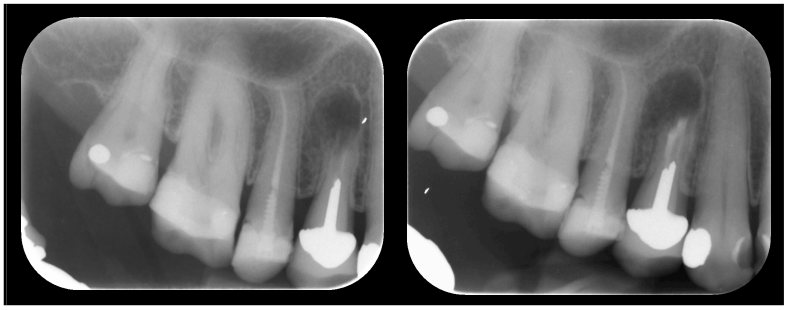

Figure 7 -Radiograph of root-end resection and preparation 14

Figure 8 - Postoperative radiograph of tooth 14

One week later

Suture removal. The patient was asymptomatic.

Figure 9 -Postoperative photo before suture removal

Results

Evaluation.

Biopsy diagnosis : Radicular cyst

The retrograde filling seems dense and good . No complications during treatment.

Prognosis

Endodontic: Good.

Tooth: Good.

Follow-up examination: One and two years after**.** The radiograph showed evidence of apical healing. Patient was asymptomatic.

Figure 10 - Follow-up radiograph one year recall.

Figure 11 -Follow-up radiograph two years recall

Discussion

The purpose of periapical surgery is to remove the periradicular inflammatory tissue and ensure adequate sealing of the apical foramen(1) The purpose of placing a root end filling material during periradicular surgery is intended to create a hermetic seal that prevents the egress of root canal contents into the periradicular tissue. (2)Root-end filling materials are in direct contact with the periapical tissues and for this reason, an ideal material should be biocompatible, impervious to dissolution or breakdown by the tissue fluids, nonresorbable, adapting as closely as possible to the dentinal walls of the root-end preparation and possess good handling characteristics (3)

In the study by Jerome A. H. Lindeboom et al. they were evaluating the clinical efficacy of MTA as a root-end filling material in comparison with IRM in a randomized prospective controlled study. Their conclusion after 1 year follow up was that as root-end filling materials in this clinical prospective randomized design on single rooted teeth, MTA and IRM had the same clinical effectiveness.(10)

MTA has in several leakage studies shown that this material provides a remarkable seal (6, 7) and a favorable biologic response (8, 9). MTA has previously been attributed with the unique potential to induce or attach to the newly regenerating periodontal ligament (8)

Some studies like Rapp et al. 1991 concluded that periapical bone healing was independent of the placement of a root-end filling after root-end resection(4). Other studies like R. Christiansen et al. 2008.preformed a randomized clinical trial of root-end resection followed by root-end filling with mineral trioxide aggregate or smoothing of the orthograde gutta-percha root filling – 1-year follow-up, concluded : Mineral trioxide aggregate was shown to be a successful root-end filling material with a healing rate of 96% evaluated 12 months post-operatively. Teeth treated with MTA had significantly better healing than teeth treated by smoothing of the orthograde GP root filling only (healing rate 52%)(5)

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Apical surgery of a mandibular right first molar

Introduction

A 44-year- old Caucasian male

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

The patient was referred to the specialist clinic for examination and treatment of the mandibular right first molar. The tooth had a crown and posts in the mesial and distal root.

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Tooth	45	46	47
Cold	-	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	5 mm	6mm	7mm

Table 1 - Clinical findings.

Soft tissue: Within normal limits

Dental:

Tooth 45 : Amalgam filling OD

Tooth 46: Porcelain fused to metal crown.

