Management of a C-Shaped Canal in mandibular second molar Using a novel Bio ceramic Sealer: A case report

Shubham Sharma,[1] Harpreet Singh,[2] Sunil Malhan[3] Gursandeep Kaur Sandhu,[4] Harpreet Kaur[5], Bharat Bhushan[6]

[1,5-6]Postgraduate Student, [2]Dean Research, Professor and Head, [3,4]Professor,
Department of Conservative dentistry & Endodontics ,
Desh Bhagat Dental College and Hospital, Mandi Gobindgarh, Punjab, India.

Corresponding Author: Prof (Dr) Harpreet singh, Dean Research, Professor and Head, Department of Conservative dentistry & Endodontics, Desh Bhagat Dental College & Hospital, Mandi Gobindgarh. Email id: deanresearch.dbdc@deshbhagatuniversity.in

ABSTRACT

C-shaped canal configurations present significant clinical challenges due to their complex anatomy and difficulty in achieving effective debridement and obturation. This case report describes the endodontic management of a mandibular second molar exhibiting a C-shaped canal morphology. Chemo mechanical preparation was enhanced using liquid EDTA to improve smear layer removal and facilitate penetration of sealer into the dentinal tubules. Obturation was performed with a novel bio ceramic sealer (CanalPro Bioceramic sealer Coltene,Switzerland) to achieve superior adaptation and three-dimensional sealing of the irregular canal spaces. This report highlights the importance of advanced irrigation protocols and the use of bio ceramic sealers in managing complex canal anatomies during endodontic therapy.

Keywords: C-shaped canal, complex anatomy, liquid EDTA, bio ceramic sealer, smear layer removal, chemo mechanical preparation, obturation, mandibular molar, endodontic management.

INTRODUCTION

The variations in root canal system morphology in molars involve clinicians facing ceaseless challenges in endodontic treatments. For instance, the C- shaped root canal configuration, an anatomical canal variation usually found in root- fused teeth is characterized by the existence of isthmus or webs connecting the canals .[1]

The pulp chamber of the C-shaped canal has a single ribbon-shaped orifice with a 180° arc (or more) in place of many distinct orifices. In mandibular molars, this orifice begins at the mesio-lingual line angle and extends across the buccal region to the pulp chamber's distal face. The root structure may contain a variety of anatomical differences below the orifice level. Those that have a single, ribbon-like, C-shaped canal from orifice to apex and those that have three or more separate canals below the C-shaped orifice are the two primary categories into which these can be divided since single-swath C-shaped canals are the exception rather than the rule[2]

The presence of a fin or web connecting the separate root canals is the primary anatomical characteristic of C-shaped canals. Conical or square roots with a C-shaped canal are frequently found[3,4.] The following three characteristics must be present in all teeth that qualify as having a C-shaped canal system: fused roots, a longitudinal groove on the lingual or buccal surfaces of the root, and at least one cross-section of the canal belongs to the C1, C2, or C3 configuration[2]Considering such complexity in the anatomy of C shaped root canal it is highly essential that extreme care must be taken while performing endodontic therapy of these teeth. The irrigation protocol must be strictly adhered to and the use of Bioceramic sealer must be considered so as to achieve a three-dimensional sealing of root canal system. This case report highlights the significance of smear layer removal and the use of Bioceramic sealer in effective management of mandibular second molar with C-shaped root canal system.

CASE REPORT

A 60-year-old female reported to the department of Conservative Dentistry and Endodontics, Desh Bhagat Dental College and Hospital with chief complaint of constant pain while chewing food. On clinical examination, dental caries was observed in tooth # 37. The intraoral periapical radiograph of tooth# 37 revealed the presence of dental caries. Negative response to the pulp testing (cold test using Endo frost, Coltene,Switzerland), A diagnosis of periapical periodontitis with chronic irreversible pulpitis was

made.

