Management of Single Rooted Single Canalled Mandibular Second Molars – A Case Series

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ABSTRACT

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 presents three cases of mandibular second molars with a single root and a single root canal managed endodontically using manual agitation, ultrasonics and the Self Adjusting file system.

KEYWORDS: Mandibular second molar, Self adjusting file, Single canal

INTRODUCTION

One of the most important issues in endodontics is the knowledge of internal root anatomy.[1] Success in endodontics requires the understanding of the anatomy and morphology of root canal, and the clinician must be equipped to identify and treat all those teeth that show an unusual anatomical configuration. [2]

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.[3,4] Routine periapical radiographs help us to assess the number, length, curvature and aberrations of the canal system of the tooth. A study by Weine et al. reported 1.3% of mandibular second molars had single canal configuration.[3] Proper cleaning, shaping and three dimensional obturation of the entire root canal system is regarded as an important determinant of good prognosis. Hence the variations in root canal system represent a challenge to its proper diagnosis, debridement, and obturation.[5]

For this, chemo-mechanical root canal preparation is done consisting of mechanical debridement and canal enlargement combined with thorough irrigation with bactericidal irrigants. However, the complex nature of the root canal system makes complete debridement difficult and a continuous challenge.[6,7,8] Most of the dentine debris is inorganic matter that cannot be dissolved by Sodium Hypochlorite (NaOCl). Therefore, removal of dentine debris relies mostly on the flushing action of irrigant.[9] Studies have shown the effectiveness of sonic and ultrasonic adjuncts to irrigants in ensuring a cleaner canal. [6,9,10]

The Self Adjusting File (SAF, Re Dent Nova, Israel) is a hollow and flexible file that adapts itself three-dimensionally to the shape of the root canal. It vibrates when operated and removes a uniform dentin layer from the canal walls even in oval, flat root canals. This hollow file allows for the continuous irrigation of the root canal throughout the cleaning and shaping procedure, with additional activation of the irrigant by its vibrating motion which creates turbulence in the root canal.[11]

This case report describes the endodontic management of 3 single rooted mandibular molars with a single canal using manual agitation, ultrasonic instruments, and the Self Adjusting File.

CASE REPORT

A diagnosis of apical periodontitis was made in case 1 whereas a diagnosis of symptomatic irreversible pulpitis was made in cases 2 and 3. The pre-operative radiograph revealed a single fused conical root for all 3 cases (Fig 1).

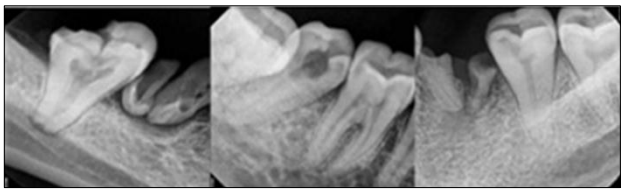

Figure 1 – Pre operative radiographs

Multiple preoperative radiographs in various angulations were taken, that showed a single root and a single root canal. Patient's informed consent was obtained in each case before proceeding with the treatment plan. On standard access cavity preparation, a single canal orifice at the center of the pulp chamber for all three cases was found. The canal patency was established with a suitable

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K file. Working length was determined with the help of electronic apex locater (Propex II, Dentsply-Maillefer, Tulsa, OK, USA) and confirmed using a radiograph.

Case 1: On access opening, a single large canal with an initial apical size of ISO #100 was found. Irrigation was done with 3% sodium hypochlorite (Prime Dental Products, Mumbai, India)followed by a final rinse with normal saline. Additional ultrasonic irrigation was done using ultrasonic tips (Satelec Acteon, Merignac, France) to ensure complete cleaning of the canal. The irrigant was periodically refreshed and ultrasonically activated 3 times for 20 seconds. Master cone #120 was selected, and the canal was coated with zinc oxide eugenol sealer (RC Fill, Prime Dental Products, Mumbai, India). The master cone was then sheared 3mm from the apex to form an apical stop which was confirmed with a radiograph. The remaining portion of the canal was then backfilled using thermoplasticized guttapercha technique (Obtura II, Spartan, USA) and warm vertical condensation technique (Fig 2).

