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CASE STUDY

MANAGEMENT OF MANDIBULAR SECOND MOLAR WITH SINGLE ROOT AND SINGLE CANAL USING SELF-ADJUSTING FILE AND THERMO PLASTICIZED GUTTA PERCHA – TWO CASE REPORTS: A RARE OCCURRENCE

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ABSTRACT

Aim: To present two cases of mandibular second molars with a single root and single canal which was diagnosed and treated successfully.

The variability of root canal morphology of multirooted teeth represents a continuous challenge to endodontic diagnosis and therapeutics. Variations of root canal systems may not be only in the form of extra canals. Clinicians should be aware that there is a possibility of the existence of lesser numbers of roots and root canals than that encountered with normal root canal anatomy. Mandibular molars with single roots and single canals are one of the variations encountered. These teeth with large single canals pose a challenge in thorough debridement of the root canal necessitating the use of adjunctive aids. This case report present two rare cases of mandibular second molars with a single root and a single root canal, which was managed successfully using the Self Adjusting file system and thermoplasticized gutta percha under surgical operating microscope.

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INTRODUCTION

A different morphological variation of the root and the root canal system among the mandibular molar provides a constant challenge for the diagnosis and endodontic treatment point of view. An in depth knowledge of anatomical variations along with proper diagnosis and chemomechanical preparation and three dimensional obturation of the root canal system is key element for the successful outcome of the endodontic therapy. (Fava *et al*., 2002) Mandibular second molars usually have two roots and three root canals but variations in the number of roots and canal morphology are often seen. This includes single canal, two canals, three and four canals, five canals and the C-shaped canal system. (Fabra-Campos, 1985) Most of the studies and clinical articles have reported presence of C shaped canal but no authors have mentioned mandibular second molar with single round conical canal. A study by Weine *et al*. reported 1.3% of mandibular second molars had single canal configuration. (Weine *et al*., 1988) This article presents two case reports on endodontic management of mandibular second molar with single round conical canal which is a rare occurrence.

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Case reports

Two patients reported to the Department of Conservative Dentistry and Endodontics with a chief complaint of pain in tooth in lower left back region of the jaw with non-contributory medical history. After thorough clinical and radiographic examination a diagnosis of apical periodontitis in case 1 and acute irreversible pulpitis in case 2 was made. And the root canal morphology showed the presence of a single root with a single canal, constricting towards the apex on radiograph which was confirmed on further multiple angulated radiographs in both the cases [Figure 1a and 2a]. It is worth highlighting that the involved teeth had no mobility, and periodontal probing around the teeth was within physiological limits. Root canal treatment was explained to both the patients. In both the cases access was gained to the pulp chamber after administration of local anaesthesia (2% Lignocaine with 1: 100000 epinephrine), under rubber dam isolation (Hygienic Dental Dam, Coltene Whaledent Germany). And the endodontic access cavity was refined with cavity access set (DentsplyMaillefer, Ballaigues, Switzerland). After careful inspection and examination under a surgical operating microscope (Global Surgicals Corporation, St Louis, MO, US), floor of the pulp chamber revealed a huge canal orifice at the center of the pulp chamber [Figure 2A]. The canal patency was established with a 15 K file. Canals were thoroughly irrigated with normal saline followed by 3% sodium

hypochlorite. The working length of the tooth was measured by Root ZX apex locator (J. Morita Mfg. corp., Kyoto, Japan) which was confirmed radiographically [Figure 1b and 2b]. Cleaning and shaping was done using step back technique using suitable sized ISO K file. Subsequently a calcium hydroxide dressing (RC CAL, Prime Dental Products, India) was placed for a period of 7 days. A small sterile cotton pallet was placed and the access cavity was temporarily sealed with Cavit (3M ESPE, Saint Paul, MN). After 7 days interval, the root canal was re-entered and irrigated alternately with 3% NaOCl and sterile saline to remove the temporary dressing. The filing with K files assured an apical shaping but not a thorough circumferential debridement of the sizeable single canal. Adequate circumferential filing posed a challenge with the wide single oval canal. Hence, the Self Adjusting File with a 1.5 mm tip diameter was used with an in-and-out vibrating RDT3 handpiece head (ReDent-Nova, Ra'anana, Israel) at a frequency of 83.3Hz (5000 vibrations per minute) at an amplitude of 0.4mm with a torque-control motor (X SMART DENTSPLY) [Figure 3]. The SAF was inserted into the canal while vibrating and gently pushed until it reached the working length. SAF was used in a pecking motion to the working length for 4 minutes according to manufacturer's instructions. Continuous irrigation with 3% sodium hypochlorite was applied by a pump (VATEA, ReDent-Nova) at a rate of 4 ml/min for achieving a complete chemo-mechanical debridement followed by a final rinse with 5ml of sterile saline. 17 % EDTA solution was left flooded in the cavity which was later rinsed with 5 ml of sterile saline. Appropriate gutta-percha master cones (Dentsply, Maillefer, Switzerland) were selected to obtain an apical tug back and confirmed radiographically [Figure 1c and 2c].

