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Case Report

An interdisciplinary approach for management of an Endo-Perio Lesion in a necrotic Mandibular Second Molar with a type I Furcation Canal: A Case Report with a 6-month Follow-up

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Abstract

Introduction: Communications between endodontic and periodontal tissue may occur through apical foramen and lateral canals allowing bi-directional spread. Furcation canals are considered lateral canals found at the floor of the pulp chamber. Infected pulps may induce tissue destruction in adjoining periodontal tissues; apically and in the bifurcation area. Proper root canal shaping, disinfection as well as Furcation canals' identification and management are a true challenge.

Case Report: A 41-year-old male came to the department of Endodontics, Faculty of Dentistry, Cairo University complaining from pain in mandibular left second molar, Clinical and radiographic examinations revealed that there was a large carious lesion and bifurcation and peri-radicular bone resorption with a pocket draining pus. The mandibular left second molar was diagnosed to have a necrotic pulp and symptomatic apical periodontitis with secondary periodontal lesion involving large inter-radicular bone resorption. Scaling and root planning were done. Using a dental operating microscope identified a furcation canal upon access cavity; Canals were prepared with rotary NiTi MG3 blue and filled with CaOH. On the second visit NaOCl Irrigation was activated and canals were obturated by utilizing gutta-percha and bio-ceramic sealer. The furcation canal was sealed with Well-Root bio-ceramic Putty. After 10-week follow-up the patient was asymptomatic. Radiographic examination revealed bone deposition in inter-radicular region. At 6 months the tooth was pain free and functioning.

Conclusion: An interdisciplinary approach to treat endo-perio lesions is mandatory to ensure favorable outcomes. The presence of furcation canals has a notable impact on the prognosis of endodontic treatments. Proper root canal shaping, disinfection as well as identification of Furcation canals and their effective sealing are crucial steps in management of infection of endodontic origin and ensuring treatment success.

Keywords: furcation canals, endo-perio lesion, apical periodontitis, bio-ceramic putty.

Introduction

Pulp necrosis associated with periapical involvement could be a challenge for success of root canal treatment. Thus, the treatment should focus on ensuring chemo-mechanical debridement and proper obturation (**Ng et al 2011**). However, one of the factors that could lead to failure of root canal treatment is the presence of unsealed lateral canal or furcation communicating between pulp chamber or root canal and the periodontal tissues. **(Rotstein et al 2004).**

Furcation canals refer to lateral canals found either at the floor of the pulp chamber or on the upper part of a root canal in premolars and molars. These canals serve as natural communication pathways between the endodontic and periodontal tissues **(Seltzer et al 1963). They** can contribute to the development of inter-radicular lesions and endo-periodontal lesions **(Dammaschke et al 2004)**

The frequency of furcation canals in mandibular molars ranges from 2.8% **(wolf et al 2019) to** approximately 29.4% **(Gutmann et al 1978**). In cases where there is a solitary furcation canal, its opening or foramen is typically situated at the center of the floor of the pulp chamber (57.1%). However, it can also be found in a more mesial position on the pulp chamber floor (28.5%), and less commonly in a distal position (14.4%) **(Goldberg et al 1987).**

The prognosis of management of furcation canals is influenced by multiple factors, including its size, the protocol and material used in sealing it **(Anderegg et al 2022).** Furcation canals are not commonly observed during clinical examinations. However, their diameter may be large, measuring about 240 µm, and can be perceptible during clinical examination **(Perlich et al 1981). (Dammaschke et al 2004)**

Bio-ceramic cement can be used to seal unwanted communications between the pulp and periodontium, because they have high biocompatibility, strong antimicrobial, and the presence of calcium phosphate. Their capacity to generate hydroxyapatite during the setting process, resulting in a chemical link between dentin and the corresponding filling. **(Khandelwal et al 2022).**

Endo-perio lesions are challenging to diagnose and treat, causing variable prognosis. Inter radicular lesion and furcation involvement may decrease the success of the root canal treatment particularly in patients with periodontitis **(Herrera et al 2018).**

The purpose of this case report is to present conventional non-surgical management of an Endo-Perio Lesion in a Mandibular Second Molar with a necrotic pulp and a type I Furcation Canal.

