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Case Report:

Endodontic management of middle mesial canal in mandibular first molars : Report of two cases

Dr Namrata Sopariwala[1],Dr Sunita Garg[2]

[1] PG Part III, Conservative Dentistry and Endodontics, GDCH, Ahmedabad, Gujarat

[2] Professor , Conservative Dentistry and Endodontics, GDCH, Ahmedabad, Gujarat

Corresponding author: Dr Namrata Sopariwala

Abstract

The primary goal of endodontic treatment is the elimination of bacterial contamination through thorough cleaning, shaping, disinfection and three dimensional obturation of the root canal system. This can be complexed by anatomical challenges such as additional roots and canals and atypical canal configurations. Highly variable anatomy of mandibular molars indicates need for careful examination of 0root anatomy to find and clean all the portals of entry and exit within the canal system. Extensive exploration of the groove between mesiobuccal and mesiolingual orifices reveal the presence of additional orifice. Various diagnostic aids like ultrasonics, long shank burs, champagne bubble test, operating microscopes and dyes help to improve the pulp chamber visibility. The incidence of such abberant anatomy should be kept in mind by the dentist and be considered norm rather than exception. Treating additional canals may be challenging, but the inability to find and properly treat the root canals may cause failures. Information on root canal anatomy come from radiographs is valuable and should always be integrated with a careful clinical examination, preferably under magnification for the better and successful endodontic treatment Both case reports described in the paper address the endodontic management of mandibular first molar with three individual mesial canals in the mesial root, from diagnosis and identification of additional canals using dental operating microscope to complete obturation.

Keywords : middle mesial canal, mandibular first molar, dental operating microscope

Introduction

In order to fulfill the objectives of Non Surgical Root Canal Treatment, it is a prerequisite to have familiarity with the internal tooth anatomy and variations associated with the same. Missed canals and spaces within the root canal system may contain microorganisms and their by products and hence contribute to failure of therapy. The mandibular first molar is the most common tooth type to be treated. It poses a series of anatomical challenges such as extra roots, extra canals, isthumuses, lateral canals and apical ramifications (1,2). Due to its morphological complexities, endodontic failure occurs highest in this tooth and thus it is the most common tooth to be extracted (3).

Middle mesial canal was first evidenced and described by Vertucci and Williams (4). Weine described the first report of middle mesial canal during endodontic retreatment (5). Prevelance of middle mesial canals according to older studies was 2.65% to 14.8% (6); however newer studies incorporating the use of higher magnification systems show that middle mesial canal is present in 46.2% mandibular molars (7). This canal is found to be

located in the developmental groove connecting the mesiobuccal and mesiolingual canals. A higher incidence of negotiable middle mesial canals was found to be in young patients aged 20 years or younger (8). Classified into three, depending on its clinically recognizable pathway, middle mesial canals can be described as fin, confluent or independent (9).

The following article describes two case reports for the endodontic management of middle mesial canals in mandibular first molars.

Case 1

A 14 year old healthy female patient reported to the department of Conservative Dentistry and Endodontics, Government Dental College, Ahmedabad with a chief complain of pain in relation to lower right back tooth. On clinical examination tooth #30 showed deep caries extending to the pulp. The tooth was tender to percussion but did not respond to sensibility testing. Medical history was not contributory and also there was no history of swelling or pus discharge. Radiographic examination showed a deep carious lesion involving the pulp, widened periodontal ligament space and periapical lesion on both roots. The mesial root showed apical resorption on its distal aspect (Fig 1 A). A diagnosis of pulp necrosis and symptomatic apical periodontitis was made and endodontic treatment initiated.

After obtaining consent, rubber dam isolation was done following administration of local anesthesia 1:100000 adrenaline (Ligno-Aid, Vishal Dentocare Pvt Ltd, Ahmedabad , India). Access opening was initiated with a #2 carbide round bur which on initial inspection showed two mesial and one distal ribbon shaped canal. The groove connecting the mesiobuccal and mesiolingual canals was troughed using a non end cutting Endo Z bur (Dentsply) and a third orifice could be seen which was scouted using a #10 K file (MANI, Japan). The access cavity was examined under a Dental operating Microscope at 5x (Microteknik, Ambala, India). Third mesial canal and ribbon shaped configuration of distal canal was thus confirmed (Fig 2).