Tooth 47: Normal

Fig 2- Occlusal view

Radiographic findings:

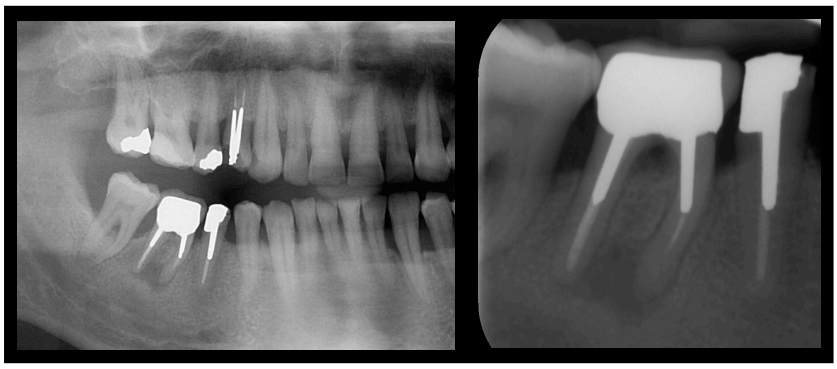

Figure 3 - OPG of the mandibular right first molar

Figure 4 - Radiograph of the mandibular right first molar

October 20th 2010

Tooth 45: Normal lamina dura. PAI 1. Radiopaque coronal restoration. Root canals were filled with a radiopaque filling. Reduced bone level.

Tooth 46: Discontinued lamina dura. Periapical radiolucency .PAI 4. Radiopaque coronal restoration. Root canals were filled with a radiopaque filling. Posts in the canals. Reduced bone level.

Tooth 47: Normal lamina dura. PAI 1 . Reduced bone level.

Diagnosis

Tooth 46:

Pulpal: Previously endodontically treated tooth (K04.19)

Apical: Chronic apical periodontitis (K04.5)

Marginal: Chronic marginal periodontitis (K05.3)

Problem list

Vertical root fracture.

Treatment plan

Surgical treatment of the tooth 46.

Treatment

Clinical examination. 3x1.8 ml Septocaine®. Marginal incision 43M-47d with a vertical releasing incision 43M. Elevation of the mucoperiostal flap and located the lesion. It was a pathological fenestration in the bone. Osteotomy. Curettage of granulation tissue. Root-end resection and retrograde preparation with ultrasonic instruments. A retrograde filling of white MTA was applied. The operation site was inspected and rinsed with sterile saline. Suturing with seven 5.0 Supramid sutures. Post operative information

Figure 5 - Photo of the mandibular right first molar. The incision is marked.

