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Endodontic Management of Right Mandibular 2nd Molar with Radix Entomolaris and Inferior Alveolar Nerve Physiologic Perforation By Mesial Root

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Abstract

Aim: To report a case of mandibular first molars with an additional distolingual root (radix entomolaris) with its mesial root physiologically perforating inferior alveolar nerve and the endodontic treatment of same with care.

Background: The occurrence of an extra distal root in primary mandibular first molars is relevant clinically and for the delivery of optimal care. if it is encountered, an awareness and understanding of this unusual root and its canal morphology can contribute to the successful outcome of root canal treatment. This case report discusses an endodontic treatment of a mandibular first molar with a radix entomolaris, which itself is a rare entity and poses as an endodontic dilemma for the clinician with respect to diagnosis and subsequent treatment, its mesial root is physiologically perforating inferior alveolar nerve So clinicians needs a strategic treatment as unfilled canals remain a nidus for infection and can compromise treatment outcome and endodontic material penetration within and along the mandibular canal from the apical part of a lower first molar following endodontic treatment may lead to complications like anaesthesia and paraesthesia of the of the lower lip and the gums.

Keywords: Radix Entomolaris, Inferior Alveolar Nerve, Cone Beam Computer Tomography.

Introduction

The goal of the endodontic procedure is to eliminate microbes from the root canal system and to prevent further reinfection, and that is achieved by biomechanical cleaning of the pulp space followed by hermetic sealing with obturating material.[1]However, often root canal treatment is complicated by the presence of variations in the root canal anatomy. Hence, meticulous knowledge about the variant root canal anatomy is mandatory for successful endodontic treatment.[2]An awareness and comprehensive knowledge

of the unusual root canal morphology can contribute to the success of the endodontic procedure.[1]

The majority of the mandibular first molars has two-root with two mesial and one distal canal. In most cases the mesial root has two root canals, ending in two distinct apical foramina and sometimes, these merge together at the root tip to end in one foramen. The distal root typically has one kidney-shaped root canal.[3,4]

Anatomical variations have been described in the mandibular first molar like the number of root canals, the number of roots may also vary [4]. The mandibular molar with an additional third root located distolingually was first reported in the literature by Carabelli in 1844 [5], and is called as the radix entomolaris 4 and is notified by different terminologies as well, e.g., "extra third root", "distolingual root" or "extra distolingual root."[6]. This supernumerary root is located distolingually in mandibular molars, mainly first molars [4] as this extra root is typically smaller than the distobuccal root and is usually curved so it requires special attention during cleaning and shaping procedures [7].

The prevalence of these three-rooted mandibular first molars appear to be less than 3% in African populations, not to exceed 4.2% in Caucasians, to be less than 5% in Eurasian and Asian populations, and to be higher than 5% (even up to 40%) in populations with Mongolian traits [8]. An additional root at the mesiobuccal side is called the radix paramolaris (RP) was first described by Bolk in 1915 [9,10]. Its prevalence varies from 0% (0/1954) for the mandibular first molar, 0.5% (11/2086) for the second and 2% (28/1405) for the third molar as reported by Visser [11,12] The identification and external morphology of these root complexes, containing a lingual or buccal supernumerary root, are described by Carlsen and Alexandersen.[3,13] , and in 1997 Ribeiro and Consolaro assessed their buccolingual orientation.[14,15]

Various methods have been used to assess root canal morphologies and configurations. These include radiographs, in vitro studies, computed tomographies (CT) and cone-beam computed tomographies (CBCT).[16] CBCTs have been reported superior to other radiographs for the assessment of RE because with CBCTs it is possible to generate three-dimensional images, images can be divided into sections, and better-quality images can be generated with lower doses of radiation.[14]

Case Report

A 20 years old female patient had been referred to the department of conservative dentistry and endodontics from the department of orthodontics for the treatment of permanent right mandibular first molar (tooth # 46), patient reported with mild pain on right lower back tooth region. On clinical examination, it was found that there was a deep caries in mandibular right first permanent molar (#46). Tooth was pulpally exposed which was further supported by radiographic interpretation. On examination of the periapical radiograph, it was revealed that there was presence of an additional root. (Figure 1)

Figure 1: Diagnostic Radiograph

For further confirmation patient was sent for CBCT which confirmed the presence of two separate distal roots with two separate root canals for each root, periapex of distolingual canal dilacerating towards distobuccal canal, mesial root slightly dilacerated

distally and periapex of mesial root involving inferior alveolar nerve canal.

Figure 2a: CBCT which confirmed the presence of two separate distal roots with two separate root canals.

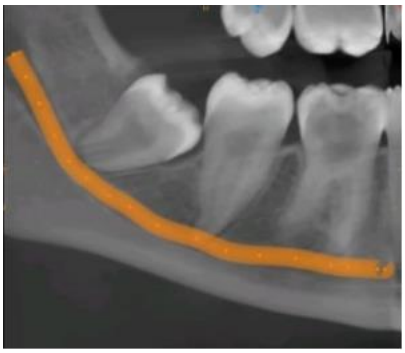

Figure 2b: CBCT confirming a periapex of mesial root involving inferior alveolar nerve canal.

