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Management of C Shaped Canals – A Case Series

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Abstract:-

Background:- Success of an endodontic treatment relies on thorough understanding of tooth anatomy and ability to identify the different root canal configurations. One of the difficult root canal configuration that is frequently encounterd in mandibular second molars is C - shaped root canal. The canals are found to be connected by slit or web in C shaped root canal. Due to the presence of slit, fin and web ,shaping and cleaning of root canal space become difficult. This case series discuss about the root canal treatment of three different C-shaped canal configuration.

Keywords:- *C Shaped Canals, Ultrasonic Irrigation, Continuous Wave Compaction Obturation Technique.*

I. INTRODUCTION

One of the abberant morphology of root canal system is the C-shaped canal configuration and was first documented by Cooke and Cox in 1979 . The C - shaped variations reported most commonly in mandibular second molars with prevalence from 2.7% to 44.5%.[1] The 'C' shaped canals has also been reported in maxillary first molars (0.12%), maxillary third molars(4.7%), mandibular third molars(3.5-4%) and mandibular second premolars(1%).[2] According to ***Manning,*** the main etiology behind the C canal configuration may be due to the failure of Hertwig's epithelial root sheath to fuse on to the buccal or lingual root surface .[3]

C shaped canals have several discrete orifices. The pulp chamber of the C-shaped canal is a single ribbon-shaped orifice with an arc of 180° (or more). In mandibular molars, it starts at the mesiolingual line angle and sweeps around the buccal aspect to end at the distal aspect of the pulp chamber. The two basic variations are (a) single, ribbon-like, C-shaped canal extending from orifice to apex and (b) three or more distinct canals exiting below the C-shaped orifice. [4]

The presence of thin slits, fins or web that connects the individual root canals creates obstacles for the proper disinfection and obturation of the root canal space .[5] Radiographic interpretation of C shaped configuration with a two dimensional radiographs possess difficulties. Recognization of the C- shaped orifice on the pulpal floor and identifying the canal configuration till the apex of the root usually appeared to be a herculean task. The irregular areas in C shaped root canals can retain soft tissue remnants and infected debris . So it is important to perform a proper biomechanical preparation and select an obturation technique for a successful outcome. This case report presents the management of three different C-shaped canal configurations in mandibular molar teeth.

II. CASE DESCRIPTION

CASE 1: MANAGEMENT OF MANDIBULAR THIRD MOLAR WITH C SHAPED CANAL (UNINTERRUPTED C MORPHOLOGY-C1)

A 22 year old female patient reported to the Department of Conservative Dentistry and Endodontics complaining of pain in lower right back tooth on chewing . Her medical history was non-contributory. Initial dental examination revealed deep dentinal caries on tooth 48 with a slight tenderness on percussion. The tooth showed early lingering response to cold test and a delayed response to electric pulp test (EPT). Radiographically there was deep caries involving pulp. Root was in conical shape with fused mesial and distal roots with a thin radiolucent line between the roots, with a C-shaped canal configuration suspected (Fig 1A). The tooth was diagnosed with symptomatic irreversible pulpitis with symptomatic apical periodontitis. Root canal treatment (RCT) was planned in relation to 48.

The access cavity was prepared under dental operating microscope and an uninterrupted c shaped canals with one mesial and one distal orifices were identified(Fig 1B). The cleaning and shaping of the canal was done using hand K files and ProTaper gold rotary files (Dentsply Maillefer, Ballaigues, Switzerland) up to F2(Fig 1C) .5.25% sodium hypochlorite was used in copious amount for irrigation and activated with ultrasonic tips . As intracanal medicament, calcium hydroxide dressing was given . The patient was recalled for the next visit after 1 week and was asymptomatic. The obturation was performed by continuous wave compaction technique, selecting a 30 size ,4% taper master cone on both the canals. An appropriate pen tip prefitted within 5 mm of the apical terminus was selected. Cordless gutta percha obturation pen- i fill (Denjoy guttapercha obturation system) was set to 200° C in the touch mode. The pen tip was inserted into the canal orifice

