International Journal of Dentistry Research

Case Report

ISSN: 2581-3218
IJDR 2022; 7(1): 1-3
Received: 03-01-2022
Accepted: 18-02-2022

www.dentistryscience.com
doi: 10.31254/dentistry.2022.7101

Management of category IV C-shaped canal in mandibular second molar: A report of two cases

Prabhavathi Poornima[1], Atul U R[2], B S Keshava Prasad[3]

[1] Post graduate student, Department of Conservative Dentistry and Endodontics, DAPM RV Dental College, Bengaluru-560078, Karnataka, India
[2] Post graduate student, Department of Conservative Dentistry and Endodontics, DAPM RV Dental College, Bengaluru-560078, Karnataka, India
[3] Professor, Head of Department, Department of Conservative Dentistry and Endodontics, DAPM RV Dental College, Bengaluru-560078, Karnataka, India

Abstract

Root canal therapy aims to clean, shape and debride the entire pulp space followed by its three dimensional obturation with an inert root filling material. Anatomic variations can complicate the steps of identifying, negotiating and managing aberrant canals thereby affecting the prognosis of endodontic treatment. The C shaped configuration is one such variation that often poses a challenge in debridement and obturation. Recent advances in radiography, magnification, irrigation and obturation techniques aid effective management of C shaped root canals. This article presents the management of two cases with C shaped canals using CBCT imaging, ultrasonic irrigation and thermoplasticized obturation techniques.

Keywords: C-shaped Canal Fan, Classification CBCT , Thermoplasticized Obturation.

INTRODUCTION

The C shaped configuration was first reported in endodontic literature by Cooke and Cox in 1979. This configuration is identified by its "C" shaped morphology seen at the transverse cross section. In contrary to the usual anatomy, this ribbon-shaped canal has its orifice transcribing an arc of 180° that begins at mesiolingual line angle of pulp chamber, curves in the buccal direction and terminates at the distal aspect[1]. The C-shape configuration can either follow the same course throughout the root length, or may present with two/three separate canals in the C-shaped groove. Such teeth may have roots fusing at the buccal or lingual aspect giving a conical or square shape to the root [2].

The most widely accepted etiological theory states that the failure of fusion of Hertwig's epithelial root sheath (HERS) onto the buccal or lingual root surface results in a conical or prism shaped root with thin interradicular ribbon-shaped isthmus connecting them, forming the C-shaped canal configuration. Due to the high incidence of root fusion in the mandibular second molars, C-shaped canals are frequent [3].

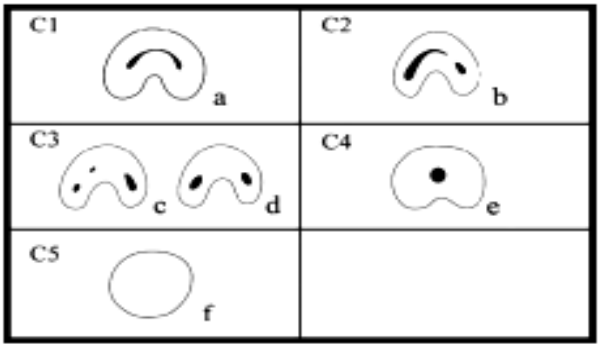

Figure 1: Anatomic classification of C-shaped canals by Fan et al.

Cleaning, shaping and obturation of C-shaped canals seem to be difficult due to their intricate root canal system with presence of numerous inaccesible fins or webs that connects individual canals[4]. But with the advent of magnification, rotary and hand instrumentation assisted with activated irrigation, as well as the modified obturation techniques have positively influenced the prognosis of this anatomical variant. This article presents the management of two cases of C-shaped root canal configuration in mandibular second molar by using CBCT imaging, and thermoplasticized obturation techniques.

***Corresponding author:**
Dr. Prabhavathi Poornima
Post graduate student, Department of Conservative Dentistry and Endodontics, DAPM RV Dental College, *Bengaluru-560078, Karnataka,* India
Email: ppn2386013@gmail.com

CASE REPORT

Case 1

A 27 years old male patient reported to the department of Conservative Dentistry and Endodontics with a chief complaint of pain in lower left back tooth region since a month. Medical history of the patient was noncontributory. Intraoral dental examination revealed deep class I carious lesion on tooth 37 with tenderness on percussion. Electric pulp testing gave a delayed response suggestive of pulpal pathology. Radiographic examination revealed occlusal carious lesion in 37 involving the pulp, with widening of the PDL space. The radiograph also revealed the presence of a single conical shaped root with a wide single root canal throughout the root length, indicating the presence of C-shaped canal configuration. The clinical and radiographic examination led to a diagnosis of symptomatic apical periodontitis with respect to 37, requiring root canal therapy and a full coverage prosthesis. Patient was explained the same and a written consent was obtained.

