

Case Report

Clinical Management of Unusual Configuration in a Lower Second Molar with Four Roots - 2 Years Follow Up

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Abstract

The present case describes a diagnosed rare anatomic configuration of a lower left second molar with anatomical variation of having four roots and severely curved MB canal in a 23-year old Saudi female, this patient was referred to the Endodontic Department at Dammam Medical Complex from PHCC for its management. The patient's medical history was noncontributory. Analysis of the cone beam computed tomography (CBCT) with aid of Dental operating microscope confirmed the presence of four roots for tooth #37. Cleaning and shaping of all canals were

performed using ProTaper universal nickel-titanium rotary instruments with copious irrigation of 2.5% sodium hypochlorite (NaOCl) solution and 17% ethylene diamine tetra-acetic acid (EDTA). Obturation was performed using continuous wave compaction of Gutta-percha and AH Plus resin sealer. The tooth was finally temporized with cavite and glass ionomer filling, later the patient was referred to Prosthodontic Department for final coronal seal and restoration. Clinical and radiographic examination of the patient after 2 years revealed complete healing of the periapical lesion.

Conclusion: The clinical relevance and the main purpose of this paper is to report the successful treatment of an uncommon four-rooted mandibular second molar, with four roots and four root canals with severely curved MB canal. The canal morphology was confirmed with CBCT and successfully managed. To have a successful treatment outcome, clinical detection of all canals is crucial, primordial awareness of all the anatomical variations which can exist and constitute a formidable challenge in endodontics, but finally team work with advanced diagnostic aid is a corner stone for its accomplishment as management of severely curved canals require advanced equipments and experienced hands.

Keywords: Anatomical variations; Cone-beam computed tomography; Dental operating microscope; Mandibular second molar; Root canal treatment

1. Introduction

The formation of one, two, three or more roots is established during the embryological stages of the root formation. In the bell stage of odontogenesis, the epithelial cells of the inner and outer dental epithelium proliferate and meet at a point called cervical loop, forming the Hertwig horizontal root sheath. The apical

end of the Hertwig horizontal root sheath bends to form a collar-like structure. In the single rooted teeth this collar structure grows apically like a tube around the newly formed pulp. In the multi-rooted teeth, epithelial cells from the Hertwig horizontal root sheath develop extensions that grow towards the center until they meet each other, dividing the original single collar into several collars, one for each root [8]. A fourrooted tooth means that four collars were formed by the invagination of the epithelial cells during the root formation. Several anatomic configurations on the mandibular second molar have been reported in the literature. The most common anatomy of this tooth is the presence of two roots and three root canals,1,2 but four or even five root canals have been described [9]. The C-shape configuration has also been widely studied [10]. The number of roots may also change, one and three-root configurations have been reported [3,5]. The ethnic influence may have a key role in the teeth anatomic configuration variations [11]. Several ethnic characterization studies have described the mandibular second molar in different populations. Ten studies from ten different populations, which included a combined sample of 2315 mandibular second molars, were unable to identify a single case of a four-rooted mandibular second molar (Table 1).

Study	Country	Sample	One fused root	Two roots	Three roots	C- shaped roots	Four roots
Manning 1990	Australia	149	14	113	3	19	0
Gulabivala 2001	Burma	134	6	98	0	30	0
Gulabivala 2002	Thailand	60	0	54	0	6	0
Ahmed 2007	Sudan	100	4	86	0	10	0
Peiris 2007	Sri Lanka	100	0	94	0	6	0
Rahimi 2008	Iran	139	6	117	6	10	0
Rwenyonyi 2009	Uganda	223	0	223	0	0	0
Al- Qudah 2009	Jordan	355	8	310	0	37	0
Neelakatan 2010	India	345	0	288	31	26	0
Park 2013	Korea	710	13	387	17	293	0
	CBCT						
		2315	51 (2%)	1770 (6%)	57 (3%)	437 (19%)	0(0%)

Table 1: Characterisation studies of the mandibular second molar in different populations.

2. Case Report

A 23-year old Saudi female was referred to the Endodontic Department at Dammam Medical Complex from PHCC for the management of a lower left mandibular second molar (#37). The patient's medical history was noncontributory. Clinical examination of

tooth #37 revealed pain with percussion, the tooth showed no mobility and was periodontally within normal limits. Pre-operative radiographs showed unusual root morphology of tooth #37 with large periapical lesion as in Figure 1, the case was initially diagnosed with symptomatic apical periodontitis.

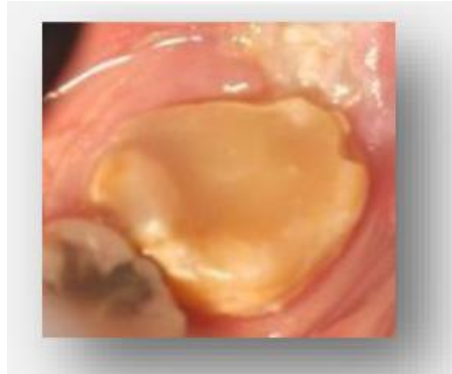


Figure 1(a): Clinical view of tooth# 37restored with GIC.

