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Mid Mesial Canal in Mandibular Molars: Two Case Report and A Review of Literature

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ABSTRACT

The main objective of root canal treatment is thorough mechanical and chemical cleansing of the entire pulp space followed by complete obturation with an inert filling material. These molars normally have two roots, one mesial and one distal, and their usual canal distribution is two in the mesial root and one or two in the distal root. This clinical case reports and review of literature describes the management of the mandibular molar with three separate mesial canals including middle mesial canal.

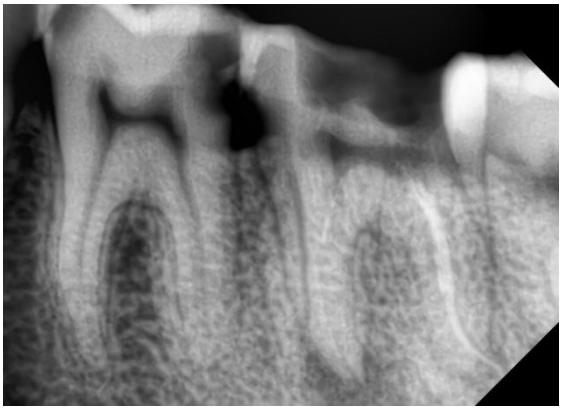
Key words: Mid Mesial, Endo Therapy, Irrigation.

Introduction

The main objective of root canal treatment is thorough mechanical and chemical cleansing of the entire pulp space followed by complete obturation with an inert filling material.[1] Therefore, it is important that aberrant canal anatomy is identified prior to, and during the root canal treatment of such teeth. In 1974, Vertucci and William[2] described the presence of an independent middle mesial canal in a mandibular first molar. Since, there have been multiple case reports of aberrant canal morphology of the mandibular first molar [3-9]. These reports have described aberrant canals in the mesial root of the mandibular first molar.

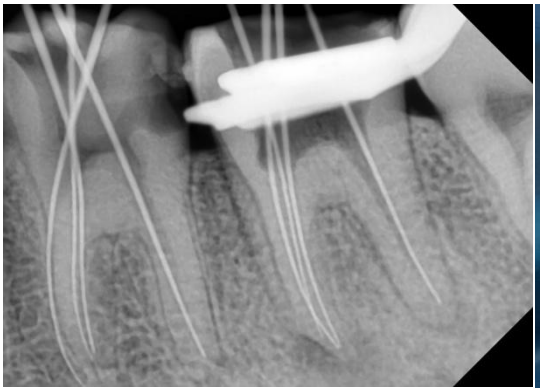
Case Report I

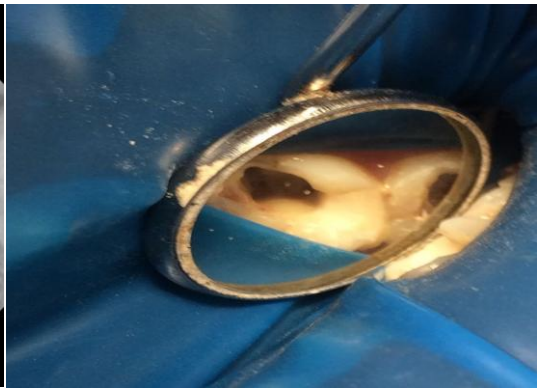
A 28-yr-old male patient presented to the Rajasthan dental clinic and hospital with a history of severe pain in lower back tooth region since 10 days. The pain aggravated while chewing food. Patient gave history of incomplete dental treatment in same teeth 6 month back and he was asymptomatic since 4 months. The clinical examination revealed an occlusal and proximal caries on tooth 36,37. The teeth were severely tender on percussion and there was no swelling / sinus opening present in the adjacent soft tissues. Diagnostic test was performed and radiograph was taken. A provisional diagnosis with acute apical periodontitis was made. A radiograph showed coronal radiolucency approaching plup space in 36 and inadequate endodontically treated 37, with widening of apical peritoneum periodontal were detected. The teeth did not respond to electrical pulp testing. Radiographic examination revealed the presence of periapical radiolucency suggestive of chronic periapical periodontitis,(Fig.1) necessitating endodontic therapy for the same.



