

UNUSUAL ROOT CANAL CONFIGURATION OF MANDIBULAR SECOND MOLAR - CASE SERIES

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ABSTRACT

This case series presents three cases with rare root canal system in a mandibular second molar tooth, a single root with a single canal (oval or c shaped canal). C-shaped canals with varying configuration is commonly observed in single rooted mandibular second molars. These access cavities displayed only one round /oval canal orifice which is very rare. A clinician thus requires to have adequate knowledge about root morphology and its variation.

KEYWORDS: Mandibular Second Molar, C-shaped canals, Single Canal.

INTRODUCTION

A thorough knowledge of root canal anatomy is very necessary to achieve appropriate cleaning and shaping of the root canal system and ensure successful endodontic treatment.^[1] Knowledge of root canal anatomy also helps in the difficulty assessment of each case and various modifications required during therapy. Routine periapical radiographs helps us to assess the number, length, curvature and aberration of the canal system of the tooth.^[2] Variations in the form, configuration, and number of root canals in mandibular molars have been discussed extensively in endodontic literature.^[15] Most common anatomical configuration of mandibular second molar is that of two roots, mesial and distal & can also be fused to a single conical root with varying internal anatomy and often have c-shaped canal configuration.^[3] Number of root canal can vary from 1 to 6 or even more. The prevalence of C-shaped canals in single rooted second molars was found to be 8% as detected by spiral computed tomography.^[4] A study by Weine et al reported 1.3% of mandibular second molars had single canal configuration.^[5] C-shaped canal system is commonly found in mandibular molars especially in Asian population. A study by Yuan Gao et al described the presence of type I merging type of canals, where canals merged into one major canal before exiting at the apical foramen; partial dentin fusion areas may appear in the coronal and (or) middle portion of the canal.^[6]

However, no mention of the presence of single canal with a round or oval orifice in a second mandibular molars could be found in literature. The purpose of presentation of these cases is to present unusual occurrence of single canal or c shaped canals in single rooted mandibular second molar that required endodontic

treatment. In this article, we report three cases of endodontic management of a mandibular second molar with a single conical root.

CASE REPORT

CASE 1

A 28 years female patient reported to the Department of Conservative Dentistry and Endodontics with complain of pain in right mandibular second molar, whose medical history was non-contributory. On examination revealed a deep caries. The tooth on examination revealed a deep caries. The patient had pain on percussion. Intra oral periapical radiograph revealed radiolucency in the crown involving the pulp suggestive of a pulpal involvement (figure 1). The root canal morphology confirmed the presence of a single root with a linear canal, constricting towards the apex. Local anesthesia was induced using 1.8mL 2% lidocaine with 1 : 200,000 epinephrine (Xylocaine; AstraZeneca Pharma India Ltd., Bangalore, India). Following caries excavation the distal surface of the tooth was restored with IRM (IRM; Dentsply De Trey GmbH, Konstanz, Germany). Rubber dam was placed and a conventional endodontic access opening was established with an Endo Access bur (Dentsply Tulsa, Tulsa, OK). On access opening, a single large canal was located in the center of the pulp chamber. Usually a single rooted mandibular molar could be associated with C-shaped canal but in this case a "C-" shaped orifice/canal was not identified, instead a single large canal was present at the center of the pulp chamber which was confirmed using dental operating microscope (Seiler Revelation, St. Louis, MO, USA) (Figure 2).

Working length was determined using radiographs (Ingle's method) and confirmed with an apex locator

(Apex id, Sybron Endo) (Figure 3). Cleaning and shaping was done using circumferential filing technique with ISO 2% taper files up to size 60 (MANI Inc., Tochigi-Ken, Japan). Irrigation was performed using normal saline, 2.5% sodium hypochlorite solution, and 17% EDTA (Prime Dental Product Pvt. Ltd., Mumbai, India). Final rinsing of the canal was performed using 2% chlorhexidine digluconate coupled with ultrasonic agitation. The canal was dried with absorbent points (Dentsply Maillefer Instruments, Ballaigues, Switzerland) and obturation was performed using cold lateral compaction of gutta-percha (Dentsply Maillefer Instruments, Ballaigues, Switzerland). After completion of root canal treatment, the tooth was restored with definitive restoration. [Fig.1 a-d].

CASE 2

A 47 yr old female was referred for endodontic treatment. Patient complained of pain in relation to the right mandibular posterior region, especially after consuming hot drinks. Medical history was noncontributory. Intraoral examination revealed deep caries. These teeth were also tender on percussion. Intraoral periapical radiograph of the teeth revealed deep caries approximating the pulp without any associated periapical changes. Vitality test for heat and cold were positive. Based on these finding the condition was diagnosed as irreversible pulpitis. A detailed examination of the radiograph revealed the presence of a single root with a wide canal. Therefore c-shaped canal configuration was anticipated.

