Never Miss on the Extras: Middle Mesial Canal an Extra Entity

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Abstract

The primary objective of endodontic therapy is to achieve a three-dimensional obturation of the root canal space to remove the tissue debris, microorganisms and their by products after a proper biomechanical preparation of the pulp chambers. The missing canal of complex root canal morphology is major reason for endodontic failure. The use of magnification, illumination, recent advancements, diagnostic aids and techniques help in minimizing the incidence of missing a canal. This case report describes the rare management of a left mandibular first permanent molar requiring root canal treatment with an additional Middle Mesial Canal (MMC) in the mesial root. Clinicians experience and approach is a key factor in negotiation and management of these aberrant canal configurations.

Keywords: Magnification, Middle Mesial Canal (MMC), Negotiation

1. Introduction

The main objective of a successful root canal therapy is to obtain a hermetic seal of the root canal space and a missed canal is an area which when neither debrided nor sealed becomes a potential source of microorganisms leading to periapical inflammation^[1]. According to literature mandibular permanent molar teeth indicates variations ranging from single canal with single apical foramen to five canals with four apical foramina^[2].

A narrow passage called isthmus seen to be present between mesial or distal canals contains pulpal tissue forming anatomical variations such as middle canals^[3,4].

This case report discusses the management of mandibular molar with an extra mesial canal and emphasizes on the importance of a sound knowledge about the variations of pulpal anatomy for a successful endodontic treatment.

2. Case Discussion

A 15-year-old female patient reported to the Department of Pedodontics and Preventive Dentistry of ITS Dental College, Hospital and Research Centre, Greater Noida with decayed tooth and associated pain over his left mandibular region and grossly decayed right mandibular molar (Figure 1). Intraoral examination revealed deep carious lesion in 36 and grossly decayed tooth irt 46. The tooth on the left side exhibited no mobility with mild tenderness on percussion and gave a negative response to heat test and a mild reaction to an electric pulp tester.



Figure 1. Occlusal views of upper and lower arch.

The preoperative diagnostic radiograph of 36 (Figure 2a) revealed a deep carious lesion involving the pulp with widening of the apical periodontal ligament space. A provisional diagnosis of necrotic pulp with apical

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periodontitis was made and endodontic treatment was planned.

Local anesthesia was administered and carious lesion was removed and an adequate endodontic access made. Inspection of the pulp chamber floor showed orifices corresponding to mesiobuccal, mesiolingual, and distobuccal and distal canals canals. On careful examination of the groove and troughing between the mesiobuccal and mesiolingual canal orifices, the middle mesial canal orifice was identified and the canal was subsequently negotiated (Figure 2b).

The working lengths were established with an electronic apex locator and size 10 K files of 21 mm length (Dentsply, Maillefer, Ballaigues, Switzerland) were used to confirm three canals in the mesial root radiographically. The working length measurement radiograph showed three independent mesial root canals by instrumenting

with a H file and 2 K file of 21 mm length (Dentsply, Maillefer) to see all three canals in mesial root separately and the orifices and canals were shaped with Neoendo protaper rotary files.

Irrigation was done with copious amounts of 2.5% sodium hypochlorite and 17% ethylenediaminetetraacetic acid (EDTA; Pulpdent Corporation, Massachusetts, USA). After preparation the canals were finally irrigated with sterile saline, dried with sterile paper points, and a calcium hydroxide dressing was given. After a week, the tooth was asymptomatic and was obturation with gutta percha cones (Dentsply, Maillefer) using AH-Plus sealer (Dentsply DeTrey GmbH, Konstanz, Germany) (Figure 2c and 2d). A composite restoration was done as a post endo restoration and patient experienced no postoperative sequelae.



Figure 2. a) IOPAR irt 36, **b)** Working length radiograph MB ML DL DB MM canal, **c)** Mastercone radiograph irt 36, **d)** Obturation irt 36.

Porcelain fused to metal crown was placed in the next appointments with respect to left permanent molar in the patient as her second permanent molars had erupted completely (Figure 3).



Figure 3. a) PFM crown placed irt 36, **b)** and **c)** RPD placed irt 46

The right first permanent molar showed furcation involvement and it was extracted followed by RPD to maintain the space. An implant was advised when the patient is 17 years and above (Figure 4).



Figure 4. Preoperative and post operative photograph.**3. Discussion**

Vertucci and Williams were the pioneers to demonstrate the presence of an extra and independent canal in mesial root of mandibular molars^[3,5]. Middle canal has been also called as intermediate canal, mesio-central canal, third mesial canal, accessory mesial canal and MMC^[6-9].

The middle canal orifice located between two main canals exists below a dentinal projection in the groove where the layer of dentin is lighter in color than adjacent dentin. The length of the groove in mandibular first and second molars is 1.07–2.81 mm and the average depth is seen to be about to be 1.05 mm^[4,10].

The mean minor diameter of the Middle Mesial Canal orifice is seen to be 0.16 mm, which is three times less than that of two main orifices (0.50 mm)^[4]. Clinically troughing through the mesial pulpal groove in a mesio-apical direction helps in detection and negotiation of MMCs.

Classified MMCs into three types where in type I independent type where canal can run independently from the orifice to the apex, type II the confluent one where the canal can join the MB or ML canals before exiting from the apex and type III fin variety where an isthmus may be present between the MMC and the MB or ML canal during any stage of its course from the orifice to the apex^[8]. This case has type II Confluent configuration of MMC.

Higher prevalence of MMC in mandibular first molars with two distal canals (45.4%) than the ones with one distal canal (13.7%). MMC was located in the middle of MB/ML orifices in 67% of cases from an Indian population and 20% had the orifice closer to the ML canal and 12% had the orifices located closer to the MB canal^[11].

This case had two distal canals so there was an increased need to navigate and find extra MMC.

The higher prevalence of extra canals in younger patients is due to the fact that roots undergo different stages of development with age. The apical closure is completed by 8–9 years of age and after 3-6 years completion of canal differentiation occurs. So between 12-30 years mixed patterns of canal morphology were seen^[12,13].

The canal separation occurs by deposition of secondary dentine within the canal at the cervical, middle and apical thirds in the mesiodistal direction as reported^[14]. If only one mesial root canal in the mandibular molar is seen it may be due to lack of differentiation of root canals.

Newer technologies and concepts like 3D digital reconstruction and computer-aided rapid prototyping are helpful to visualize the variations. In our study we used dental loupes, DG16 endodontic explorer, clinical troughing and proper visualizing aided to locate the extra canal.

4. Conclusion

A complete isthmus is seen between the main canals resulting in a middle canal. The orifice of MMC is smaller in diameter than the MB/ML canal and may or may not be equidistant from the orifice of the main canals. In our case it was confluent with the main canal. After a proper access cavity preparation, clinicians should spend time in examining the mesial sub pulpal groove to detect and negotiate additional canal.

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