Case I: Fig.1

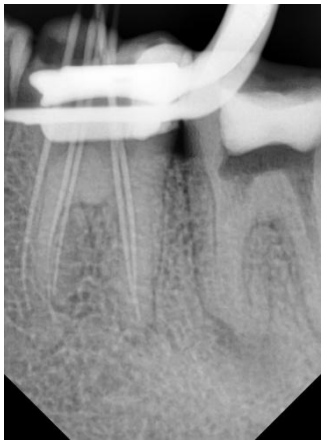
After obtaining the patient's consent, tooth was anesthetized using 2% Lignocaine with 1: 80,000 adrenaline (Lignox, Indoco Remedies Ltd, India) and isolated using rubber dam. All caries were removed and access cavity was prepared .Retrieval of gutta-percha point from distal canal of 37 with the help of 20 no Hero sehfar file, five root canal orifices were observed in , including mesio-buccal (MB),mid-mesial, mesio-lingual (ML) , distobuccal(DB) and distolingual(DL) in 36.Three orifices were initially were observed in , including mesio-buccal (MB), mesio-lingual (ML) , and distal(D) in 37. The working length was determined with an electronic apex locator (RootZX II; Japan) (Fig.2,3).

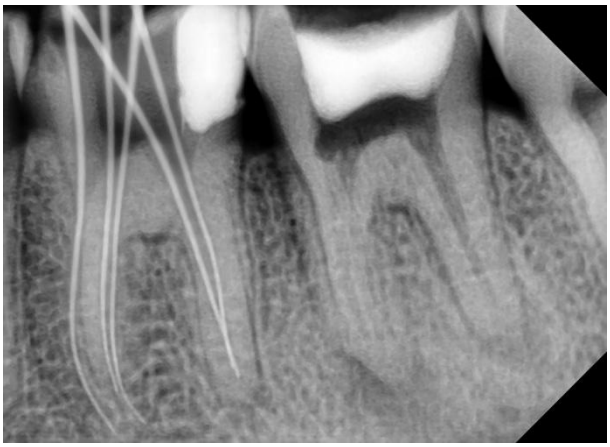




Case I: Fig.2 **Case I: Fig.3**

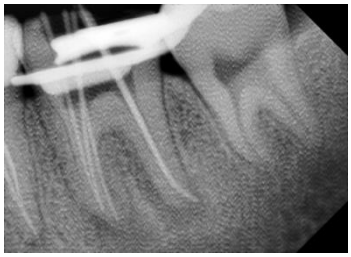
The patency of the root canals were obtained using stainless steel no. 10 K-files (Mani inc., Japan) and cleaned and shaped using 2% Hand file (Dentsplya) . During instrumentation the canals were intermittently flushed with 5.25% sodium hypochlorite. After through shaping and clinging, $Ca(OH)_2$used as intera canal medicament .Patient recalled after a week. During second appointment, a tiny orifice was detected between the MB and ML with an endodontic explorer DG-16 (DentsplyMaillefer, Switzerland) which was conformed under endodontic microscope at 10X magnification IN 37. The patency of the additional canal was confirmed using no.15 K-file passing through the orifice. The existence of a middle mesial (MM) canal in a line was considered and later confirmed with the intraoral periapical radiograph (IOPA) (Fig.3,4).

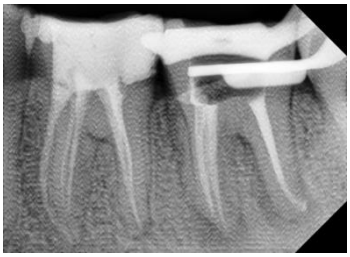


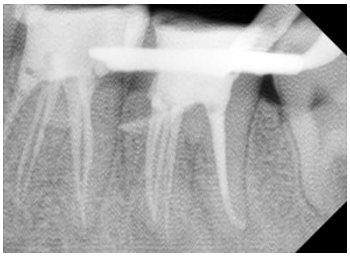


Case I: Fig. 4 **Case I: Fig. 5**

According to Pormeranz's classification, the MM canal was classified as "confluent"- The MM canal originates as a separate orifice but apically joins the MB or ML canal. All three mesial canals including the MM canal were cleaned, shaped, mastercone radiograph (Fig. 5,6) and obturated with gutta-percha and sealer via lateral condensation obturation tecqunic(AHplus, Dentsply-Maillifer) (Fig.7,8).