Access cavity opened after anesthesia under rubber dam and pulp extirpated. Examination of the pulpal floor revealed only a single round shaped orifice, classical

Cshaped canal orifice configuration or any other canal orifices could not be located. Working length was determined and cleaning and shaping completed by step back method and irrigation with a combination of irrigants. A snugly fitting master cone was selected. Obturation of the canal was done by combination of warm vertical condensation and thermo plasticized injectable gutta percha technique (Obtura II, Obtura Corporation). 47 the contra lateral tooth also revealed the same canal configuration. The same procedure of cleaning and shaping and obturation was followed. [fig. 2 a-d]

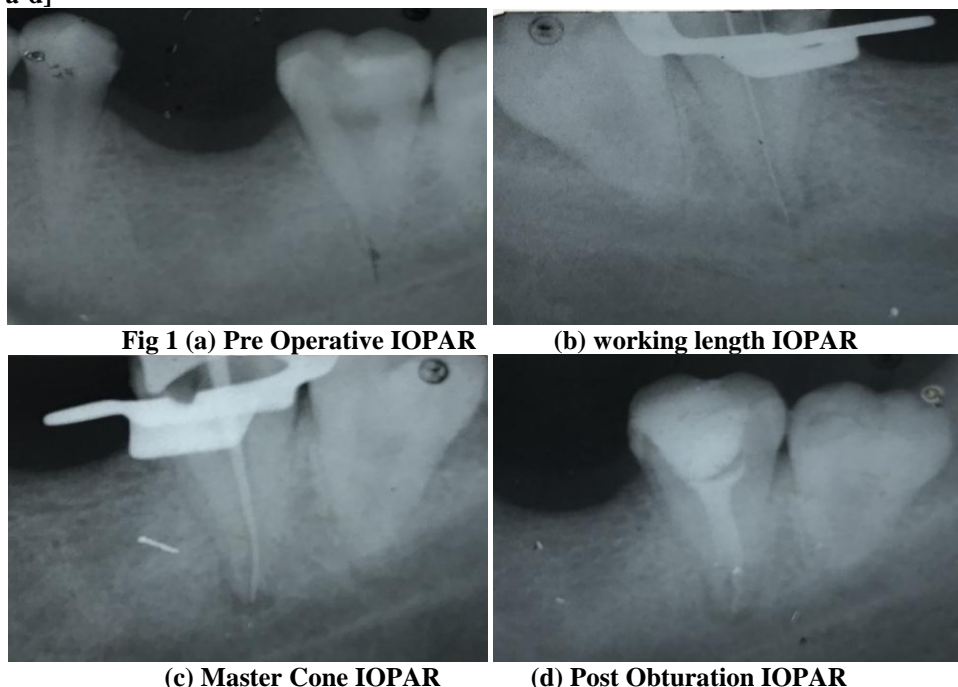
CASE 3

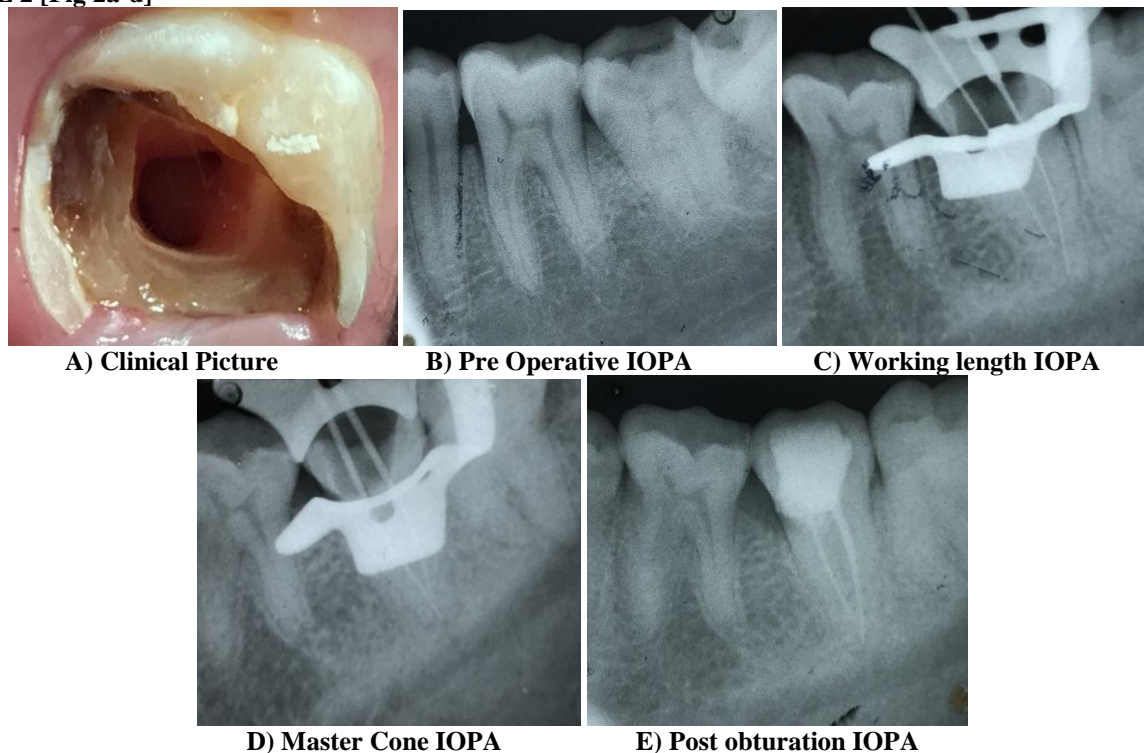
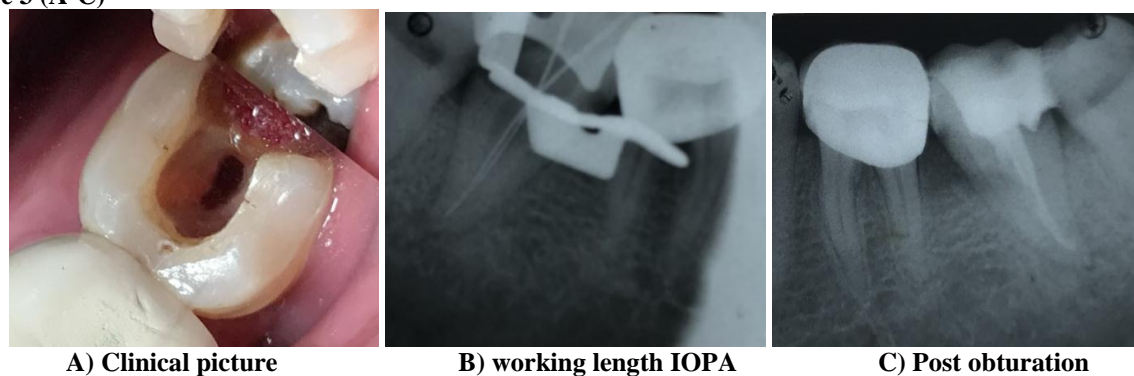
A 45 year old lady reported to the dental OPD of endodontic department with pain in relation to her mandibular right second molar, whose medical history was non-contributory. The tooth on examination revealed a deep caries. The patient had pain on percussion. Intra oral periapical radiograph revealed radiolucency in the crown involving the pulp suggestive of a pulpal involvement. The root canal morphology confirmed the presence of a single root with a linear canal, constricting towards the apex. Slight periradicular changes were appreciable.

After adequate anesthesia under rubber dam isolation an access cavity was prepared. Only a single round orifice was located in the middle portion of the floor of the pulp chamber. After pulp extirpation, working length determined using a 20 no. K-file. Cleaning and shaping was by step back technique. A thorough irrigation with sodium hypochlorite and saline was done throughout the procedure. A 70 no GP was selected as a master apical cone to obtain an apical tug back.

[Fig. 3 a-d]

CASE1 [fig.1 a-d]



CASE 2 [Fig 2a-d]**Figure 3 (A-C)****DISCUSSION**

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.^[6] As with most posterior teeth, the maxillary and 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, maxillary and mandibular second molars with a conical root and wide single root canal are also reported and the occurrence in mandibular molar is described more often than in the corresponding maxillary second molars.^[7] In case of C-shaped canal, radiograph always reveals a fused root with a longitudinal groove in the middle of the root.^[8,9] The basic feature of C shaped canals is the presence of a fin or web connecting the individual canals. Weine et al in a study evaluated 75 human extracted second molars and found one tooth (1.3%) with one root canal.^[5] Pansiera & Milano^[12]