Case presentation

This case report has been written according to Preferred Reporting Items for Case Reports in Endodontics (PRICE) 2020 guidelines. A 41-year-old male came to the department of Endodontics postgraduate clinic, Faculty of Dentistry, Cairo University, Cairo, Egypt in November 2023. He complained from pain in lower left quadrant which was aggravated by biting. No relevant medical, family, or psychosocial histories were reported by the patient. There was a previous history of extraction of #36.

Extra oral clinical examination: showed normal findings. Intraoral examination revealed average oral hygiene. A large carious lesion was related to #37. There was no response to cold test. Also, there was small buccal swelling; slight tenderness with palpation. Moreover, there was a positive response to percussion test and mobility grade II. There were multiple pockets measured by periodontal probe; one at middle of buccal surface (5mm depth), and another one at middle of distal surface (4mm depth), Radiographic examination revealed interradicular bone resorption and periapical radiolucency (Figure 1a).

Based on previous clinical and radiographic findings the diagnosis was pulp necrosis with symptomatic apical periodontitis. There was a primary endodontic disease with secondary periodontal involvement according to endo-perio lesions classification **(Rotstein and Simon's et al 2004).** The treatment options were first periodontal management then non-surgical root canal treatment or extraction of the tooth. According to the patient's decision to keep the tooth; the treatment plan was interdisciplinary. It was divided into two parts,

periodontal part: through supra and sub-gingival debridement and Endodontic part: non-surgical root canal treatment. A written consent was obtained from the patient which contained all the details of the treatment plan, and the first visit was scheduled.

Treatment procedure:

On the first visit: Regarding the periodontal phase: Scaling and root planning were done using ultrasonic scaler and periodontal curette. Pus was evacuated during the supra and subgingival debridement. Oral hygiene measures were given, and mouth wash was prescribed for the patient twice daily. Extraction of remaining root of #38 was scheduled. Regarding the root canal treatment: The tooth was anaesthetized using a buccal infiltration of 1.8 ml of articaine 4% (1:100000) epinephrine. Caries was removed and then rubber dam was applied. Access cavity was done under dental operating microscope (Seiler Alpha Air 6, Seiler medical, Germany). Inspection of the pulp chamber floor under an operating microscope revealed an opening similar to canal orifice in its middle (figure 1b). With the assistance of apex locator (Root zx mini, Morita, Dietzenbach, Germany) the communication of the canal with periodontal tissues was confirmed. Exploration by manual k file size 10 was done which revealed no bleeding from this site of communication.

Canal patency was achieved using several manual K-files # 8,10 and 15 (K-Files, MANI, INC., Industrial Park, Utsunomiya, Tochigi, Japan), cleaning and shaping was performed by NiTi rotary files with 350 rpm speed and 2 N/cm torque (MG3 blue, Shenzhen Perfect Medical Instruments Co., Shanwei, china) for mesio-buccal and mesio lingual canal up to size 35/04 and disto buccal, disto lingual to size 40/04. Irrigation protocol was NaOCl 5.25 % 3 ml for 3 mins between each file with 30 G side-vent needle. Calcium hydroxide (Meta paste, Meta Biomed Co., Ltd, Korea) was used as intra canal medication for 14 days. The tooth was then sealed with temporary filling (MD-Temp plus, Meta Biomed Co. Ltd, Korea). No antibiotic prescription was needed as the patient was under antibiotic coverage a week before. A second visit after 14 days was scheduled.

On the second visit: the patient was asymptomatic; there was no pain, no swelling and mobility decreased. Temporary filling was removed, and the tooth was isolated with rubber dam. Canals were irrigated with NaOCl 5.25 % and was activated by sonic device (Easy Do activator, Easyinsmile Intelliegence Technology Co., Ltd, United States) for removal of intra canal medication. Final rinse was with NaOCl 2.5% 10 ml for 5 mins followed by EDTA 17% 3 ml for 3 min Followed by activation by sonic device then Saline irrigation. Canals were dried by using a corresponding size sterile paper point (Meta Biomed Co., Ltd, Korea). Master cone verification was done using size 35/04 and 40/04 for the mesial and distal canals, respectively (figure 1c). Reconfirmation of master cone in distal canals was done after using the larger size of gutta percha 45/04 (figure1d). Obturation was done using cold lateral compaction technique (CLC) with bioceramic sealer (Ceraseal, Meta Biomed Co., Ltd, Korea) (figure 1e).