After establishing glide path with #10 and #15 K files (MANI, Japan), orifice enlargement was done using SX PROTAPER (Dentsply Maillefer). Working length was determined using apex locater (Root ZX II; Morita, Tokyo, Japan) and confirmed with a radiograph (Fig 1 B). Shaping of mesiobuccal and mesiolingual canals was done using hand K files (MANI, Japan). The confluence of middle mesial canal to the mesiolingual canal was determined using the Furri's technique (10) which was found to be 5 mm prior to the latter. The middle mesial canal was prepared upto that point using hand K files. The distal canal was prepared using nickel titanium rotary files Protaper (Dentsply Maillefer), hand K files and H files in the isthumus area. During the entire procedure, canal was copiously irrigated with 4% Sodium Hypochlorite (Fortune fresh, Navsari, Gujarat) and 17% EDTA (PREVEST DenPro) with a saline rinse in between. The canal was dried with paper points and an intracanal dressing of calcium hydroxide (PREVEST DenPro) mixed with 2% chlorhexidine was given for two weeks and cavity was sealed with IRM (DENTSPLY Maillefer).

At the subsequent appointment, intracanal dressing was removed by irrigating the canal with normal saline and a final rinse of 2% chlorhexidine was done. The canal was dried with paper points and obturation was completed using AH plus sealer and gutta-percha points (DENTSPLY Maillefer) using

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lateral condensation technique (Fig 1 C, D, and Fig 2). A post endodontic restoration was given with composite resin. The patient is asymptomatic and on follow up.

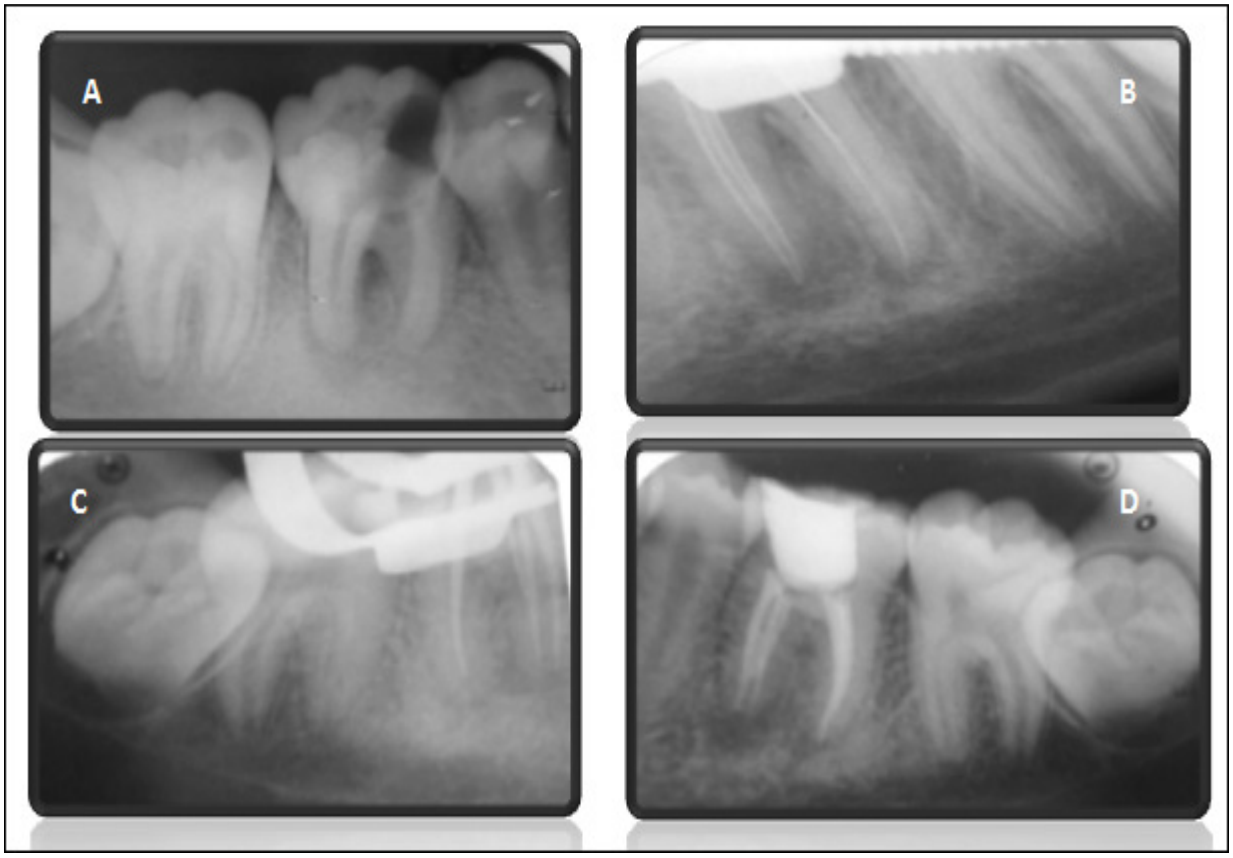

Figure 1: A- preoperative radiograph; B: working length radiograph; C: master cone radiograph; D: post operative radiograph