Administration of local anaesthesia was done using 2% lidocaine with1:80,000 epinephrine. The tooth was isolated by a rubber dam, and then the access cavity was prepared with distolingual extension to provide proper access to distolingual canal. After locating orifices of the canals with DG 16 instrument under loops as a magnification aid they were enlarged with the help of GG drills till size 3, (Figure 3). Initial negotiation of the root canals was done and a radiograph was taken to determine the working length of the canals with two instruments (no #10 K FLEX files) in mesial root and two instruments in the distal roots. (Figure 4) The lengths of these canals were measured radiographically and verified with apex locator readings and a previous CBCT report as well .

Figure 3: Occlusal view of pulp chamber

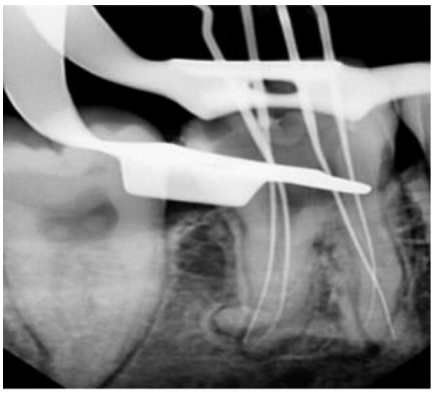

Figure 4: Working Length Radiograph

The root canals were prepared up to size 25 4% (Hyflex CM COLTENE Whaledent), according to manufacturer's instructions with crown down technique under copious irrigation, All canals were filled with gutta-percha and mtafillapex sealer. After it a post endodontic restoration was performed. (Figure 5,6). Follow up was done after four months.

Figure 5: Master cone radiograph

Figure 6 : post obturation radiograph

Figure 7: Follow up radiograph after 4 months

Discussion

Carlsen and Alexandersen[13] explained the morphological and anatomical variations of root systems with an extra lingual or buccal root, which makes it mandatory to carefully examine radiographs, to have knowledge about the anatomy, modify the access opening and find missed canals. [17]

Patel et al. [16] reported that using three-dimensional CBCT imaging scan allows the clinician to better visualizing and interpreting the anatomy of root canal configuration, number of canals and roots, and any possibility of morphological vibration in all three planes (sagittal, axial and coronal) without superimposing to vital structure.

Since radix entomolaris is located parallel to the mesial root, common and digital posteroanterior radiographies are ineffective for clarifying these roots, while CBCT offers non-destructive way to detect and visualize all anatomical structure that superimposed and not identified using conventional two-dimensional periapical radiograph[5]

R. J. G. De Moor et al classified radix entomolaris based on Curvature[8], as Type I: A straight root/root canal Type II: Initially curved entrance of the root canal and the continuation as a straight root/root canals Type III: Initial curve in the coronal third of the root canal and a second buccally oriented curve starting from the middle third. On scouting with 10 k file on extracted molars[10,12] in this case we found a type III kind of curvature.

Carlsen and Alexandersen [13] Classified radix entomolaris on the base on Location of cervical part of radix entomolaris as Type A: Cervical part located Distally, with two normal distal root components ,Type B: Cervical part located Distally, with one normal distal root component Type C: Refers to a mesially located cervical part Type AC: Located centrally, between the distal and mesial root component.[10]This classification helps in the identification of separate and non-separate radix entomolaris.[17]

In the case of a Radix Entomolaris, the conventional triangular access cavity opening must be modified to a trapezoidal form in order to properly locate the distolingually located canal orifice of the extra root. Due to the curvature seen in majority of the cases a straight-line access and glide path must be given attention. [17]

There are many reports of paraesthesia related to endodontic problems because of the proximity of the root apices to the IAN. The possible causes of this problem are as follows: 1. Mechanical: by physical traumas, including over instrumentation and compression, as a result of extravasation of filling materials/intracanal dressing and stretching or rupture (partial or total) of the nerve during peri radicular surgery 2. Pathologic: by the aggression of microbial

products that diffuse in the bone marrow spaces and reach the nerve Fiber or by the peri radicular lesion itself that can compress the nerve ,3. Physical: excess heat, as in the case of osteotomy using drills or ultrasonic tips without proper cooling during a periapical surgery or even in cases of thermoplastic obturation techniques in teeth close to the nerve 4. Chemical: related to various substances, including local anaesthetics, endodontic sealers, intracanal dressing, and irrigation solutions, all of which may be extruded through the apical foramen 5. Microbiological: caused by extra radicular infections [18]

Among them procedures such as foraminal enlargement and preparation at the apical terminus ("zero" limit) cause the increase of the horizontal diameter of the apical foramen with the loss of apical constriction, which Favors the extravasation of bacteria, irritants, and filling materials beyond the apex, Cytotoxicity and mechanical pressure are the mechanisms directly involved with altered sensation subsequent to sealer extrusion,[19] The popularity of bioceramic sealers has steadily increased in recent years because of their benefits, which include the ability to form hydroxyapatite in the presence of water, satisfactory antibacterial action, biocompatibility, adequate seal, and adhesion. Among these sealers is the MTA Fillapex (Angelus, Londrina, PR, Brazil), a paste-paste mineral trioxide aggregate–based sealer.[19]

Conclusion

mandibular first molar can display several anatomical variations, due to the presence of supernumerary root and due to the proximity of the root apices to the inferior alveolar nerve. Hence to avoid unwanted complications proper diagnosis with initial radiographic and cone-beam computed tomographies examination and must be done thoroughly and proper care must be taken during endodontic procedure.

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