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Endodontic management of mandibular premolar with vertucci's type iv and type v root canal system – A case series

[1]Dr. Riddhi Doshi, Department of Conservative Dentistry & Endodontics

[2]Dr. Dipti Choksi, Department of Conservative Dentistry & Endodontics

[3]Dr. Barkha Idanani, Department of Conservative Dentistry & Endodontics

[4]Dr. Neel Patel, Department of Conservative Dentistry & Endodontics

Corresponding Author: Dr. Riddhi Doshi, Department of Conservative Dentistry & Endodontics

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Abstract

The foundation for successful root canal therapy is a thorough understanding of root canal morphology, an accurate assessment of the pulp chamber floor, and a critical interpretation of radiographs. Premolars in the mandible have a history of having an unusual morphology, making them one of the most challenging teeth to endodontically treat. As a result, clinicians should be aware of the pulp system's configuration. False assumptions regarding the morphology of a root canals can lead to misdiagnosis, missed canals, inadequate debridement, and root canal instrument breakage. In a study of extracted mandibular premolar teeth, Vertucci's found 2.5 percent of them had a second canal. The purpose of this case study is to provide information on how to effectively treat mandibular premolars with two canals.

Introduction

A complete understanding of the internal anatomy and morphology of the root canal system is required for a good endodontic treatment outcome.1, 2 During root canal therapy, there's a chance of missing anatomy. Missed canals or roots were recorded in 42% of cases by Hoen and Pink which require retreatment of teeth.[3]

The most likely cause of flare-ups and failures was considered to be variations in root canal anatomy. Untreated canals can cause a wide range of symptoms, from asymptomatic teeth to acute reactions to hot and cold stimuli, as well as minor sensitivity to percussion and/or palpation and acute abscesses.[4]

According to Slowey, [5] the mandibular premolars may pose the greatest challenge of all teeth in terms of successful endodontic treatment. The mandibular first premolar had the greatest failure rate of 11.45%.6,7 The prevalence of two or more root & root canals in the

mandibular first premolar has been observed to range from 2.7% to 62.5%. [8]

Tome's root was described by Scott and Turner as the accessory root of the mandibular first premolar. They discovered that the prevalence of accessory roots was highest (>25%) among Australian and Sub-Saharan African people.9 Sert and Bayirli found sex variations in root canal morphology and found that females had a higher incidence (44%) of auxiliary roots and canals than males (34%).[10]

The mandibular premolar is usually a single-rooted tooth (99.28%). 0.5% of the teeth were two-rooted mandibular premolars. Three-rooted mandibular premolar forms were uncommon; accounting for only 0.1% of mandibular premolars.[11]

On the distal root surface, the developmental root groove appears more frequently.12 When a second canal system is present, it is more frequently toward the lingual surface in the middle or apical third of the main canal.13 The restoration of severely decayed endodontically treated teeth is a difficult task that demands careful treatment planning. If more than half of the crown structure of a tooth has been lost, a post with core buildsup may be required to restore the tooth.[14]

As a result, the goal of this report is to show the uncommon morphology of a mandibular second premolar with two roots and two canals and a mandibular first premolar with two root canals in one root the successful endodontic management.

Case 1

An 18-year-old female patient was reported to the Department of Conservative dentistry and Endodontics Dharmsinh Desai University with the chief complaint of intermittent pain in the lower right back teeth region since two weeks. Pain was moderate in intensity, non-radiating and arose on chewing, Patient gave the history of previously initiated root canal treatment of the same tooth at a private clinic before one month. Patient had no significant medical history.

Intraoral examination revealed open cavity in right mandibular second premolar. The buccal and lingual mucosa was normal. There was no intra or extraoral swelling/sinus present. The periodontal health was normal and there was no mobility. Tooth was not tender on percussion.

Pre-operative radiograph revealed root canal opening was done. And root bifurcation in the middle third with distinct outline of the buccal and lingual root without any periapical pathology.

A diagnosis of previously initiated root canal therapy with normal periapex was made, and root canal treatment was planned based on the clinical and radiographic findings.

“a” “b”

Fig 1a: pre-operative photograph

Fig 1b: pre-operative iopa

On first appointment, Caries was excavated using a large round bur and pre-endodontic build-up of lost tooth structure was done with composite resin. After that access was gained to the pulp chamber, under rubber dam isolation. To gain sufficient access to the canals, the conventional access opening was modified into one that was wider buccolingually. Gates-Glidden drills 4,3,2 with a brushing motion, in a crown down fashion was

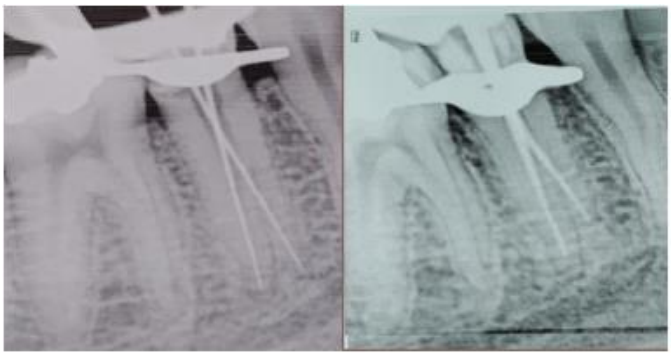
used to enlarge the orifices to achieve a straight-line access to the apex.