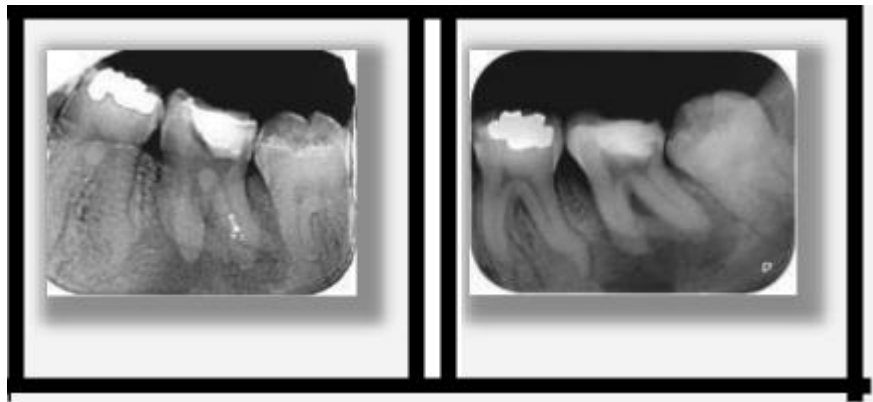


Figure 1 (b): Preoperative radiograph with different angulations



Figure 2: (a) coronal view buccal (b) lingual

The tooth number 37 is strategically and functionally important, hence the option of its management was Endodontic treatment as it will treat the infection and will retain the tooth. The treatment plan was proposed, explained and consented by the patient. The tooth was anaesthetized with a mandibular block infiltration using 1.8 ml of 2% lidocaine with 1:80,000 epinephrine, after proper rubber dam isolation was obtained, access cavity was achieved. Internal anatomy was evaluated using a dental operating microscope and the aid of DG-16 endodontic explorer followed by orifice microopener size #10(0.04) and ultrasonic troughing using Endo tip 2 finally revealed four root canals (MB,ML,DB,DL). The coronal enlargement was achieved with a nickel-titanium ProTaper series orifice shaper SX to improve the straight-line access. The working length was determined by an electronic apex locator A(Root Zx II, Morita,USA) and confirmed with a PA radiograph[Figure 4-b]. The initial instrumentation for MB canal

of the root canal, size #8 and 10 stainless steel K-file were used. Canals were identified at the end of each extremity of the X [Figure 3a], USA [figure 3b]. Mechanical instrumentation of the root canals was performed with Pro-Taper NiTi rotary files (ProTaper Universal, Dentsply Maillefer, Switzerland) and according to the manufacturer's instructions. Protaper hand file was used to instrument MB (dilacerated canal). Instrumentation was coupled with a copious irrigation of 5.25% sodium hypochlorite. The treatment was accomplished in two appointments. After the biomechanical preparation, the root canals were dried with paper points and intracanal medicated with a paste of calcium hydroxide (Ultracal, Ultradent, USA). Cavit (Cavit W, 3M ESPE, Germany) was used as a provisional restorative filling between the two visits. At the second appointment a final irrigation protocol which included 17% EDTA irrigation for one minute and one last rinse with 5.25% sodium hypochlorite was performed, then the canals were dried. Gutta-percha

master points were adapted and root canal lengths were confirmed by a radiograph. AH plus (AH Plus, Dentsply, Germany) was used as sealer. The obturation technique chosen was the continuous wave of condensation technique (System B, Sybron Endo, USA, and Obtura II, Obtura Spartan, USA). The post

obturation periapical radiograph shows clearly the presence of four root canals, one for each root (Figure 4). The pulp chamber was restored provisionally with 3mm Cavit and GIC filling. The patient was scheduled for Prosthodontic management.



Figure 3: (a) clinical picture of access cavity (b) radiograph showing working length taking in 4 canals