After the tooth was isolated and anesthetized, access cavity was prepared, pulpal tissue was extirpated and the access was examined with the dental loupes. Floor of pulp chamber revealed a single, large orifice located at the centre, suggestive of Fan et al C1 type canal anatomy. Working length was determined with size 25 K stainless steel hand files. Cleaning and shaping was performed using hand files under circumferential filing motion, under copious irrigation with 3% sodium hypochlorite which was ultrasonically activated. The apical third of the canal was prepared with Heroshaper hand file of size 30, (0.06), taper. In the subsequent appointment, master cone radiograph was taken to verify the extent of gutta percha upto the working length. After coating the canal with zinc oxide eugenol sealer, and ensuring a good tug back, the apical third of the canal was down packed with master cone, followed by back filling the rest of the canal space with thermoplasticised gutta percha (Sybron Endo Elements Obturation Unit). Warm vertical compaction was done to compact the softened gp, to obtain a dense obturation devoid of the voids. Access was restored with glass ionomer, and the patient was recalled after a week for prosthesis.

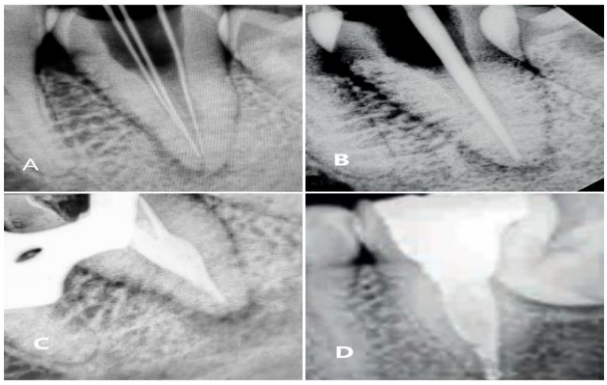

Figure 2: Working Length Determination, B- Master Cone radiograph, C- Thermoplasticized obturation, D- Post Operative radiograph

Case 2

A 24 years female patient reported to department of conservative dentistry and endodontics with the chief complaint of pain in the lower left back tooth region since 3-4 months. Medical history of the patient was non-contributory. On clinical examination 37 was grossly decayed and was tender on percussion. Intraoral periapical radiograph revealed deep dentinal caries involving the pulp space. A diagnosis of symptomatic irreversible pulpitis and symptomatic apical periodontitis was given. Root canal treatment followed by full-coverage crown was planned. The treatment plan was explained to the patient and informed consent was taken.

After achieving profound anaesthesia, all the caries were excavated and access cavity was prepared. Patient was advised to take a CBCT imaging of 37 so as to prevent further damage to the tooth while locating the canal which was already damaged due to carious process and also 37 was strategically important tooth as 38 was mesioangularly impacted.

The single canal was located easily with the help of CBCT images without loss of much tooth structure. After the extirpation of pulpal tissues, working length was determined by radiographic method. Cleaning and shaping was carried out till #40,0.6 using EDTA and copious irrigation with saline and sodium hypochlorite in between instrumentation. A final activation of irrigant was carried out with ultrasonic. Obturation was carried out in a method similar to previous case.

Figure 3: CBCT Images showing single canal in the tooth 37

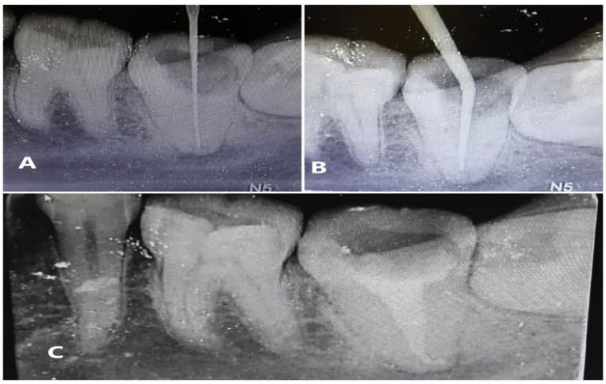

Figure 1: Working Length Determination, B- Master Cone radiograph, C- Immediate Post Operative radiograph

DISCUSSION

The incidence of C-shaped canal anatomy is found to be more frequent in the Asians than in whites. The incidence of C shaped canals in the Indian population is (7.5%)[5]. The interrelationship between C-shaped canal and gender, age or tooth position is not significant. Apart from the mandibular second molars, such configuration has also been reported in mandibular and maxillary first molars (0.12%), maxillary and mandibular third molars (3%-4.5%), mandibular first and second premolars (1%)[6,7]. The incidence of C-shaped canals existing bilaterally has been recorded in 70%-81% of cases [8].

Two dimensional radiographs are less effective in identifying the complex intricacies associated with C shaped canals. Recent radiographic imaging modalities like spiral CT and micro CT aid in the diagnosing the configurations of C-shaped canals[9]. On the other hand Volume CBCT comes with an added advantage of low radiation dose compared to the latter. It is a noninvasive radiographic technique that allows precise qualitative and quantitative evaluation of root canal morphology with high resolution three dimensional images[10]. In the above presented cases the Fan et al., category IV classification is seen in both the cases (Category IV: only one round or oval canal in the cross

section). In case 2 CBCT imaging could give a clear information regarding the number of canals and canal morphology which would not be possible with the use of conventional radiographs.