"a" "b"

Fig 2a: pre-endodontic build up

Fig 2b: access opening

Then No 10 K file was inserted with tactile examination. The main canal located was buccal canal. To find the lingual canal, a precurved No 10 K-file was inserted alongside the lingual wall. The working length was then determined using an apex locater and confirmed radiographically. To achieve glidepath Root canal was prepared initially with 2% hand K files up to size number 20. Canals were then cleaned and shaped using rotary endodontic file Neo Endo-S up to 25/4% taper. After each instrument, recapitulation and continuous irrigation in the canals were done with 3% sodium hypochlorite solution and 17% EDTA. Final irrigation of the canal was done with normal saline and temporary dressing was given. In the next appointment, Master-cones were selected, measured to the working length and carefully placed into the canals and was confirmed using radiograph.



"a" "b"

Fig 3a: working length iopa

Fig 3b: master cone

The canals were thoroughly dried with absorbent paper points. The master cones (25/4%) were coated with Grossmans sealer and inserted in buccal and then lingual canal. Accessory cones were inserted up to the level of bifurcation. The excess gutta-percha was seared of at the orifice using a heated burnisher. Later on, vertical compaction of gutta-percha was done using a heated hand plugger. Finally, Tooth was restored with composite resin.

"a" "b" "c"

Fig 4a: obturation iopa

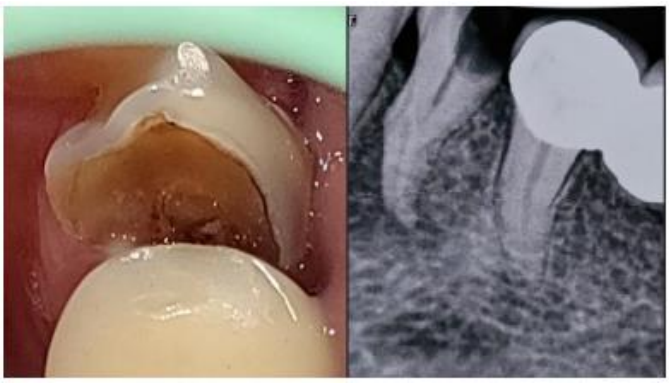
Fig 4b, c: post endodontic restoration

Case 2

A 42-year-old male patient reported to the Department of Conservative dentistry and Endodontics. Patient complains food lodgement in the lower left back teeth region since 2 - 3 weeks. Patient had no significant medical history. Intraoral examination revealed a carious lesion on disto-occlusal surface of left mandibular first premolar with significantly less coronal tooth structure. The buccal and lingual mucosa was normal. There was no intra or extraoral swelling/sinus present. The periodontal health was normal and there was no mobility. Tooth was not tender on percussion.

Pre-operative radiographic examination revealed distoproximal radiolucency involving pulp chamber and radiographic examination revealed there was a sudden

disappearance of pulpal space radiolucency in middle third of the root.



"a" "b"

Fig 5a: pre-operative photograph

Fig 5b: pre-operative iopa

Final diagnosis was made as asymptomatic irreversible pulpitis with asymptomatic apical periodontitis.

Root canal treatment followed by post and core was planned. On first appointment, Caries was excavated using a large round bur and pre-endodontic build-up of lost tooth structure was done with composite resin to place rubber dam. After that Rubber dam isolation was done and access cavity was prepared.

To gain sufficient access to the canals, the conventional access opening was modified into one that was wider buccolingually.

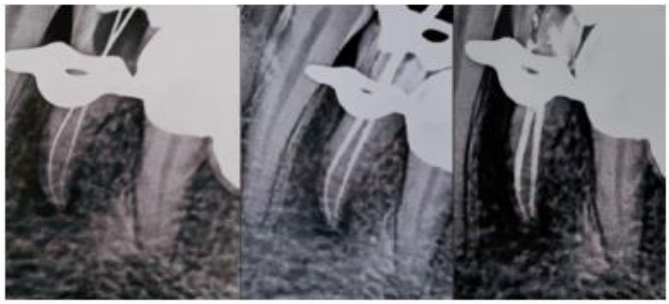
Two separate canal orifices buccal and lingual were located.