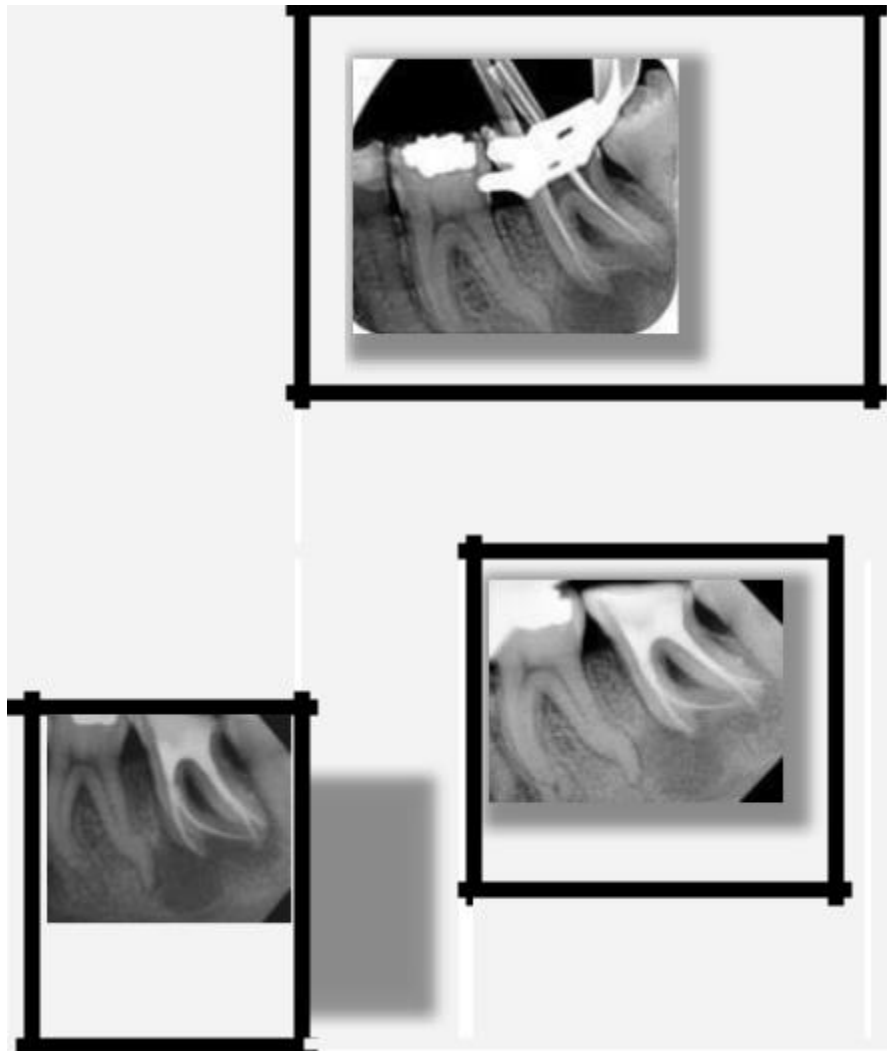


Figure 4: (a) MAC radiograph. (b) final obturation M angulation (c) Dangling

3. Discussion

The most common configuration of the mandibular second molar can be :

-two roots and three root canals 58% {1,2},

C shaped canal also reported in Saudi population 10.6% {4}. -one root with single root canal {3}.

The present case has two normal length mesial roots with dilacerated MB root ,a normal length disto-buccal root and a smaller conical radix entomolaris, which has been described as an uncommon feature in a mandibular second molar [5]. The four-root configuration has an incidence of 0.04% in the mandibular first molar[20] with only three in vivo case reports available [19,21,22].

No incidence is available for the mandibular second molar. Anatomic variations may be present in any tooth. Knowing the typical morphology and their variations may help to detect these variations during root canal therapy and enhancing the chance for a successful treatment. The most typical anatomy of a mandibular second molar is the presence of two roots and three root canals [1,2] but other root configurations have been described in the literature. One root with a single root canal has been reported [3] C shaped {4} radix entomolaris and Radix Para- molaris [6] in a three-root configuration have also been reported. The clinical relevance and the main purpose of this paper is to report

an uncommon four-rooted mandibular second molar, with four roots and four root canals with severely curved MB canal the canal morphology was confirmed with CBCT and successfully managed. There were only

2 cases reported of lower second molar with four roots{7,8} but in this case the presence of severely curved MB root made the case more challenging and added a complication in its management.

Study	Type of study	Country	Gender	Age	Positin of roots	No of roots	bilateral
Peiris 7	Ex vivo	Sir lanka	female	23	MB,ML,DB,DL	4	N/A
Purra 6	In vivo	India	male	21	MB,MM,ML,D L	4	N/A
Taroty (actual case) in vivo		Saudi	female	23	MB,MD,DB,DL	4	N/A

Table 1: Four-rooted mandibular second molar reports

Conclusion

Clinicians should be aware of the complex root canal anatomy and should take all necessary diagnostic tools according to the guidelines and treatment needs e.g. (periapical radiographs with different angulations, CBCT, etc.....) and after careful interpretation/ analysis, proper access preparation and detailed exploration of the interior anatomy of the root canal system should be achieved, ideally under magnification, for a successful treatment outcome. To have a successful treatment outcome, clinical detection of all canals is crucial, primordial awareness of all the anatomical variations which can exist and constitute a formidable challenge in endodontics, but finally team work with advanced diagnostic aid is a corner stone for its accomplishment as management of severely curved canals require advanced equipments and experienced hands. Although it is an extremely rare condition, a four-rooted configuration may be present in the mandibular second molar.

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