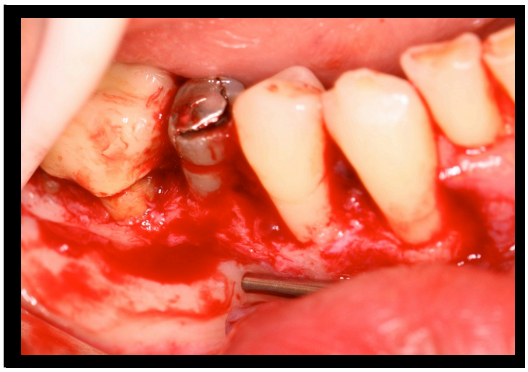

Figure 6 - Photo after elevating the flap

Figure 7 - Photo of the osteotomy

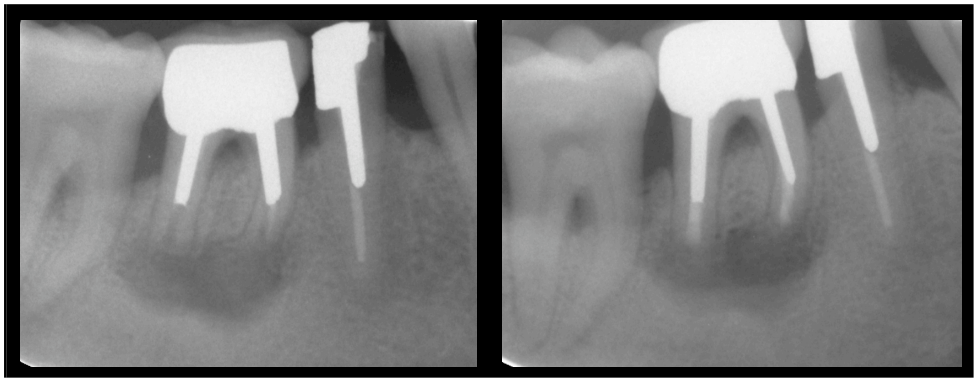

Figure 8 - Radiograph after retrograde preparation

Figure 9 - Postoperative radiograph

One week later Suture removal. The patient was asymptomatic.

Figure 10- Postoperative photo 1 week later.

Results

Evaluation.

The retrograde filling seems dense and good . No complications during treatment .

Prognosis

Endodontic: Good.

Tooth: Good .

Follow-up examination: One year later . Failure due to vertical root fracture. Patient was asymptomatic. PPD 10 mm mesial on tooth 46.

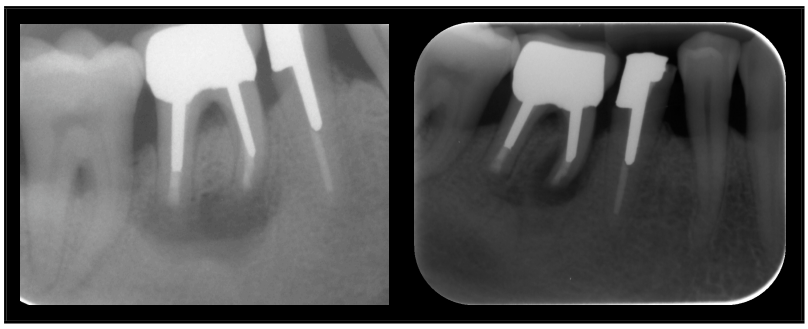

Figure 11 - Postoperative radiograph

Figure 12 - Periapical radiograph at follow-up examination

Figure 13 - Photo at follow-up examination 1 year after surgery.

Discussion

Periapical pathosis is treated either by non-surgical orthograde treatment or surgical treatment. When comparing nonsurgical endodontic retreatment with endodontic surgery with regards to long-term outcome, the literature showes varying results. One study by Torabinejad et al. performed a systematic review to compare the outcomes of nonsurgical and surgical endodontic retreatment. They concluded that while endodontic surgery demonstrates more favorable initial healing, this declines with increasing recall periods. Conversely, nonsurgical retreatment shows improved outcomes with increasing recall time(1). Kvist et al did a randomized clinical study comparing surgical and nonsurgical procedures. They failed to show any systematic difference in the outcome of surgical and nonsurgical endodontic retreatment. Surgical retreatment seems to result in more rapid periapical bone fill, but also may imply a higher risk of "late failures"(2).

A most frustrating complication to root canal therapy is vertical root fracture (VRF) in an endodontically treated tooth.(4)The VRF is a longitudinally oriented fracture of the root that originates from its apical end and propagates coronally (5). The prevalence of VRF leading to tooth

extraction is not well established. Reports from case series and follow-ups of patients treated with prosthetic reconstructions , and retrospective radiological studies suggest a prevalence of 2% and 5%. (4) In a study by Toure et al. the reasons for extraction due to vertical root fracture were as high as 13.4% and the mandibular molars were the most extracted teeth(6). Vertical fractures are usually associated with endodontically treated teeth(4). The most common signs of VRF are deep osseous defects especially on the buccal aspect of the susceptible teeth and roots, and highly located sinus tract (4,8). The most frequent radiographic features of VRF are the ''halo'' appearance, which is a combined periapical and perilateral radiolucency in one or both sides of the root, lateral periodontal radiolucency along the side of the root, or angular radiolucency from the crestal bone terminating along the root side(7).

The presence of two posts in the mesial root prohibited a conservative approach to treatment initially.

