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Management of C-shaped canal configuration in mandibular molar tooth: A Case-Report

Manoj Kumar[1], Harmanjot[2]

[1, 2]Department of Conservative Dentistry and Endodontics, Dr. Harvansh Singh Judge Institute of Dental Sciences & Hospital, Panjab University, Chandigarh, India

ABSTRACT

With a prevalence that varies from 2.7% to 45.5% in various cultures, the C-shaped root canal configuration is an anatomical variation of root fusion and a kind of taurodontism frequently observed in the mandibular second molar. In addition to diagnosis, treatment planning, and clinical expertise, a comprehensive understanding of the root canal anatomy and its variations is necessary for successful root canal therapy. A 45-year-old male patient who was systemically healthy reported with complaints of pain in lower right back tooth region from past 1-month. On intra-oral examination occlusal surface of mandibular right second molar found carious. Intra-oral periapical(IOPA) radiograph showed radiolucency approaching toward pulp chamber from mesial side of tooth along with periapical radiolucency involvement. After access cavity preparation pulpal floor revealed c-shaped root canal morphology. Root canal treatment was done with caution and patient was followed up for 1-year. No post-operative complication was obtained at follow-up visits.

Keywords: c-shaped canal, mandibular molar, root canal

INTRODUCTION

The C-shaped cross-sectional anatomical structure of the root and root canal is what gives rise to the term "C-shaped root canal." Cooke and Cox were the first to describe this condition in a published work in 1979.[1] The C-shaped canal arrangement is most frequently seen in mandibular second molars,[2] but it can also be seen in mandibular premolars, maxillary molars, and mandibular third molars.[3]

Failure of the Hertwig's epithelial root sheath to fuse on the lingual or buccal root surface is the main cause of C-shaped roots, which always contain a C-shaped canal. Since the canal(s) run from the coronal to the apical third, the C-shaped canal design exhibits variances in both the number and placement of the canal(s). When it comes to debridement, obturation, and perhaps the outcome of root canal therapy, the intricacy of this canal structure presents difficulties.

Prior to treatment, identifying a C-shaped canal layout can help with efficient management, preventing irreversible damage that could seriously endanger the tooth. Once identified, the C-shaped canal presents difficulties for obturation and debridement, particularly as it is uncertain if the C-shaped opening on the pulp chamber floor truly extends to the apical third of the root.[1,4]This canal arrangement is typically encountered in teeth where the buccal or lingual aspects of the roots have fused. The presence of a fin or web joining the separate root canals is the primary anatomical characteristic of C-shaped canals. Roots with a C-shaped canal frequently have a square or conical form.[5]When good biomechanical preparation, obturation, and restoration practices are followed, the long-term prognosis for C-shaped root retention is comparable to that of other molars; however, cautious optimism seems to be the most appropriate way to predict whether a C-shaped canal root canal treatment will be successful.[6]

Based on the shape of their cross-section, Melton et al. (1991)[7] proposed the classification for C-shaped canals which was further modified by Fan et al. In current case report category-1 type canal that is continuous C-shaped canal running from the pulp chamber to the apex defines a C-shaped outline without any separation was observed.

CASE REPORT

In this case report a 45-year-old systemically healthy male reported with chief complaint of pain in lower right back teeth region from past 1 month. On intra-oral examination occlusal caries was detected in mandibular right second molar tooth and periapical radiograph reveal radiolucency involving pulp chamber and periapical area[figure1]. The presence of a single conical root also showed on periapical radiograph[figure1]. On electrical and thermal pulp testing,

the tooth was found nonresponsive to stimuli, suggesting loss of tooth vitality. Rubber dam isolation was used before start of root canal therapy. After access cavity preparation pulpal floor revealed the presence of C1-shaped orifice extending from distal to mesio-lingual canal[figure2]. Exploration of the orifice showed one common apical exit.The working length of tooth was determined[figure3]. The canal orifice was enlarged by an ultrasonic tip for facilitating uninterrupted instrumentation and successful root canal treatment. Cleaning and shaping of root canal were initiated with hand Protaperfile in the wider portion of C-shaped canal, followed by circumferential filing using hand k-file instruments.A uniform canal preparation was achieved after cleaning and shaping. A 5.25% sodium hypochlorite and 17% ethylenediaminetetraacetic acid (EDTA) were used as irrigants alternatively. The canal was dried with sterile paper points and temporized with noneugenol temporary restoration. The canal was obturated by warm vertical compaction technique[figure 4]. Post-operative restoration and coronal seal was obtained in respective root canal treated tooth [figure5]. Visual Analog Scale(VAS) score was obtained at each follow-up visits that indicate no-pain.After 1 month, the patient was recalled and was found to be asymptomatic. A 1-year recall examination clinically demonstrated an asymptomatic tooth, with normal attachment and architecture of the soft tissues. A radiographic analysis at this recall evaluation revealed no development of a periapical lesion and no further widening of the periodontal ligament (PDL) space [figure6]

Figure 1- IOPA Radiograph (at baseline)

Figure 2-Pulpal floor with C-shaped canal

Figure 3- Working length determination

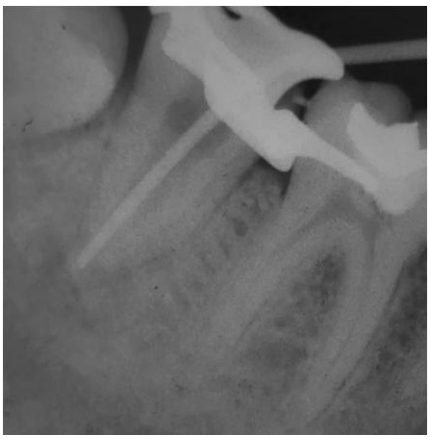

Figure 4- Master cone radiograph

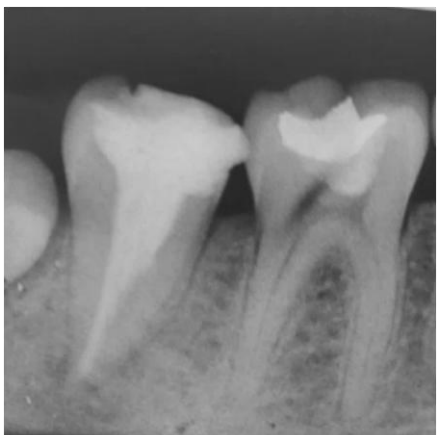

Figure 5- Obturation with Post-operative restoration

Figure 6- IOPA Radiograph at 12 months follow-up

RESULTS

Patient did not complain any post-operative complications like swelling, pain and pus discharge at follow-up visits and presented a well-maintained tooth along with good oral hygiene.

DISCUSSION

A C-shaped root canal system's access cavity varies greatly depending on the pulp architecture of the individual tooth.[8] The initial detection of the canal system happens following the successful completion of normal endodontic access and pulp chamber tissue removal.[6]The dentist should check for furcal disintegration during the follow-up radiographic examination since it is the hardest to obturate and has the highest risk of perforation. A restoration's chances of success are poor if the furcation area fails.When good biomechanical preparation, obturation, and restoration practices are followed, the long-term prognosis for C-shaped root retention is comparable to that of other molars; however, cautious optimism seems to be the most appropriate way to predict the success of root canal therapy for a C-shaped canal.[6,7]

CONCLUSION

Familiarization with dental anomalies, specifically those pertaining to endodontic treatment, will enable the clinician to prevent inaccurate diagnosis that can potentially lead to inappropriate treatment or procedural errors.Neither development of a periapical lesion nor further widening of the periodontal ligament (PDL) space was observed at 12 months follow-up visit.

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