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and activated to remove excess coronal gutta percha.The heat was inactivated and at the same time firm pressure was maintained on the pen tip for 5 to 10 seconds. After the gutta-percha mass has cooled ,a 1-second of heat application separates the pen tip from the gutta-percha, and it was removed. Remaining portion of the canal was back filled with thermoplasticized gutta percha by using Denjoy ifill obturation gun (Fig 1D and 1E)

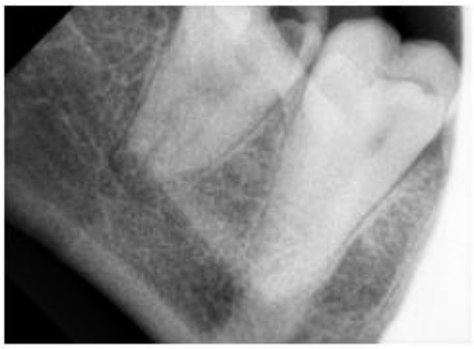

FIGURE 1A- PREOPERATIVE RADIOGRAPH OF 48

FIGURE 1B- ACCESS OPENING UNDER MAGNIFICATION

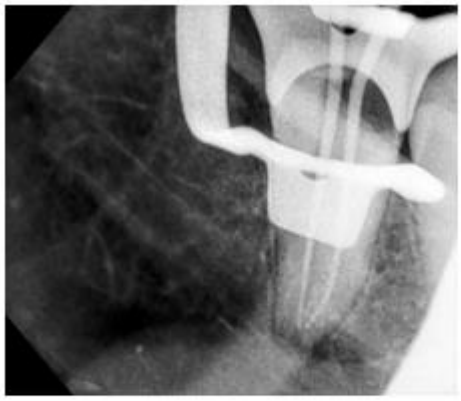

FIGURE 1C - MASTER CONE RADIOGRAPH

FIGURE 1D - POST OBTURATION PHOTOGRAPH

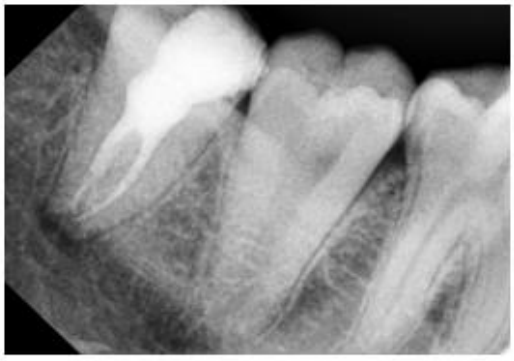

FIGURE-1E POST OBTURATION RADIOGRAPH (CONTINUOUS WAVE COMPACTION)

FIGURE 1F-REVIEW AFTER SIX MONTHS

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CASE 2: MANAGEMENT OF MANDIBULAR THIRD MOLAR WITH C SHAPED CANAL (C2 MORPHOLOGY)

A 21year old female patient came to the Department of Conservative Dentistry and Endodontics complaning of pain in lower left back tooth since two days . Her medical history was non-significant. Intra oral examination revealed carious 38 with tenderness on percussion and the tooth had drifted mesially in the place of missing 37 . Intra oral periapical radiograph (IOPA) showed deep caries involving pulp(Fig 2A). Cold test gave painful lingering response and EPT showed a delayed response. Tooth was diagnosed to have symptomatic irreversible pulpitis with symptomatic apical periodontitis. RCT was planned for the tooth .

Access cavity was prepared after achieving profound local anaesthesia and a semi column shaped C canal configuration was identified with a one large distal canal extending bucco lingually and one separate mesial canal (Fig 2B). Cleaning and shaping of the root canal was done with hand K files and ProTaper gold rotary files (Dentsply Maillefer, Ballaigues, Switzerland) up to F2(Fig 2C). 5.25% sodium hypochlorite in copious amount was used for irrigation and activated with ultrasonic tips. As the intracanal medicament calcium hydroxide dressing was given. The patient was recalled for the next visit after 1 week and was symptom free. The obturation was performed using continuous wave compaction obturation technique (Fig 2D and Fig 2E).

