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Management of molarized premolar: A case series

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Abstract
The long term success of an endodontically treated tooth depends on the elimination of micro-organisms and creation of an apical seal. There is evidence of a high frequency of missed canals in unsuccessful cases requiring endodontic retreatment, which raises concerns about the possible detrimental impact of untreated canals on the result of a root canal treatment. During root canal therapy, it is possible for canals to be overlooked due to a lack of knowledge of the intricate root canal system. These untreated canals may encourage the growth of microorganisms that worsen post-operative discomfort and impair prognosis. In this paper, a case series of management of premolars with three root canals is discussed.

Keywords: Root canal treatment, missed canal, premolar, management

Introduction
The success of endodontic therapy largely depends on having a solid understanding of the morphology of the root canal. But there is a lot of variation in root canal anatomy, and a clinician faces difficulties because of these anatomical nuances. An unfavorable communication between the pulp and periodontium results from an endodontic treatment that is not done correctly, leaving spaces within the canal. These spaces may eventually encourage the growth of microbes, primarily bacteria, which would result in periapical inflammation [1].
A thorough examination of the preoperative radiographs is required for the endodontic therapy to be successful. However, a three-dimensional object is represented by two-dimensional pictures on intraoral periapical radiographs (IOPAR) [2]. When interpreting radiographs, the clinician needs to be aware of these restrictions. According to Sieraski *et al.*, a tooth most likely had three roots if the mesio-distal width of the middle third of the root was equal to or greater than the mesio-distal width of the crown. We made a diagnosis and started the root canal process for premolars with multiple canals based on this information [2].
They are also known as radiculous premolars, miniature three-canalled molars, or minimolars [1, 3]. Maxillary and mandibular first premolars with three root canals are managed in the current case series.

Case report-1
The chief complaint of a 35-year-old female patient who presented to the Department of Conservative Dentistry and Endodontics was pain in the upper right back tooth region that had persisted for the previous 10 days. Upon clinical examination, tooth number 14 was found to have deep dentinal caries (class 2). The pain was moderate, intermittent and aggravated on chewing food and had nocturnal pain with no association of swelling. The tooth presented tenderness to percussion. The tooth had given early response to Electric pulp test (Digitest, Parkell, New York, USA) and exaggerated one to cold test (Endo-ice). A final diagnosis was made as symptomatic irreversible pulpitis with symptomatic apical periodontitis (AP) and root canal treatment was initiated under dental operating microscope (DOM).
Local anesthesia was given, rubber dam was used for isolation and the caries removal and access opening was done. Mesiobuccal, distobuccal and palatal canal orifices were located. A triangle-shaped access cavity with its base on the buccal aspect is the external outline observed when three canals are present.

The respective canal orifices should be directly over the Mesiobuccal and distobuccal corners of the triangle. Pre endodontic restoration was done using composite. Initially mesio buccal and palatal canals were negotiated. The distobuccal canal was calcified and negotiation was attempted using Definders (Mani, Japan) and 17% EDTA solution. The DB canal was negotiated. The working length was determined after confirming apical patency with #10 K-file using electronic apex locator (Root ZX, J Morita) and IOPARs. The canals were cleaned and shaped using Pro-Taper GOLD rotary files (Dentsply Maillefer, Switzerland) up to F2 (25/08%) and irrigated with 2.5% sodium hypochlorite activated using sonic activation (Endoactivator, Dentsply Sirona). Saline was used in between sodium hypochlorite and EDTA solution.

17% EDTA solution for 1 minute to eliminate the dentinal debris and saline as a final rinse. The master cone IOPAR was followed after confirming using apical gauging and visual gauging using 25 (06%) gutta percha. Cold lateral condensation method using an epoxy resin based sealer (AH Plus, Dentsply Sirona) was used for obturation followed by post-endodontic composite restoration (Filtek Z350 XT, 3 M ESPE). The 9-months follow-up radiograph is shown, and clinically reduction of the symptoms indicates successful endodontic treatment.

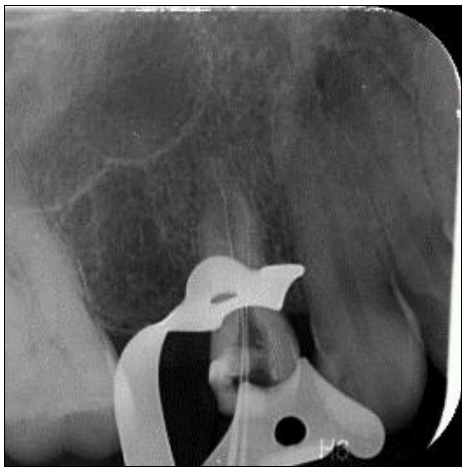


Fig 1: Initial negotiation of Mesiobuccal and palatal canals.