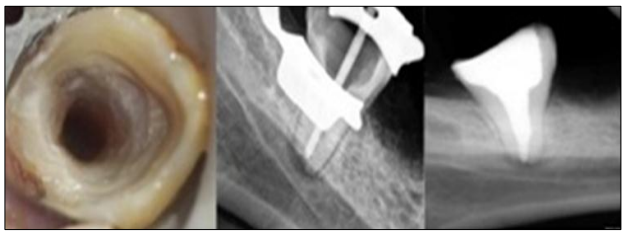

Figure 2 – Endodontic treatment in Case 1

Case 2: Irrigation was done with 3% sodium hypochlorite. The biomechanical preparation was done using Protaper universal files till #F3. The filing assured an apical shaping but not a thorough circumferential debridement of the sizeable single canal. Activation of the sodium hypochlorite was done with hand agitation of the master gutta-percha to ensure complete cleaning of the canal. Obturation was done by cold lateral compaction method (Fig 3) with zinc oxide eugenol sealer (RC Fill, Prime Dental Products, Mumbai, India).

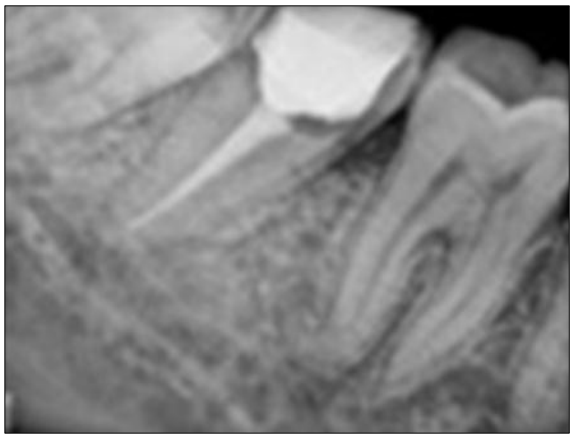

Figure 3 – Post Obturation radiograph of Case 2

Case 3: After working length determination, a glide path was ensured till ISO #20 K file. Like in the previous two cases, 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 4000 vibrations per minute with the amplitude of 0.4mm. The SAF was inserted into the canal while vibrating and gently pushed until it reached the working length. It was then operated with a manual in and out motion for 4 mins in the canal with an irrigant (3% NaOCl) flow of 4ml per minute. Obturation of the canal was done with cold lateral compaction technique (Fig 4) using zinc oxide eugenol sealer (RC Fill, Prime Dental Products, Mumbai, India).

Figure 4 – Post Obturation radiograph of Case 3

DISCUSSION

During endodontic therapy, variations in canal morphology such as extra canals, apical ramifications, apical deltas, or lateral canals are commonly encountered, and their incidence and significance have been well documented.[12] Anatomy of the mandibular molars is important because the number of roots and root canals is highly variable. Numerous studies have been conducted on the anatomical variations of mandibular molars.[13] The mandibular second molar is similar to the mandibular first molar, the exception being incidence of two canals in the distal root is much smaller (1.3-7% in mandibular second molars as compared to 4.5-43.3% in mandibular first molars).[23] According to Vertucci FJ, the roots of the mandibular second molar are shorter; the canals are more curved, and the rate of anatomical variations is different.[7,23]

Normal anatomy of the mandibular second molar is with two roots: one mesial and one distal. They are usually separated, but can merge forming a conical root, with varying internal anatomy, and sometimes can have a C-shaped configuration. [14] Studies report the anatomic variations of mandibular second molars, which includes presence of single canal- 2-7%, two canal- 30%, four canals- 20%, five canals- 2% and C shaped system- 8.3-8.5%.[15-17]

All these variations represent 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. First,

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 guttapercha and sealer. Therefore, the debris filled canal extensions may lead to leakage.[18]

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.[19] This has led to the proposal of many modified techniques to optimize the technical quality and hence the prognosis of endodontic therapy.[20] Sabnis et al. suggested that passive sonic or ultrasonic irrigation, for as little as 30 s, resulted in significantly cleaner canals than hand filing alone.[10]

Sluis et al. conducted a study comparing cleaning efficacy of sonic, ultrasonic and passive syringe irrigation for 30 and 60 seconds. There was no difference in the cleaning efficacy at 30 and 60 seconds. Ultrasonic irrigation for 30 seconds produced significantly cleaner canals when compared to sonic irrigation.[21] The difference lies in the oscillating movements: sonic devices range between 1500 Hz and 6000 Hz, and ultrasonic equipment requires vibrations greater than 20,000 Hz.[22-25]

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- mm-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.[11]

CONCLUSION

Biomechanical preparation of large canals should be supplemented with additional cleaning aids to ensure complete debridement of the canal. Knowledge of root canal anatomy of teeth with fewer canals and preoperative radiographs before endodontic therapy are necessary to prevent iatrogenic errors in search of conventional number of canals in all cases.

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