Figure 1a Pre - operative radiograph

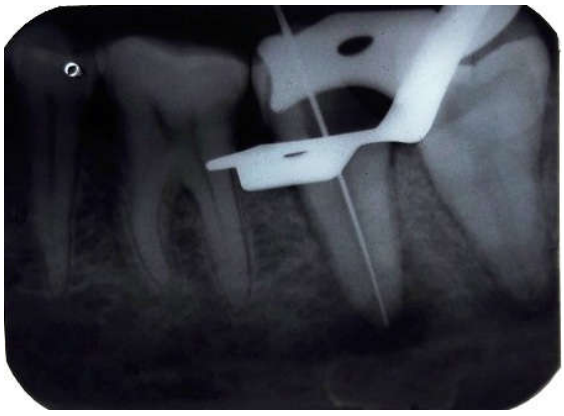

Figure 1b Working length radiograph

Figure 1 c master cone radiograph

Figure 1d. Down pack radiograph

Figure 1e Obturation radiograph

Figure 1 f Six months follows up radiograph

Figure 2a Pre - operative radiograph

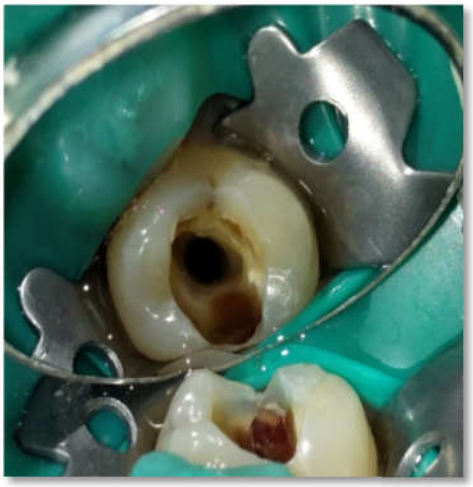

Figure 2 A Clinical view showing large single canal

Figure 2 b Working length radiograph

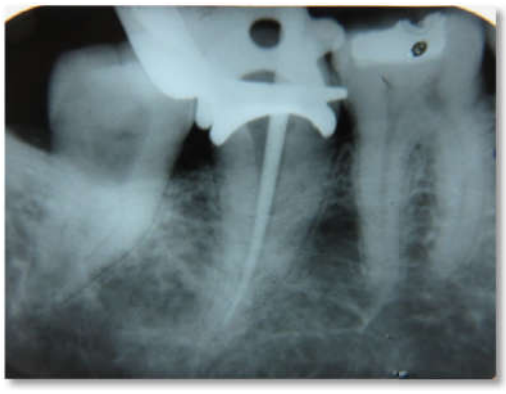

Figure 2 c Master cone radiograph

Figure 2 d Down pack radiograph

Figure 2 E Post obturation clinical view

Figure 2 e Post obturation radiograph

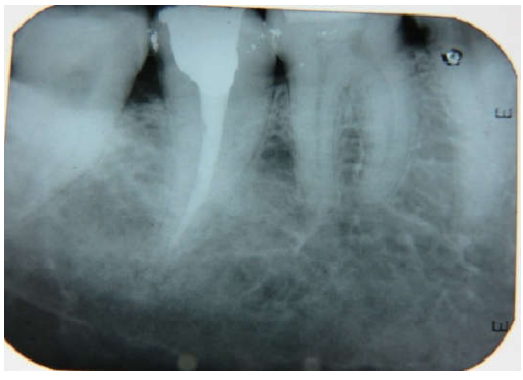

Figure 2f Six months follow up radiograph

Figure 3 SAF unit used for cleaning and shaping

Figure 4 E & Q system used for obturaion

Then root canals were thoroughly dried with sterile absorbent paper points and coated with AH plus sealer (Dentsply, Maillefer, Switzerland) using lentulo-spirals. To get a good apical seal the master cone was laterally condensed with accessory cones in apical area and then sheared 4 mm from the apex using E & Q pen (META BIOMED) to form a down pack which was confirmed with a radiograph [Figure 1d and 2d]. The remaining portion of the canal was then backfilled with an E & Q gun using thermoplastic gutta-percha [Figure 4]. Warm gutta-percha at the orifice was vertically compacted by using appropriate sized pluggers [Figure 2E]. Immediate radiograph showed dens obturation with complete sealing of accessory canals [Figure 1e and 2e]. After completion of root canal treatment, teeth were restored using posterior resin composite (P60; 3M Dental Products, Saint Paul, MN). Patients were advised with full coverage porcelain crowns. After six months follow-up, the patients were asymptomatic demonstrating functional teeth number 37. On clinical examination, there was no mobility or pain in response to percussion, palpation, or biting and the patients had a healthy gingiva and no periodontal pockets on probing. Radiographic examination revealed the teeth and its surrounding tissues to be within normal limits with intact dens obturation [Figure 1f and 2f].

DISCUSSION

A thorough understanding of root canal anatomy and morphology is essential for achieving high levels of success in endodontic treatment. Failure to recognize variations in root or root canal anatomy can result in unsuccessful endodontic treatment. As with most posterior teeth, the mandibular second molars have several variants in its canal configurations. The standard description of the mandibular second molar is of two roots and two, three or four root canals. However, mandibular second molars with a conical root and wide single root canal are also reported. (Fava *et al*., 2002) When only one root is present, the root canal system may present with only a single broad root canal or two canals that may or may not join, or a C-shaped canal. (Cleghorn *et al*., 2008) Manning investigated the anatomy of mandibular second molars and found that 22% had one root, 76% had 2 roots and 2% had 3 roots. (Manning, 1990) Pansiera & Milano studied 102 extracted human mandibular second molars and described six teeth (5.88%) possessing one root and one root canal. (Pansiera and Milano, 1995) Weine *et al* in a