Complete disinfection and debridement of the canal spaces of this complex configuration is difficult to achieve. The numerous inaccessible fins, accessory canals, or isthmi harbor debris and soft-tissue remnants. Hence the step of irrigation plays an imperative role in debriding the spaces that cannot be instrumented. It has been reported that ultrasonic activation of the irrigant can accomplish meticulous disinfection and debridement of C-shaped canals. Circumferential and anti-curvature filing techniques are the recommended techniques for cleaning and shaping the wide width of c shaped canals. Due to numerous developmental grooves and concavities on the external root surface, the dentinal thickness varies across the root length, and thereby, isthmus should not be instrumented above #25 size files to minimize the potential for strip perforation[4,11].

The instrumentation with conventional instruments may be difficult in such cases. The recently developed self-adjusting file (SAF) system is more efficient than the other file systems for preparing the C-shaped canals. The NiTi metal lattice of the SAF file conforms itself into the narrow canal spaces. This feature along with continuous irrigation and vibrations create a scrubbing effect on the canal walls[12].

Qualitative obturation of teeth with a C shaped canal by lateral condensation is questionable due to the number of anastomoses present in the root canal system. Also the cold lateral condensation requires deeper penetration of spreaders and pluggers in various sites, the forces of compaction may result in root fractures because the roots can be thin in some areas unlike the tubular roots seen in usual cases. In this regard thermoplasticized gp technique ensures the flow of the gp or sealers into the narrow spaces and hence is more beneficial[13].

Modifications like combination of lateral and warm vertical condensation help in better adaptation and improved density of obturation. Martin et al developed Endo Tech II that combined the ease and speed of cold lateral condensation as well as superior density gained by vertical compaction of warmgutta-percha[14].

CONCLUSION

The C-shaped anatomy is often difficult to tackle in terms of negotiating the canal configuration, debriding the intricacies and obturating them. Advances with proper illumination and magnification backed up with CBCT imaging can help the clinician to negotiate this varied configuration non-invasively. Chemomechanical disinfection with Activated irrigation is considered more relevant in debriding such configurations that are often inaccessible by instrumentation. Hence with newer materials and technology, the clinicians can achieve predictable outcomes while managing C shaped configurations.

Conflict of Interest

None declared.

Financial Support

None declared.

REFERENCES

1. Cooke HG, Cox FL. C-shaped canal configurations in mandibular molars. J Am Dent Assoc. 1979;99(5):836-9.
2. Fan B, Cheung GS, Fan M, Gutmann JL, Bian Z. C-shaped canal system in mandibular second molars: part I - anatomical features. J Endod. 2004;30(12):899-03
3. Orban B, Mueller E. The development of the bifurcation of multirooted teeth. J Am Dent Assoc. 1922;16(2):297-19.
4. Chai WL, Thong YL. Cross-sectional morphology and minimum canal wall widths in Cshaped roots of mandibular molars. Journal of endodontics. 2004;1;30(7):509-12.
5. Cohen S, Burns RC. Pathways of the pulp 8th ed St. Louis CV Mosby Co St Louis Misso. 2002;641-46.
6. Neelakantan P, Subbarao C, Subbarao CV, Ravindranath M. Root and canal morphology of mandibular second molars in an Indian population. J Endod. 2010;36(8):1319-22.
7. Yılmaz Z, Tuncel B, Serper A, Calt S. Cshaped root canal in a maxillary first molar: a case report. Int Endod J. 2006;39(2):162-6.
8. Zheng Q, Zhang L, Zhou X, Wang Q, Wang Y, Tang L, et al. C-shaped root canal system in mandibular second molars in a Chinese population evaluated by cone-beam computed tomography. Int Endod J. 2011;44(9):857-62.
9. Singla M, Aggarwal V. C-shaped palatal canal in maxillary second molar mimicking two palatal canals diagnosed with the aid of spiral computerized tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endodontology. 2010;109(6):92-5.
10. Cotton TP, Geisler TM, Holden DT, Schwartz SA, Schindler WG. Endodontic applications of cone-beam volumetric tomography. J Endod. 2007;33(9):1121-32.
11. Cheung LH, Cheung GS. Evaluation of a rotary instrumentation method for C-shaped canals with micro-computed tomography. J Endod. 2008;34(10):1233-8.
12. Solomonov M, Paqué F, Fan B, Eilat Y, Berman LH. The challenge of C-shaped canal systems: a comparative study of the self-adjusting file and ProTaper. J Endod. 2012;38(2):209-14.
13. Ruddle CJ. Three-dimensional obturation of the root canal system. Dent Today. 1992;11(3):28-30
14. Liewehr FR, Kulild JC, Primack PD. Obturation of a C-shaped canal using an improved method of warm lateral condensation. J Endod. 1993;19(9):474-7.

HOW TO CITE THIS ARTICLE-
Poornima P, Atul UR, Prasad BSK. Management of category IV C-shaped canal in mandibular second molar: A report of two cases. Int J Dent Res 2022;7(1):1-3. doi: 10.31254/dentistry.2022.7101