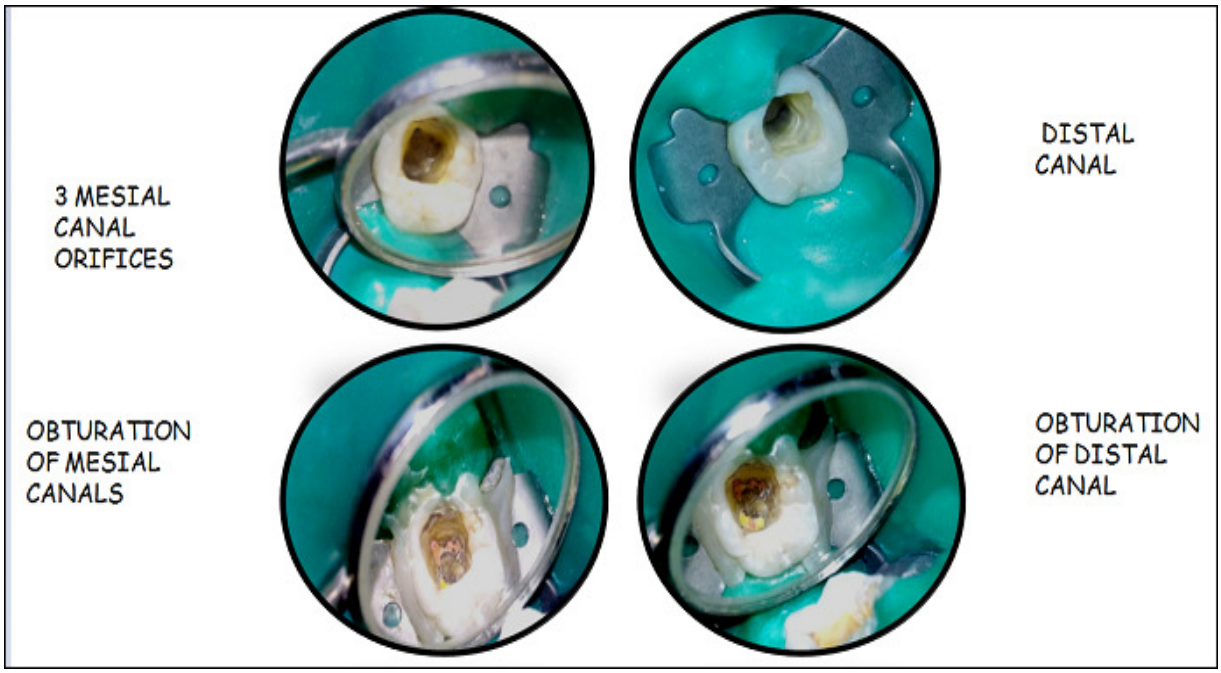

Figure 2

Case 2

A 35 year old healthy female patient reported to the department of Conservative Dentistry and Endodontics, Government Dental College, Ahmedabad with a chief complain of pain and broken filling in relation to lower right back tooth. On clinical examination tooth #30 showed fractured amalgam filling. Tooth was tender to percussion but did not respond to sensibility testing. Medical history was not contributory and no soft tissue swelling was seen. Radiographic examination showed a widened periodontal ligament space on the distal root (Fig 3 A). A diagnosis of pulp necrosis and symptomatic apical periodontitis was made and endodontic treatment initiated.

After obtaining consent, rubber dam isolation was done following administration of local anaesthesia 1:100000 adrenaline (Ligno-Aid, Vishal Dentocare Pvt Ltd, Ahmedabad, India). Access opening was initiated with a #2 carbide round bur which on initial inspection showed two mesial and one distal canal. The groove connecting the mesiobuccal and mesiolingual canals was troughed using a non end cutting Endo Z bur (DENTSPLY) and a third orifice could be felt as catch on the DG 16 explorer. It was scouted using a #10 K file (MANI, Japan). The access cavity was examined under a Dental operating Microscope at 5x (Microteknik, Ambala, India) to confirm the presence of a third mesial canal (Fig 4).