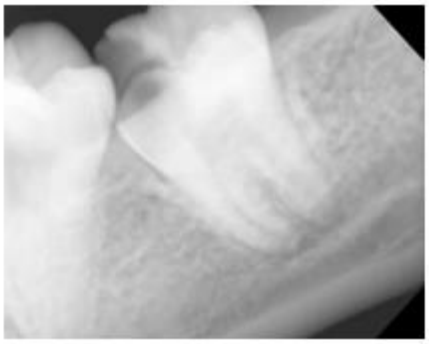

FIGURE 2A -PRE-OPERATIVE RADIOGRAPH

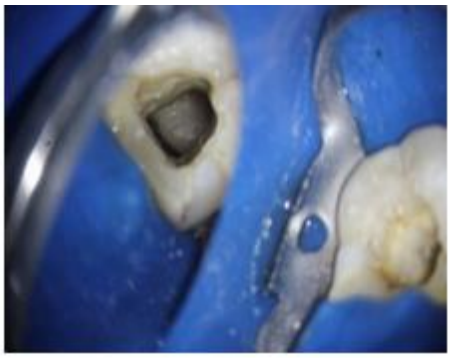

FIGURE 2B-ACCESS OPENING UNDER MAGNIFICATION

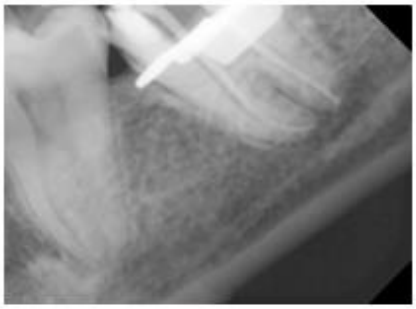

FIGURE 2C- MASTER CONE RADIOGRAPH

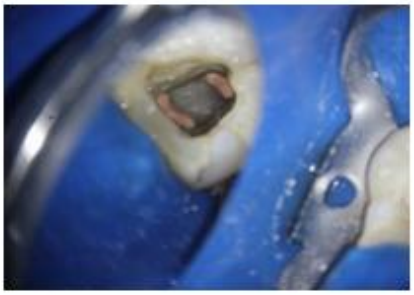

FIGURE 2D-POST OBTURATION PHOTOGRAPH

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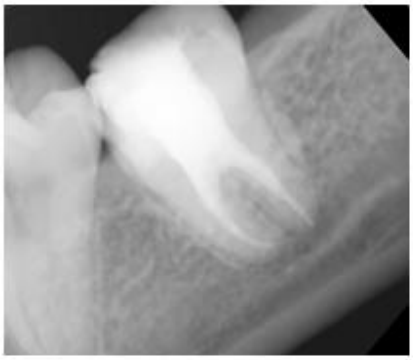

FIGURE 2E-OBTURATION WITH CONTINUOUS WAVE COMPACTION

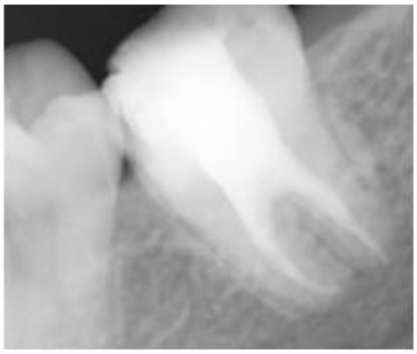

FIGURE 2F-REVIEW AFTER SIX MONTHS

CASE 3: MANAGEMENT OF MANDIBULAR SECOND MOLAR WITH C SHAPED CANAL (C3 MORPHOLOGY)

A 26 year old female patient visited the Department of Conservative Dentistry and Endodontics complaining of pain in relation to 47. Her medical history was noncontributory. In the intra oral examination it revealed a carious 47 with tenderness on percussion. The radiograph has shown a deep carious lesion with pulpal involvement and fused mesial and distal roots (Fig 3a). The tooth was diagnosed with symptomatic irreversible pulpitis with symptomatic apical periodontitis.