Regarding Furcation canal sealing: it was done by application of Mineral trioxide aggregate in putty form (Well-Root, Vericom, Gangwon-do, Korea). Putty MTA was packed using bond brush and large paper points till the level of the pulpal floor (figure 1f). Access cavity was sealed with temporary filling (MD-Temp plus, Meta Biomed Co. Ltd, Korea). The patient was referred to fixed prosthodontic department for post and core then an extra coronal coverage.

After 10-week follow up the patient was asymptomatic. No signs and symptoms were related to the tooth. Radiographic evaluation revealed that there was a slight bone deposition at inter-radicular region. The tooth was restored with a fiber post and was ready to receive extra coronal restoration (figure 1g). The patient was rescheduled for 6- and 12-month follow-up visits.

A 6-month follow up phone call was made, and the patient reported that there wasn't any pain or swelling during the last six months and the tooth functioning properly. Radiographic examination is still in progress.

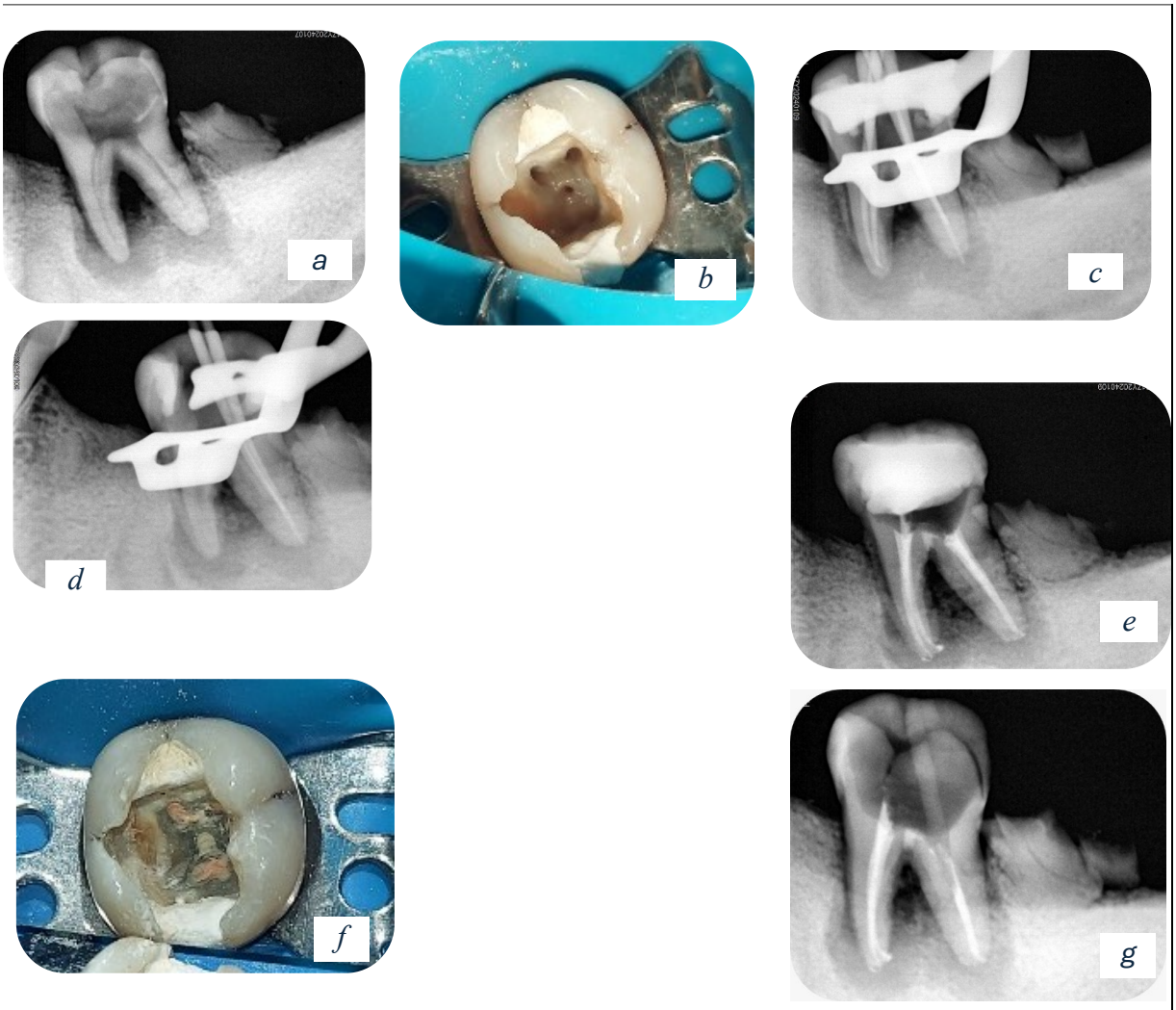

Figure 1: A panel of clinical photographs and radiographs of the treatment process.
(a) Preoperative radiograph of mandibular second molar (b) clinical photograph of furcation canal site (c) Master cone verification. (d) master cone verification for distal canals (e) Postoperative radiograph. (f) clinical photograph for the sealed furcation canal (g) 10- weeks follow-up. All periapical radiographs were taken with bisecting angle technique (Digora digital sensor size 2)

Discussion:

The present case describes atypical condition of endo-perio lesion. Pulp necrosis caused spread of infection to periapical tissue which led to periapical radiolucency. Moreover, furcation canal presented an outlet for infection in furcation area, which result in furcation involvement and inter-radicular radiolucency. Thus, all this finding explained that the endo-perio lesion was a primary endodontic disease with secondary periodontal involvement according to endo-perio lesions classification **(Rotstein and Simon's classification 2004).**

The case holds many challenges; *first: periodontal challenge* through interradicular bone resorption and the presence of furcation canal and mobility. In this case the furcation canal was type 1 according to the morphological classification of ACFs (accessory canal of furcation) **(Yoshida *et al*. 1975).** Type 1 furcation canal is a Pulpal chamber and periodontium communication by a "true" accessory canal. *Second: an endodontic challenge* due to pulp necrosis and presence of apical radiolucency