studied 102 extracted human mandibular second molars and described six teeth (5.88%) possessing one root and one root canal. Manning et al in a study reported that Asians have a higher frequency of single rooted mandibular second molars.^[10]

Kottoor et al.^[13] and La et al.^[14] have suggested the use of CBCT for the purpose of determining the root canal morphology in cases with aberrations. However, the use of multiple preoperative radiographs or an additional radiographic view from a 20° degree mesial or distal projection increases the chances of detecting unusual root canal morphology.^[16] Therefore, In these cases, multiple radiographs in variable horizontal angulations were taken and they clearly indicated the presence of single root and single canal. In these cases initial evaluations of the radiographs suggested the presence of single root with a wide canal space suggesting that there may be c-shaped configuration of canals. After access cavity preparation, on observation of the pulpal floor

only one canal with a round orifice was located, suggestive of the presence of a single canal. Further exploration of the pulpal floor did not reveal presence of any additional orifice opening. Knowledge and recognition of canal configuration can facilitate more effective canal identification and unnecessary removal of healthy tooth structure in an attempt to search for missing canals. Based on the various studies describing the canal anatomy for second mandibular molar it is difficult to determine to which classification of C-shaped canal do these above described canals belong to or can they just be described as Vertucci's type I canal system. After the adequate Access opening the clinician should then perform a thorough examination of the pulp chamber to insure complete debridement of all canals. This increases the chance for long-term successful endodontic therapy.^[11]

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 of the tooth in concern will reveal more details of the anatomy of the root canal system.

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