Fig 2: Negotiation of calcified distobuccal canal

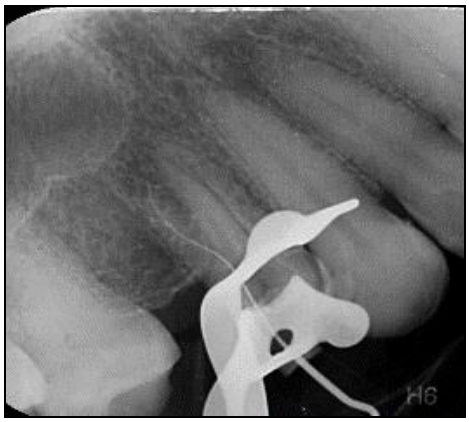


Fig 3: Negotiation of distobuccal canal

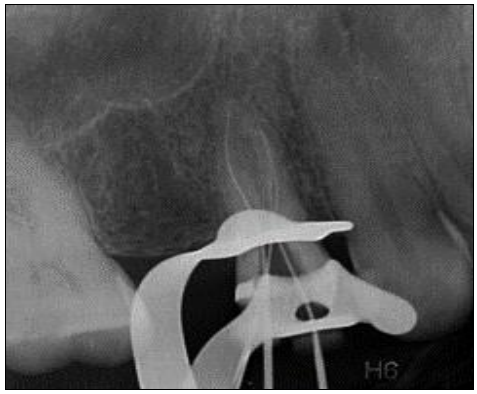


Fig 4: Working length determination

Fig 5: Master cone selection done

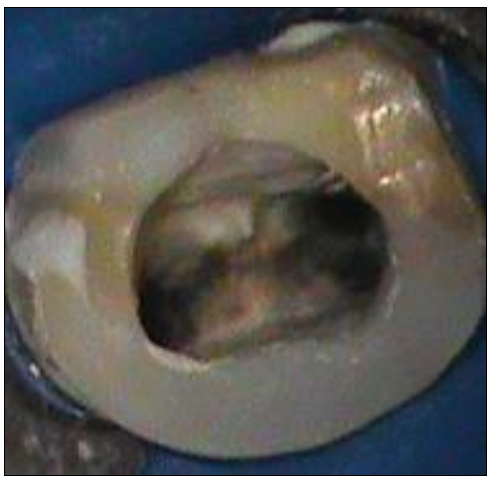


Fig 6: Visibility of canal orifices under DOM under 2.5X magnification

Fig 7: Obturation using cold lateral condensation and post endo restoration

Fig 8: 9 months post operative radiograph

Case report-2

The chief complaint of a 28-year-old male patient who presented to the Department of Conservative Dentistry and Endodontics was pain in the lower right back tooth region that had persisted for the previous three days. Upon clinical examination, tooth number 44 was found to have deep dentinal caries (class 1). The pain was moderate, intermittent and aggravated on chewing food and had nocturnal pain with no associated swelling. The tooth presented tenderness to percussion. The tooth had given early response to Electric pulp test (Digitest, Parkell, New York, USA) and exaggerated one to cold test (Endo-ice). A final diagnosis was made as symptomatic irreversible pulpitis with symptomatic apical periodontitis (AP) and root canal treatment was initiated under dental operating microscope (DOM). The canal orifices located were Mesiobuccal, mesiolingual and distal. Working length was determined using apex locator (Root ZX, J Morita) after initial negotiation and canals were prepared till F2 (25/08%) by irrigating with 2.5% sodium hypochlorite activated using sonic activation (Endoactivator, Dentsply Sirona). Saline was used in between sodium hypochlorite and EDTA solution.

17% EDTA solution for 1 minute to eliminate the dentinal debris and saline as a final rinse. The master cone IOPAR was followed after confirming using apical gauging and visual gauging using 25 (06%) gutta percha. Cold lateral condensation along with epoxy resin based sealer was used for obturation. Post endodontic restoration was done using composite material (Filtek Z350 XT, 3 M ESPE).

Fig 9: Master cone IOPAR in relation to 44

Fig 10: Obturation IOPAR in relation to 44

Discussion

Up to 85.4% of endodontically treated teeth with untreated canals developed apical periodontitis (AP), majority of which were in the maxillary region. The mandibular premolars are known to be enigma to endodontists. The failure rate of root canal therapy for mandibular first premolars might reach 11.45% because of root canal anatomy variation [11]. Before starting any treatment, anatomical differences in the root must always be taken into account. Effective endodontic therapy requires a thorough clinical and radiographic assessment. Visibility of the pulp chamber floor and additional canal orifices can be improved by using loupes or a dental operating microscope [5].