The intra oral periapical radiograph (IOPAR) appeared as an atypical canal configuration with the presence of root canals that are C-shaped. (Figure 1). Following the administration of 1.5 ml of local anaesthetic, rubber dam isolation was done, and carious lesion was removed. Access opening was done using a sterile Endo access bur (coltene,Switzerland). The working length was determined using an electronic apex locator (CanalPro CL2i Endomotor,Coltene Switzerland) and then confirmed periapical radiograph (Figure 2)

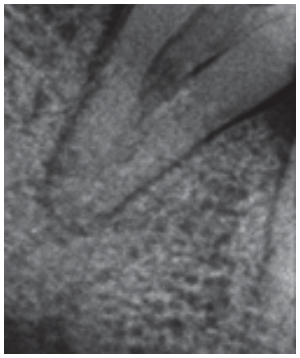

Figure: 1

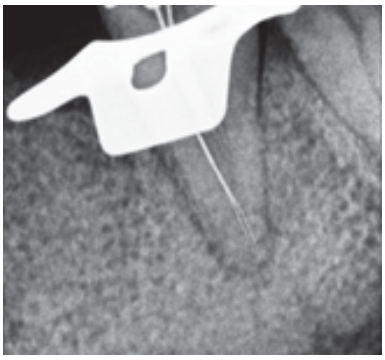

Figure: 2

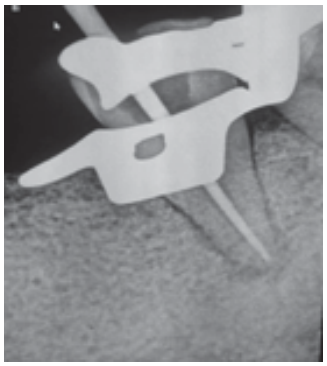

Figure: 3

Figure: 4

Mechanical preparation was done in a Comen hand step back technique. During instrumentation, CanalPro 5.25% sodium hypochlorite (Coltene, Switzerland) was used as an irrigant (Figure 5) and 17% CanalPro EDTA solution (Coltene, Switzerland) (Figure 6) was used for smear layer removal and was activated for 1 min using Canal Pro Endo Activator (Coltene, Switzerland) (Figure 7). Saline was used to wash out remaining EDTA from the canals. And finally, the canal was dried with sterile paper points. Obturation was done (Figure 4) by cold lateral compaction obturation technique using 40 / .02 mater cone using the Canal Pro Root Canal Sealer (Coltene, Switzerland) (figure 8). The post obturation restoration was done.

Figure: 5

Figure: 6

Figure: 7

Figure: 8

Discussion

Choosing the right irrigants leads to the complete elimination of the infected areas in the isthmus. For adequate chemical treatment, we recommend activating the solutions through sonic activation with the Endo Activator. There are many materials and techniques for filling root canals. It is necessary to evaluate which combination of materials and methods would lead to the hermetic three-dimensional sealing of the root canal system. Bioceramic sealers give good results due to their ability to adapt to the irregularities in the root canal system and thus permanently seal the anatomical complexities encompass residue of infected pulp tissue leading to persistent intra radicular infection triggered by microorganisms hosted in these zones.[5,6] The presence of fins in a C- shaped canal configuration makes it challenging to do the debridement efficiently.[7]

There is a high risk of root perforation at the thinner lingual walls of C-shaped canals during cleaning and shaping. The Abou-Rass et.al Anti-curvature filing technique has been recommended to avoid danger zones that are frequently present at mesiolingual walls thus this technique was used in this case. [8]

Obtaining a three-dimensional fill of a C-shaped canal may prove to be a problem due to the various intricacies present within the root canal system. Therefore, use of a Bioceramic sealer was made which possessed a good flow, thereby ensuring a 3D seal [9,10]

CONCLUSION

The successful management of this C-shaped canal highlights the importance of combining advanced irrigation protocols and a use of a novel Bioceramic sealer. The use of liquid EDTA enhanced smear layer removal and improved irrigant penetration in the complex isthmus areas, while the CanalPro Bioceramic Sealer provided excellent flow, adaptability, and a predictable three-dimensional seal. Together, these techniques contributed to effective debridement, obturation, and a favourable clinical outcome. This case demonstrates that meticulous technique, supported by contemporary materials, can significantly improve the prognosis of teeth with complex canal anatomies.

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