After establishing glide path with #10 and #15 K files (MANI, Japan), orifice enlargement was done using SX PROTAPER (DENTSPLY Maillefer). Working length was determined using apex locater (Root ZX II; Morita, Tokyo, Japan) and confirmed with a radiograph (Fig 3 B). The confluence of middle mesial canal to the mesiobuccal canal was determined using the Furri's technique (10) which was found to be 3.5 mm prior to the latter. The

middle mesial canal was prepared upto that point whereas the distal and two mesial canals were prepared using nickel titanium rotary files Protaper (DENTSPLY Maillefer). During the entire procedure, canal was copiously irrigated with 4% Sodium Hypochlorite (Fortune Fresh, Navsari, Gujarat) and 17% EDTA (PREVEST DenPro) with a saline rinse in between. The canal was dried with paper points and an intracanal dressing of calcium hydroxide (PREVEST DenPro) mixed with 2% chlorhexidine was given for one week and cavity was sealed with IRM (DENTSPLY Maillefer).

At the next appointment, intracanal dressing was removed by irrigating the canal with normal saline and a final rinse of 2% chlorhexidine was done. The canal was dried with paper points and obturation was completed using zinc oxide eugenol sealer and gutta-percha points (DENTSPLY Maillefer) using lateral condensation technique (Fig 3 C,D). A post endodontic restoration was given with amalgam. The patient is asymptomatic and on follow up.

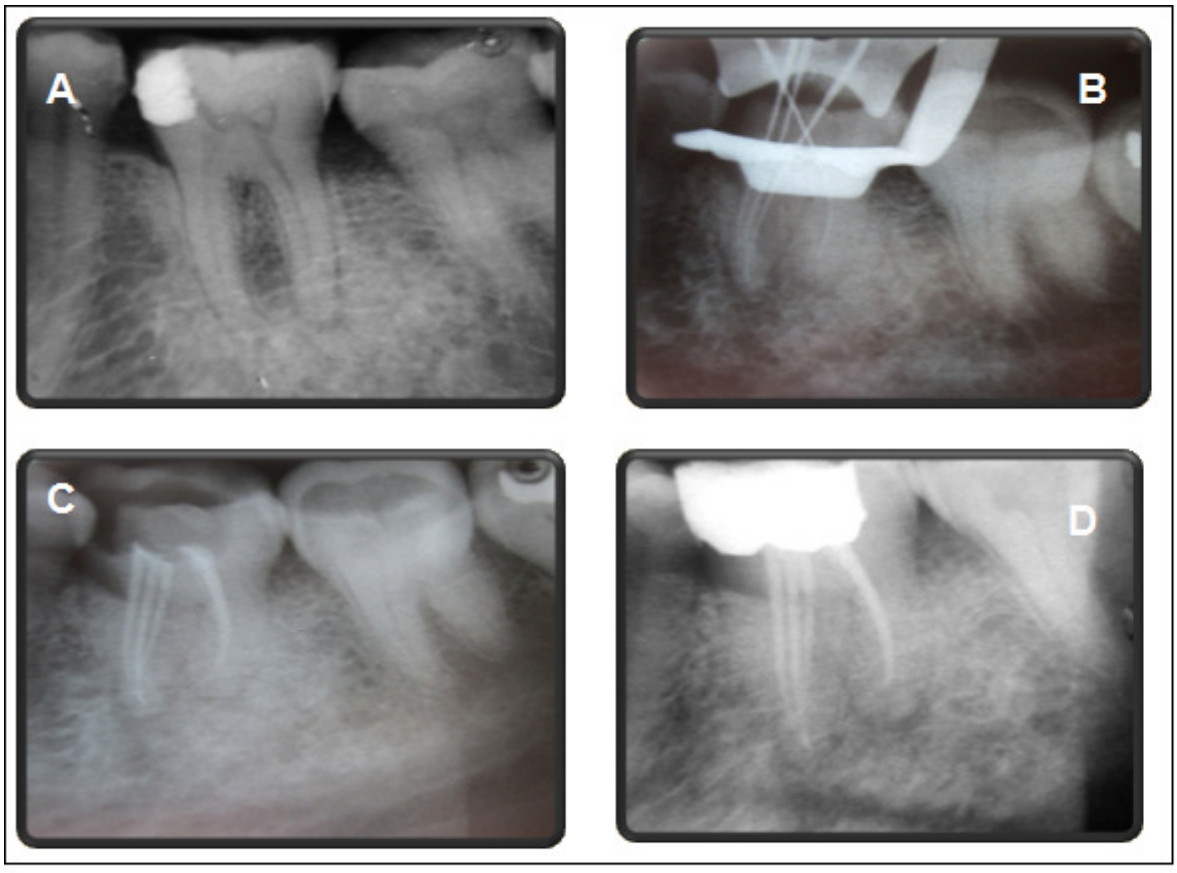

Figure 3: A- preoperative radiograph; B: working length radiograph; C: master cone radiograph; D: post operative radiograph