Case I: Fig. 6 **Case I: Fig. 7** **Case I: Fig. 8**

Radiograph were taken from mesial and distal angulation to check out mid mesial canal in 36 and 37 adequately obturated (fig 7,8) The patient experienced no post treatment discomfort and was subsequently referred for appropriate coronal restoration. The patient will be followed clinically to monitor periradicular responses.

Case Report II

A 26-yr-old female patient presented to the Rajasthan dental clinic and hospital with a history of severe pain in lower left back region of tooth since 5 days. The pain kept her awake at night and was radiating up the side of her face. The clinical examination revealed an occlusal caries on tooth 36. The tooth 36 was tender and there was no swelling / sinus opening present in the adjacent soft tissues. A diagnosis of necrotic pulp with acute apical periodontitis was made. A radiograph showed a deep, carious lesion approximating the pulp. No periodontal pockets were detected. The tooth did not respond to electrical pulp testing. Radiographic examination revealed the presence of radiolucency involving the pulp and PDL was enlarged with mesial and distal roots of 36 suggestive of chronic periapical periodontitis,(Fig.1) necessitating endodontic therapy for the same.

Case II: Fig.1

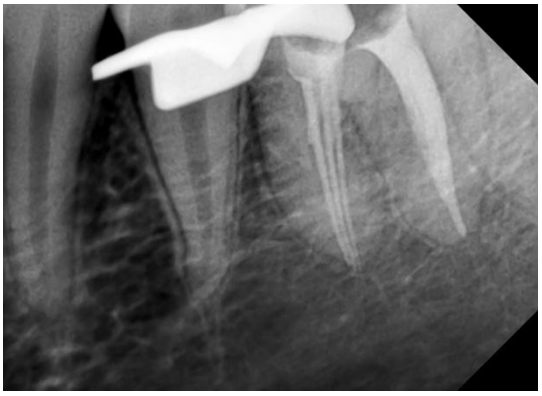
After obtaining the patient's consent, tooth was anesthetized using 2% Lignocaine with 1: 80,000 adrenaline (Lignox, Indoco Remedies Ltd, India) and isolated using rubber dam. All caries were removed and access cavity was prepared. Three root canal orifices were initially observed, including mesio-buccal (MB), mesio-lingual (ML) and distal. The working length was determined with an electronic apex locator (RootZX II; Japan). The patency of the root canals were obtained using stainless steel no. 10 K-files (Mani inc., Japan) and cleaned and shaped using 4% nickel titanium rotary file (HyFlex CM, Coltene) . During instrumentation the canals were intermittently flushed with 5.25% sodium hypochlorite. During the course, a tiny orifice was detected between the MB and ML with an endodontic explorer DG-16 (Dentsply Maillefer, Switzerland) which was conformed under endodontic microscope at 10X magnification(fig 2,3). The patency of the additional canal was confirmed using no.15 K-file passing through the orifice. The existence of a middle mesial (MM) canal in a line was considered and later confirmed with the intraoral periapical radiograph (IOPA) (Fig.3).

Case II: Fig.2

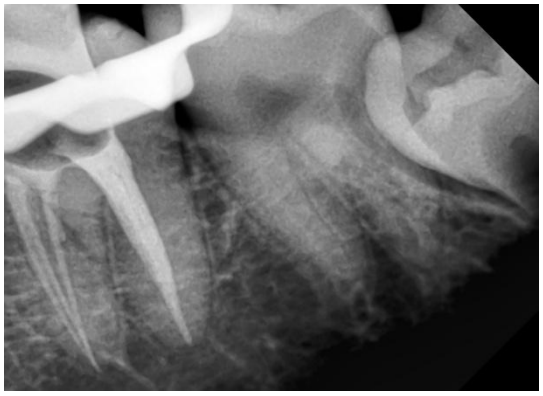
Case II: Fig. 3

According to Pormeranz's classification, the MM canal was classified as "confluent"- The MM canal originates as a separate orifice but apically joins the MB or ML canal. All three mesial canals including the MM canal were cleaned, shaped, and obturated with gutta-percha and sealer (AHplus, Dentsply-Maillifer) (Fig.4,5). The

patient experienced no post treatment discomfort and was subsequently referred for appropriate coronal restoration. The patient will be followed clinically to monitor periradicular responses.