Access cavity was prepared after adequate anaesthesia under rubber dam and three separate orifices with two mesial orifices and a broad C- shaped distal orifice (Fig3B and Fig 3C). Working length was determined(Fig 3B) after which the cleaning and shaping was performed with Protaper gold rotary files. Irrigation was carried out with copious amount of 5.25% Sodium hypochlorite and normal saline. The obturation was carried out with cold lateral compaction technique(Fig 3D & 3E).

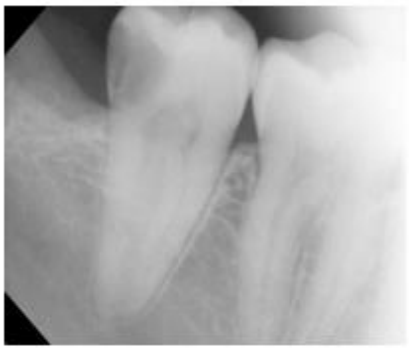

FIGURE 3 A-PRE-OPERATIVES RADIOGRAPH

FIGURE 3 B- ACCESSES OPENING UNDER

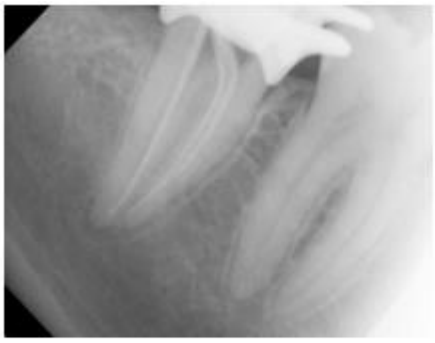

FIGURE 3 C - MASTER CONE RADIOGRAPH

FIGURE 3 D - POST OBTURATION PHOTOGRAPH

FIGURE 3 E - POST OBTURATION RADIOGRAPH

FIGURE 3 F - REVIEW AFTER SIX MONTHS

III. DISCUSSION

The preoperative knowledge of internal dental anatomy and variations of the root canal system is relevant for the successful outcome of the endodontic treatment . C shaped configuration of root canals are an important morphological variation encountered in the routine endodontic practice. According to ***Wadhwani*** et al. the prevalence of C shaped canals in mandibular second and third molars are 9.7% and 8% respectively.[6]

Various classifications of C-shaped canal configurations have been proposed to make the diagnosis and treatment. Melton et al in 1991 proposed a classification in which the C shaped canals are classified into three types, Type I, Type II and Type III. Type I indicates continuous C shaped canal, Type II configurations having a Semicolon, shaped canal which extends buccally or lingually, separated from another distinctive canal with a dentine wall and in Type III , separate canals are present.[4]

Majority of teeth with C shaped canal system showed an orifice with an uninterrupted "C"configuration.[8] The teeth having a C shaped canal system usually exhibits fused roots, longitudinal groove on the lingual or buccal surfaces of the root, and a C1, C2, or C3 canal cross section.

In the current case reports, three cases of different C shaped configurations had been discussed. Preoperative radiographs of the Case 1 and Case 3 showed close fused roots and Case 2 had images of two distinct roots. Additional 20° of mesial or distal angulation will be useful to detect this configuration.

Fan et al. suggested a new classification for C- shaped canals in 2004 . He modified Melton's classification and divided the C-shaped canals into five types. Type I configurations having continuous shape, Type II with semicolon shape and Type III having two or three separate canals. In type IV, only one round or oval canal and Type V with no canal lumen.[7]

The Case 1 represents Type I 'C' shaped canal, according to ***Fan*** *et al.* radiographic classification of C shaped canal. The mesial and a distal canals of the tooth were appeard to be merged into single canal near the apex . Due to the accessibility up to the apical third this case was managed with continuous wave compaction (Fig 1A-1F). The Case 2 represents Type II configuration in which mesial and a distal canals appeared to have two seperate canal opening at the apex. This case was also obturated using continuous wave compaction technique (Fig 2A-2F).

