Endodontic Management of C Shaped canal configuration in mandibular second molars: A report for two cases

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Abstract

Unusual canal morphologies hamper the success rate of endodontic treatment. C shaped canal configurations are the most commonly faced anatomic variations. Inability to identify and debride the C shaped canal may lead to endodontic failure. Presence of a C shaped canal presents a great challenge to the dentist. The presence of transverse anastomoses, lateral canals and apical deltas make it difficult to clean and seal the root canal in these teeth. Proper diagnosis and identification of canal variations using the latest diagnostic aids such as CBCT, microscopes and magnifying loupes help in better identification and management of C shaped canals. This paper reports 2 cases of C shaped canals which were diagnosed and managed successfully by endoactivator and SAF.

Case 1

A 35-year-old male patient reported to the Department of Conservative Dentistry and endodontics with a chief complaint of pain in the lower right back tooth region since 1 year. On clinical examination, there was a deep disto proximal carious lesion involving pulp. There was prolonged sensitivity to hot and cold vitality tests and it was tender on percussion. Radiographically, radiolucency was seen involving pulp with slight widening of periodontal ligament at apex. The patient was diagnosed with apical periodontitis in relation to 47. The radiograph also showed a single conical root with outline of single root canal, suggesting presence of C-shaped canal.

After gaining profound anesthesia and rubber dam application, an access cavity was prepared. After pulp extirpation, three orifices were seen, of which mesiobuccal and distal canals were united with separate mesiolingual canal to form incomplete C shaped canal [Fig1]. The pulp chamber was irrigated with 5% sodium hypochlorite. Working length was determined using apex locator (propex pixi, Dentsply) and radiographs [Fig2]. Cleaning and shaping was done with ProTaper rotary files (Dentsply Maillefer) till F2. The canals were joining at the apical third of the root. Calcium hydroxide (RC-Cal), an intracanal medicament was placed and the patient was recalled after 1 week. In the next appointment, master cone was fitted to the working length and radiographs were taken, and the canal was obturated with selected master gutta-percha cone along with accessory cones with zinc oxide eugenol as endodontic sealer. A temporary restoration was placed. The patient was recalled after 1 week for a post endodontic restoration [Fig:3].

Case 2

A 40 year old female patient reported to the department of Conservative Dentistry and endodontics with pain in relation to lower right back tooth region since 3 months. Pain was dull, and aggravated on
intake of hot and cold substances. On clinical examination deep occlusal caries was seen. On pulp sensibility testing tooth gave delayed response and on radiographic examination tooth was box shaped with fused roots with caries involving pulp space and with slight periodontal widening.

After attaining profound anesthesia access cavity was prepared under rubber dam isolation. The occluso-apical height of the pulp chamber was more than normal and the anatomy of the pulpal floor showed fusion of mesiobuccal and mesiolingual canals with isthmus and a separate distal canal Fig:4. Coronal orifice flaring was done using GG drill till no 3 and working length was determined by means of both radiograph and the apex locator. Cleaning and shaping was done till Protaper F2 in relation to mesiobuccal and mesiolingual canals and F3 in relation to the distal canal. Isthmus area was prepared by means of self adjusting file system with 1.5mm hollow cylindrical file. Strict irrigation protocol was followed with 5.25% NaOCl 1 to 2 ml after every file and 5ml at the end of bio mechanical preparation followed by irrigation with 17% EDTA and final rinse with chlorexidine. The canals were then dried and the obturation was done by means of warm vertical gutta percha condensation using calamus Fig5.Fig:6

Discussion

The prevalence of C-shaped configuration is highest in mandibular second molar and the bilateral occurrence was over 70%. The definition of a C-shaped canal is not yet clear. Some authors consider C-shaped canals as all those with a general outline of a “C” and present in a C-shaped root, regardless of whether a separate canal or orifice was observed. Recognition of a C-shaped canal configuration before treatment can facilitate effective management, which will prevent irreparable damage that may put the tooth in severe jeopardy. Careful location and negotiation of the canals and meticulous mechanical and chemical debridement of the pulp tissue should be carried out to successfully treat a C shaped canal. The C-shaped canal system presents a challenge to its proper debridement and obturation. Mandibular molars with C-shaped roots prepared with NiTi rotary instrumentation are associated with a higher percentage (59.6%) of uninstrumented canal areas than the manual K-file group (41.6%) with more dentine removed from the convex aspect of the C-shaped canal. Use of ultrasonics and an increased volume of irrigation and deeper penetration with small instruments allows effective cleaning and tissue removal from narrow C shaped canals.

Thermoplastised gutta percha technique is the recommended technique for canal irregularities.

The Case 1 represents type I C-shaped canal according to Fan et al. radiographic classification of C-shaped canal. There was a mesial and a distal canal that merged into one before exiting at the apical foramen. This type of tooth usually possess conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. Due to irregular canal morphology, irrigation plays a crucial role in root canal disinfection because it attains cleaning beyond what might be achieved by root canal instrumentation alone. This case was managed by instrumenting all the 3 canals upto F2 and followed by ultrasonic activation of 5.25% of NaOCl with endoactivator for 3 min in each canal. Later it was obturated with F2 Gutta-percha cone and AH plus sealer with warm vertical condensation technique.

The Case 2 represents type II configuration in which the tooth possess conical or square root with a vague, radiolucent longitudinal line separating the root into distal and mesial parts. There was a mesial and a distal canal and the two canals appeared to continue on their own pathway to the apex. This case was managed by cleaning the canals with rotary instruments and isthmus with SAF. Three dimensional adaptation and continuous irrigation thorough hollow design of SAF allows efficient cleaning and shaping of C shaped canals. Thermoplasticized gutta-percha technique of obturation was used in this case. All the cases were reviewed after 1 week and a 6 months follow up to evaluate the RCT by clinical and radiographic examination. The patients were free of pain and there were no radiographic abnormalities.

Conclusion

Understanding the anatomical presentation of this variation will enable the clinician to manage these cases effectively. Considerable care should be taken during biomechanical preparation and obturation of C-shaped canals for good long term prognosis.

References

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Illustrations

Illustration 1

CASE 1

Illustration 2

CASE 2