In this case a deep periodontal pocket was found at the clinical examination. A deep periodontal pocket and radiographic ''halo'' appearance is often a sign of VRF . Patient was advised to have the tooth extracted. Only with this treatment, the persisting infection can be eliminated

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Apical surgery of a maxillary right incisor

Introduction

A 29-year- old African female

Figure 1 - Frontal view

Chief complaint

Non-contributory

Medical history

Non-contributory

Dental history

Referred to the Department of Endodontics, UiO, from dental student clinic, UiO, for examination and treatment of maxillary right incisor. The tooth had recently been endodontic treated (non -surgical endodontic retreatment) . The tooth had a persisting sinus tract and a perforation buccal in the cervical area.

Clinical findings

Extra-oral examination:

Non-contributory.

Intra-oral examination:

Non-contributory.

Fig 2- Occlusal view

Tooth	11	21	22
Cold	+	-	+
Percussion	-	-	-
Palpation	-	-	-
Mobility	I	I	I
PPD	6 mm	7mm	6mm

Table 1 - Clinical findings.

Soft tissue: Gingival recession
Dental:

Tooth 11: Normal

Tooth 21: Temporary palatal filling

Tooth 22: Normal

Radiographic findings:

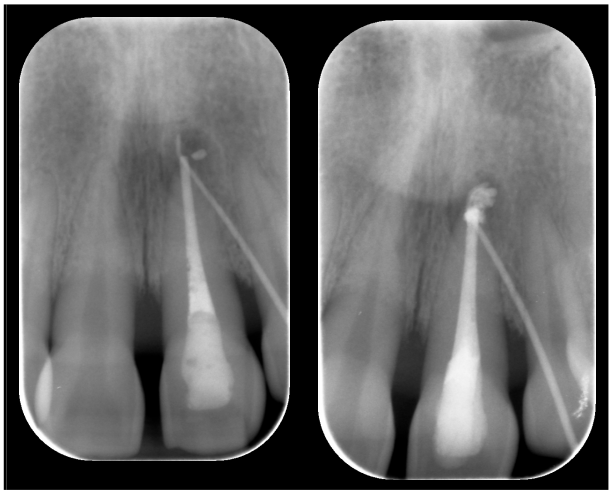

Figure 3 - Radiograph (fistelogram) of 21 before retreatment 20.10.2011

Figure 4 - Radiograph of 21 after retreatment . Persisting fistula. 12.01.2012

February 23th 2012

Tooth 11: Normal lamina dura. PAI 1 . Radiopaque coronal restoration.
Reduced bone level.

Tooth 21: Normal lamina dura. PAI 4 . Radiopaque coronal restoration.
Root canals were filled with a radiopaque filling. Extruded root fillings material apically.
Reduced bone level.

Tooth 22: Normal lamina dura. PAI 1 .
Reduced bone level.

Diagnosis

Tooth 21:

Pulpal: Previously endodontically treated tooth (K04.19).

Apical: Periapical abscess with sinus tract (K04.6).

Marginal: Chronic marginal periodontitis (K05.3).

Problem list

Reduced bone level and perforation.

Treatment plan

Apicoectomy on tooth 21 with a retrograde filling .

Closure of buccal perforation.

March 08th 2012

Treatment

Clinical examination. 3x1.8 ml Septocaine®. Marginal incision 12M-23D with a vertical releasing incision 23M. Elevation of the mucoperiostal flap and located the lesion. It was a pathological fenestration in the bone apically and root perforation in cervical region. Osteotomy. Curettage of granulation tissue. Root-end resection and retrograde preparation with ultrasonic instruments. A retrograde filling of white MTA was applied. Ferric sulfate for hemorrhage control. A composite filling was applied. (35% phosphoric acid, Adper™ Scotchbond™, Filtek™ Z250 A2). The filling was polished. The operation site was inspected and rinsed with sterile saline Suturing with seven 5.0 Supramid sutures. Post operative information