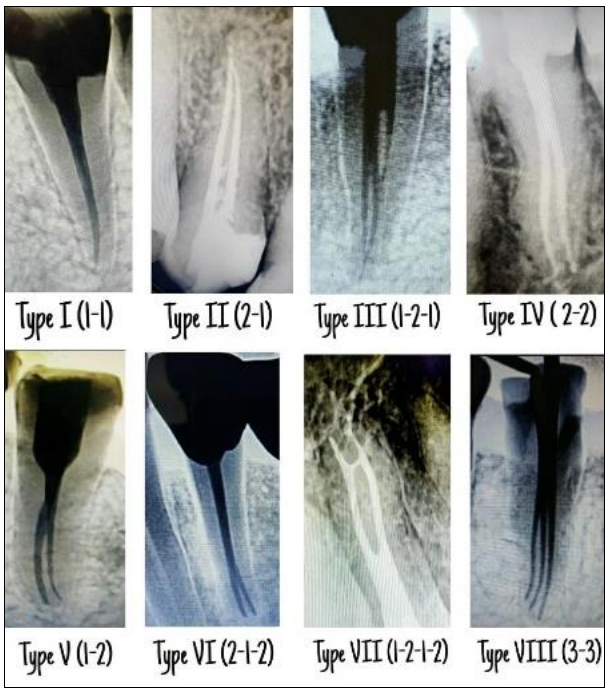
If an abrupt narrowing or disappearance of pulp space is shown on a radiograph, the canal diverges into two sections that may continue to be distinct or combine before reaching the apex. The law of symmetry states that if an eccentric orifice is discovered, there may be one or more canals present, which should be looked for on the other side [9]. When the pulp chamber is not positioned in the typical bucco-palatal connection, a third canal may be suspected. Additionally, there may be more than one root canal if the pulp chamber looks to be either triangular in shape or too large in a mesiodistal plane [3, 9].

A considerable proportion of untreated canals in teeth that had undergone root canal therapy required non-surgical endodontic retreatment, according to published research [4, 5]. Hoen and Pink [4] *et al.* discovered that 42% of non-surgically retreated teeth had untreated canals. It was concluded by Karabucak [5] *et al.* that there was an overall frequency of 23%, and by Mashyakhy [6] *et al.* that there was an overall prevalence of 18% of untreated canals. The percentage of untreated canals linked to AP that were not treated was reported to be 82.6% by Baruwa [7] *et al.* and 82.8% by Karabucak *et al.* Furthermore, among teeth with untreated canals, Mashyakhy *et al.* and Costa *et al.* discovered a relatively high incidence of AP (90% and 98%, respectively) [6].

Vertucci reports that in the USA, the occurrence of three root canals in a first premolar is around 5% in maxillary teeth and 0.05% in mandibular teeth. Although mandibular first premolars typically have a single root, and maxillary first premolars often have two roots, the configuration of the root canals varies. In this group of teeth, all canal types listed in the Vertucci classification (1984) have been known to occur [9, 10].

Wein's classification (1969) contains the following root canal types: Type I (1-1): Single canal from orifice to apex. Type II (2-1): Two canals originating from the pulp chamber and uniting into a single one during its course. Type III (2-2): Two canals originating separately from orifice to apex. Type IV (1-2): One canal originating from the floor of the pulp chamber and dividing into two during its course [9].

According to Vertucci classification (1984) [9]



Type 1 - 1-1
Type 2 - 2-1
Type 3 - 1-2-1
Type 4 - 2-2
Type 5 - 2-1
Type 6 - 2-1-2
Type 7 - 1-2-1-2
Type 8 - 3-3

However, the disadvantage of these conventional classification systems is that they only address the arrangement of the root canals, ignoring the morphology of the roots or the clear connections between the canals inside the roots. Hence a novel classification of canal configuration is used in the present paper according to Ahmed *et al.* $314MB^1\ DB^1\ P^1$ is the code for the present 3 rooted maxillary premolar with 3 canals. Where 3 represents number of roots, 14 represents tooth number and we can quote the number of canals in each root using superscript on MB, DB and P canals. The mandibular 1st premolar had $144MB^1ML^1D^1$ code where 1 represents single root and 44 represents tooth number, number of canals were quoted using superscript on MB, ML and D canals [12].

In only 2.6% of cases there were three rooted maxillary first premolars. In the presence of three roots, teeth numbers 14 and 24 did not differ statistically significantly ($p>0.05$). When it came to the number of roots found, the incidence was comparable for men and women. The coronal third of the root had the highest frequency of bifurcation (44.2%), followed by the middle third (40.5%), while the apical third (15.3%) had the lowest frequency. The Indian population was found to have a higher percentage of two rooted maxillary premolars (91.7%) [12].

There was a statistically significant difference ($p<0.05$) in the occurrence of root split levels across genders. Males were more likely than women to have a bifurcation in the coronal third of the root (58.6 vs. 34.3%, $p<0.05$), whereas women were significantly more likely than males to have bifurcations in the middle or apical sections (middle third 46.8 vs. 31.3%; apical third 18.9 vs. 10.1%, $p<0.05$). Regarding the prevalence of specific root split levels, there was no significant difference between contralateral teeth ($p>0.05$) [12].

Conclusion

Improved diagnosis and treatment outcomes in endodontics are made possible by the integration of radiographic and clinical data with precise root canal classification. According to Ahmed *et al.*, [12] a new classification of canal morphology provides a more accurate way to describe how many root canals are there in each root. An efficient and non-invasive method for analyzing the morphology of root canal system is CBCT analysis. The CBCT scan can be recommended to enhance the caliber of endodontic therapy in accordance with the ALARA principle.

Conflict of Interest

Not available

Financial Support

Not available

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