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The Case 3 represents Type III 'C' configuration in which the tooth poses fused distal and mesial roots. There was two mesial and a distal canal. This case was managed with cold lateral compaction obturation technique (Fig 3A-3F).

In all the three cases root canal treatment procedure was done under dental operating microscope which helped us in understanding the anatomical variation and thereby improving the treatment outcome.

Root canal cleaning and shaping is the critical procedure during the management of C shaped canals. Care should be taken to avoid strip perforation during the cleaning and shaping of a 'C' shaped root canal space. The anti curvature filing method was useful in these circumstances. [4]

Irrigation of the root canal plays a crucial role in the root canal disinfection of 'C' shaped canals because it can attain effective cleaning beyond what might be achieved by root canal instrumentation alone .[8] Copious amount of 5.25 % of sodium hypochlorite and activation with ultrasonics had been used in all the cases in-order to get a maximum disinfection and debridement in the inaccessible areas.[4] Due to the irregular canal morphology, the use of thermoplasticized Gutta percha will be useful for effective obturation.[9] So in the current case report two cases were obturated using continuous wave compaction and one with cold lateral compaction technique.

In all the cases review was done till 6 months to evaluate the outcome . The patients were totally asymptomatic and no abnormalities were detected in the radiographic examination (Fig 1F, Fig 2F and Fig 3F).

IV. CONCLUSION

The basic knowledge about the morphology of the natural dentition is the stepping stone for an accurate diagnosis, three dimensional root canal cleaning and shaping as well as obturation. Management of C shaped canals requires, an efficient biomechanical preparation and an appropriate obturation technique for a better prognosis.

CLINICAL SIGNIFICANCE

The presence of inaccessible areas and unique canal patterns of C shaped canals make the successful endodontic therapy of this canal configuration very difficult. Better treatment outcome can be achieved by using dental operating microscope, appropriate rotary and hand instrumentation assisted with ultrasonic irrigant activation and a three dimensional obturation of the root canal system.

REFERENCES

[1]. Seo DG, Gu Y, Yi YA, Lee SJ, Jeong JS, Lee Y, *et al.* A biometric study of C-shaped root canal systems in mandibular second molars using cone-beam computed tomography. Int Endod J 2012;45:807-14.
[2]. Vasudeva, A., Sinha, D. J., Tyagi, N., Tyagi, S. P., & Vasudeva, A. (2015). The Concurrence of Radix Paramolaris and C Shaped Root Canal Anatomy in Adjacent Teeth: A Rare Finding. *J Dent App*, *2*(7), 261-263.
[3]. Manning SA. Root canal anatomy of mandibular second molars. Part II. C-shaped canals. Int Endod J 1990;23:40-5.
[4]. Jafarzadeh H, Wu YN. The C-shaped root canal configuration: A review. J Endod 2007;33:517-23.
[5]. 5.Fan B, Min Y, Lu G, Yang J, Cheung GS, Gutmann JL. Negotiation of C-shaped canal systems in mandibular second molars. J Endod 2009;35:1003-8.
[6]. Wadhwani S, Singh MP, Agarwal M, Somasundaram P, Rawtiya M, Wadhwani P K. Prevalence of C-shaped canals in mandibular second and third molars in a central India population: A cone beam computed tomography analysis. J Conserv Dent 2017;20:351-4.
[7]. 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;30:899-903.
[8]. Elumalai D, Kumar A, Tewari RK, Mishra SK, Iftekhar H, Alam S, *et al*. Newer endodontic irrigation devices: An update. IOSR J Dent Med Sci 2014;13:4-8.
[9]. Elumalai D, Kumar A, Tewari RK, Mishra SK, Andrabi SM, Iftekhar H, *et al*. Management of C-shaped root canal configuration with three different obturation systems. Eur J Gen Dent 2015;4:25-8.