study evaluated 75 human extracted second molars and found one tooth (1.3%) with one root canal. (Weine *et al*., 1988) All these variations in root and canal anatomy represents a challenge to its thorough debridement and obturation. If the dentin debris is not removed completely from the instrumented canal extensions, two unfavourable outcomes may result. Calcium hydroxide and other medicaments that function only when in direct contact with the pathogens cannot be placed in the space occupied by debris, and therefore cannot be effective. Secondly, only those areas free of debris can be filled with gutta-percha and sealer. Therefore, the debris filled canal extensions may lead to leakage. (Wu and Wesselink, 2001) Complete cleaning of the canal system cannot be achieved unless the filing of the walls is done to reach mineralized dentin and all the debris has been flushed out. (Grossman, 1978) This has led to the proposal of many modified techniques to optimize the technical quality and hence the prognosis of endodontic therapy. (Chokshi *et al*., 2013) There were several factors, which were taken into consideration in the management of these single-rooted single canaled mandibular second molars for a better prognosis. Proper preoperative diagnosis using multiple angled radiographs and correlating them clinically is necessary. In this present case, radiographic evaluation showed presence of single root with single canal suggesting that there may be C shape configuration canal, after access opening pulp floor was explored and examined carefully under surgical operating microscope, which showed only one canal orifice.

Due to large root canal space, proper removal of entire bulky pulp tissue is necessary along with good biomechanical preparation in the presence of large amount of intracanal irrigation. For this purpose Self Adjusting File was used. SAF is a hollow file designed as a compressible, thin-walled pointed cylinder either 1.5 or 2.0 mm in diameter composed of 120 um-thick nickel-titanium lattice. Upon insertion into a root canal, it adapts itself to the canal's shape, both longitudinally and along the cross-section. This provides a three-dimensional adaptation which is not seen with conventional NiTi rotary files. The surface of the lattice threads is lightly abrasive, which allows it to remove dentin with a back-and-forth grinding motion. This helps in efficient debridement of the canal system. (Metzger *et al*., 2010) Another challenge was obturation of this large pulpal space. The advantage of using a thermoplasticized injectable obturating technique as it ensures compact obturation of the

wide canals without voids. Any aberration present in these canal systems can be well obturated by thermoplasticized obturating systems along with warm vertical compaction which helps in better flow of gutta percha.

Conclusion

The anomalies in the root canal morphology need not always be extra canals. It can also be in the form of fused or fewer canals. From a clinical standpoint, when an unusual anatomic form is encountered, multiple angled radiographs and careful inspection of the tooth under surgical operating microscope will reveal more details of the anatomy of the root canal system.

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