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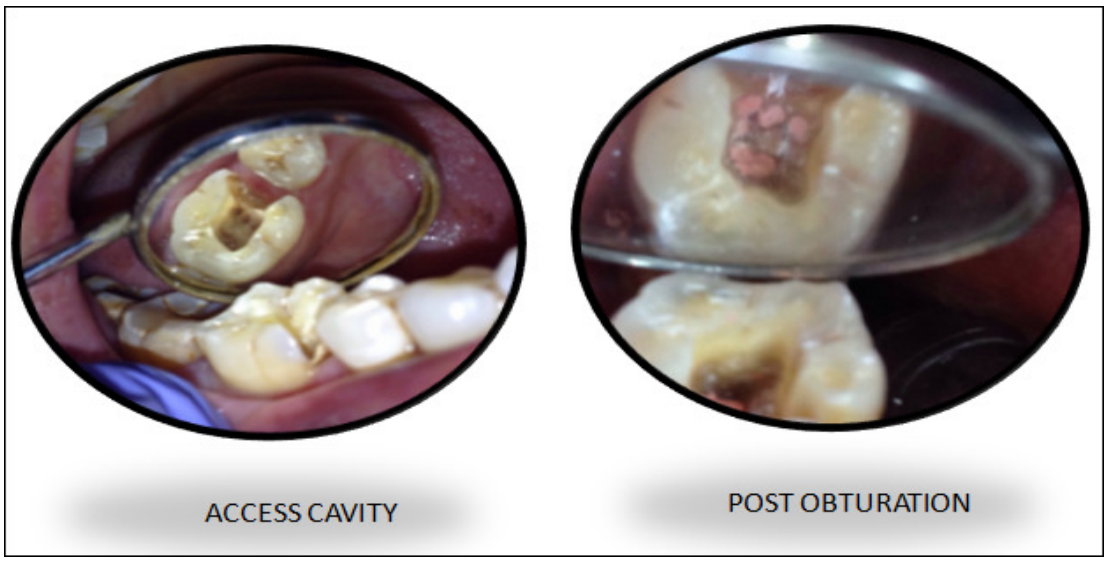

Figure 4

Discussion

The middle mesial canal is also called the "intermediary mesial canal" or the "medial mesial canal" since it is situated centrally between the buccal and lingual canals (11). The diameter of middle mesial canal is smaller than other two and is age related due to dentinal deposition (1). It is not an uncommon morphological aberration and should be anticipated. Judicious removal of any protuberance of pulpal wall or slight troughing with ultrasonic tips in the developmental groove discloses additional canals (6). In virtually all cases, this canal will either join the mesiobuccal or mesiolingual canals in the apical third, having an independent apical foramen in 5% cases (13). Alternatively, it can be argued that the middle mesial canal is not an extra canal but rather the sequelae of instrumenting the isthmus between the two mesial canals (14).The occurrence of an independent middle mesial canal is rare as compared to fin or confluent types wherein canal instrumentation needs to be modified. In such cases, one canal is prepared to its point of terminus and other canal is prepared till point of confluence, so as to avoid an hour glass shape preparation (15).

Various techniques have been advocated to locate the presence of a third mesial canal. Digital radiography images at different angles are helpful to determine canal configuration. The use of Cone Beam Computed Tomography (CBCT) has also been suggested to identify presence of third mesial canal in mandibular molars (16). Also, the use of Dental Operating Microscope (DOM) and magnifying loupes offer magnification and illumination of operating field and substantially improve the visualization of root canal orifices. Axial dentin has a different chromatic color tone than dentin and orifices that are present in the root trunk. That dentin is much darker and just keeping it wet magnifies the chromatic distinction thus aiding in identification of canal orifices.

Since isthmuses serve as reservoirs of bacterial contamination, special considerations should be made to reduce bacterial load from the isthmuses present in the mesial root of mandibular first molars and thus

optimize the outcome of treatment. The negotiation of middle mesial canals with hand or rotary files provides access for irrigating solutions into otherwise inaccessible isthmus (8). Acknowledgement of higher occurrence of middle mesial canal convergence than separation helps in avoiding procedural errors during preparation. The middle mesial canal due to its frequent confluence with the main mesial canals may offer a passage to non-negotiable MB or ML canal. E.g. in cases of separated instrument (6).

Conclusion

From the various in vitro studies and case reports in the literature, prevalence of a middle mesial canal in mandibular first molars is about 46% and increasing significantly with use of magnification. Clinically the third canal is difficult to find and exhibits a very variable morphology, which may present anastomoses with the other canals.

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