The presence of an Endo-perio lesion may worsen the prognosis of the case according to literature **(Abbot et al 2009).** Thus, the treatment plan was a comprehensive interdisciplinary treatment containing periodontal part, endodontic part, and prosthodontic part to achieve the best results.

The periodontal management by supra and sub-gingival debridement in this case was essential to enhance the health of periodontium and remove any source of infection related to periodontal tissues. **(Makeeva et al 2020).**

Throughout the whole endodontic procedures and furcation canal sealing, a dental operating microscope was incorporated to offer optimal magnification, facilitate superior visualization and precision, ultimately leading to improved treatment outcomes **(Mente et al 2015).**

Proper disinfection, in this particular case, was carried out in terms of irrigation and intracanal medication. Easy do Activator was used as irrigation activation device due to that it has superior results in sealer penetration and removal of smear layer in apical third of the root over passive ultrasonic irrigation and side-vent needle irrigation **(Zhang et al 2024). C**alcium hydroxide was employed as an intracanal medication during the intervals between visits. Calcium hydroxide was utilized due to its numerous desirable properties; particularly its ability to inhibit bacterial enzymes, thereby contributing to its antimicrobial effects **(Panzarini et al., 2012).**

Sealing the furcation canal was carried by Putty MTA (Mineral Trioxide Aggregate) due to several advantageous properties it possesses. These include enhanced biocompatibility, increased attachment of periodontal cells, cemento- and osteo-inductive properties, as well as elevated pH values **(Dong et al 2023).** MTA putty consistency was used because it is easier to handle.

Proper final restoration to guard against coronal leakage is mandatory. Thus, the patient was referred to the department of prosthodontics to receive a post and core then an extra-coronal coverage.

Due to the correct diagnosis and comprehensive interdisciplinary treatment

the root canal treatment was successful, and the signs and symptoms were eliminated.

Conclusion:

Conclusion: An interdisciplinary approach to treat endo-perio lesions is mandatory to ensure favorable outcomes. The presence of furcation canals has a notable impact on the prognosis of endodontic treatments. Proper root canal shaping, disinfection as well as identification of Furcation canals and their effective sealing are crucial steps in management of infection of endodontic origin and ensuring treatment success.

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Conflict of interest

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