Case II: Fig.4



Case II: Fig. 5

Discussion

A major cause of root canal therapy failure is the inability to understand the internal anatomy of the tooth and subsequent incomplete endodontic treatment.[10] A good pre-operative radiograph is essential for preventing missed anatomy but it does not always necessarily reveal the actual number of canals present in the root.[11] Krasner and Rankow proposed specific laws of symmetry, law of color change, and laws of orifice location based on consistent and identifiable anatomic configurations of pulp chamber.[1] These laws help to locate canal orifices on the pulp chamber floor in a systematic way. Visual and diagnostic aids also play an important role in detecting atypical root canal anatomy.[12-14]

Numerous in vitro and in vivo studies on the morphology of mandibular first molars have provided new data relating to the presence of extra roots, additional root canals, lateral canals or transverse canal anastomoses between the two or three canals in the mesial root.[12]There are numerous cases in the literature concerning the unusual anatomy of the mandibular first molar. A middle mesial [MM] canal sometimes is present in the developmental groove between the mesiobuccal [MB] and mesiolingual [ML] canals. The presence of a third canal in the mesial root of mandibular molars has been reported to have an incidence rate of 1 to 15%. This additional canal may be independent with a separate foramen, or the additional canal may have a separate foramen and join apically with either the mesiobuccal or mesiolingual canal [15]. Numerous techniques enable the clinician to look for the middle mesial canal. It is important to have an adequately flared access cavity to visualize the anatomy of the chamber; constricted access can lead to missed anatomy. Diagnostic measures are important aids in the location of root canal orifices. The measures include obtaining multiple pre-treatment radiographs or CBCT, examining the pulp chamber floor with sharp explorer, troughing grooves with ultrasonic tips etc; the use of surgical microscopes has vastly enhanced the quality of endodontic treatment.

Over the years, there have been numerous studies that describe the morphology of teeth, including mandibular first molars. Skidmore and Bjorndal, Pineda and Kuttler, and Vertucci [16-17, 11] have all reported on the morphology of the mandibular first molar. These reports have shown that mandibular first molars have three or four canals. Martinez-Berna and Bandanelli [18] showed two cases with six canals. Reeh [10] has even reported a case with seven canals, consisting of four canals in the mesial and three in the distal root.

There have been comprehensive studies to show that there are mandibular first molars with more than four canals. In 1981, Pomeranz et al. [12] reported on 12 of 100 cases. In 1985, Martinez-Berna and Badanelli [18] reported on 26 of 1418 cases. In 1985 and 1989, Fabra-Campos [19, 20] reported on 4 of 145 and 20 of 760 cases, respectively. In 1991, Goel [15] reported on 9 of 60 cases. Table 1 lists the results of these comprehensive studies over the years. With increasing reports of aberrant canal morphology, the clinician needs to be aware of this varied anatomy. The purpose of this article is to report the successful treatment of an additional case of a mandibular molar with three mesial and two distal canals.

Investigator	Year	Teeth	Method	Roots	Three Canals
Skidmore and Bjorndol	1971	45	Vitro	Mesial Distal	— —
Pineda and Kuttler	1972	300	Vitro	Mesial Distal	— —
Vertucci	1984	100	Vitro	Mesial Distal	1.0% —
Pomeranz et al.	1981	100	Vivo	Mesial Distal	12% —
Martinez-Berna and Badanelli	1983	1418	Vivo	Mesial Distal	1.5% —
Fabra-Campos	1985	145	Vivo	Mesial Distal	2.1% 0.6%
Fabra-Campos	1989	760	Vivo	Mesial Distal	2.6% —
Goel et al.	1991	60	Vivo	Mesial Distal	15.0% —

Conclusion

There are numerous cases in the literature concerning the unusual anatomy of the mandibular molars. The presence of a third canal in the mesial root of mandibular molars has been reported to have an incidence rate of 1 to 15%. This additional canal may be independent with a separate foramen, or the additional canal may have a separate foramen and join apically with either the mesiobuccal or mesiolingual canal. Instrumentation is one of the key factors in the success of endodontic therapy; therefore, the clinician should be aware of the incidence of these extra canals in the mandibular molars. The clinician can then perform a thorough examination of the pulp chamber to insure complete debridement of all canals. This increases the chance for long-term successful endodontic therapy.

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