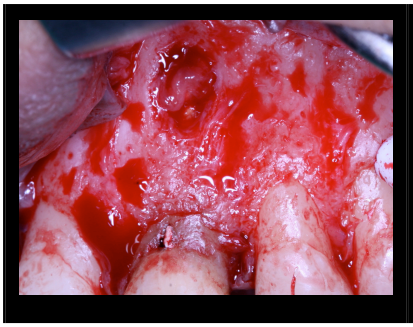

Figure 5 - Pathological fenestration of the cortical bone

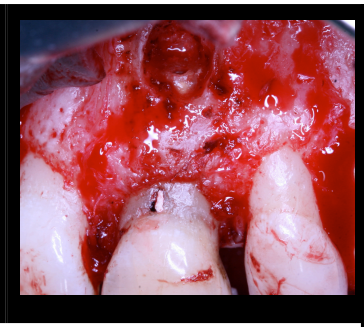

Figure 6 - Root-end resection

Figure 7 - Retrograde filling and composite in the perforation.

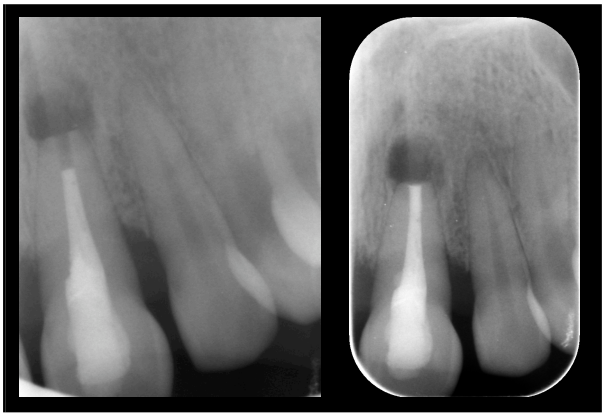

Figure 8 - Radiograph of root-end resection and preparation

Figure 9 - Post treatment radiograph

One week later

Suture removal. The patient was asymptomatic. Sinus tract had closed.

Figure 10-Wound healing one week after surgery

Results

Evaluation.

Biopsy diagnosis : Radicular cyst

The retrograde filling seems dense and good . No complications during treatment .

Prognosis

Endodontic: Good.

Tooth: Good.

Discussion

Extraradicular infections, cysts, and extruded filling materials that cause foreign-body reactions are factors that can adversely affect periapical healing after conventional endodontic retreatment(5**).**Inflammatory apical cysts are associated with endodontically involved teeth. They are believed to form by proliferation of the epithelial cell rests of Malassez in inflamed periradicular tissues. Periapical cysts are a direct sequel to chronic apical periodontitis, but not every chronic lesion develops into a cyst. Two types of inflammatory apical cysts have been described histologically .True cyst, those containing cavities completely enclosed in epithelial lining, and pocket cyst ,those containing epithelium-lined cavities that are open to the root canals. The latter was originally described as 'bay cysts' by Simon 1980 (1,3) .The reported incidence of radicular cysts among human periapical lesions varies from 6% to 55%. The actual incidence of the cysts may be well below 20%.(2). Nair et al. examined 256 periapical lesions and found that 9% of them were apical true cysts and 6% were apical pocket cysts (1)The prognosis of root canal treatment with apical periodontitis is 85-90% so most of the cystic lesions heal after endodontic treatment (4)

In this case we had a persisting apical peridontitis with a sinus tract after retreatment at the student clinic. It had also extruded filling materials apically. The iatrogentic perforation on the buccal site was over the bone crestal and small, which gave the tooth a good prognosis according Trope and Fuss (6)

References

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5. Sundqvist G, Figdor D, Persson S, Sjøgren. Microbiologic analysis of teeth with failed endodontic treatment and the outcome of conservative re-treatment. OOOOE 1998;85:86-93)

6. Fuss Z, Trope M.(1996) Root perforations: classification and treatment choices based on prognostic factors. Endod Dent Traumatol: 12: 255–264.