"a" "b"

Fig 6a: pre-endodontic build up

Fig 6b: access opening

Then the working length of both the root canals were determined with No 10 K file using an electronic apex locator and verified by a radiograph. Glidepath preparation was done up to No 20 K file. Canals were prepared with Neo Endo S rotary files up to 25/04 along with 3% sodium hypochlorite and 17% EDTA. Final irrigation of the canal was done with normal saline. Master-cones were selected, measured to the working length and carefully placed into the canals and was confirmed using radiograph. The canals were dried with absorbent paper points. Obturation was done using gross man sealer and single cone (25/04) obduration technique. Then temporary dressing was given and patient was recalled after two days.



"a" "b" "c"

Fig 7a: working length iopa

Fig 7b: master cone iopa

Fig 7c: obturation ioa

On the second appointment, the temporary restoration was removed; Post space was prepared in the lingual canal up to No 3 Peeso reamer. Then No 1 Fibre post cementation was done with Self-adhesive Resin cement (3m Espe Relyx U200) & core build-up was done with composite resin.

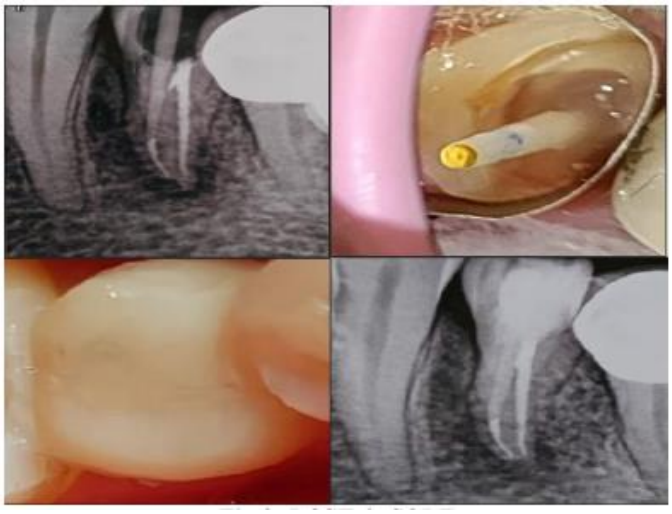


Fig 8: post & core

Discussion

Recognizing the abnormal anatomy necessitates a detailed understanding of root canal morphology, critical interpretation of diagnostic tools, accurate assessment of the pulp chamber floor, and the clinician's operating abilities.[15]

Weine categorized the root canal system into four basic types. Vertucci in his studies found numerous complex root canal systems and identified eight pulp canal configurations.

Vertucci 16

- Type I (1-1)
- Type II (2-1)
- Type III (1-2-1)
- Type IV (2-2)
- Type V (1-2)
- Type VI (2-1-2)
- Type VII (1-2-1-2)
- Type VIII (3-3) Weine et al.17
- Type I (1-1)
- Type II (2-1)
- Type III (2-2)
- Type IV (1-2)

When the root canal shadow abruptly disappears in the radicular region on radiograph, bifurcation or trifurcation of the canal should be suspected, according to Slowey. When the root outline is unclear, has an irregular contour, or deviates from the normal look on radiograph, an extra root canal can be found.[18]

Magnification was required for the management of branched canal configurations where the clinician had difficulties locating and preparing the canal. Inadequate access, which leaves a shelf of dentine over the second canal, is one of the most prevalent reasons for trouble finding the second canal.19 The second canal departs the main canal at a sharp angle, almost at a straight angle, in most cases. Slowey suggests visualising such a canal design as a lower-case letter 'h,' with the main canal forming the straight-line section of the 'h,' and the second canal forming a sharp angle from the straight canal around midroot.[20]

Direct access to the buccal canal is frequently feasible in such anatomic variations, however finding the lingual canal can be challenging since the lingual canal tends to branch from the main canal at a severe angle. Furthermore, the crown's lingual inclination directs files buccally, making finding a lingual canal opening more challenging. A modification in access was also necessary in such a canal, which necessitated appropriate flaring of the channel coronal to the bifurcation for unhindered transit of instruments into the second canal.[21] A precurved 10K file should be used to carefully explore the bifurcation canal, which will produce a tactile feeling when the instrument moves in an eccentric orientation on deeper penetration into the canal.[22, 23] Obturation of branched canal designs is a difficult task. These can be obturated in two ways: [24] utilising Thermoplasticised gutta-percha procedures25 or using single cone obturation until the level of bifurcation and lateral compaction for the remaining canal.[26]

When the remaining coronal portion of an endodontically treated tooth can no longer provide sufficient/satisfactory support and retention for the restoration, an intraradicular post is usually used to reinforce strength. The resin fibre post has more properties in common with natural dentinal structure than any other post previously employed. It has great transverse strength and functions as a shock absorber, dispersing much of the load put on the completed restoration while only conveying a small fraction of the pressures to the dentinal walls.[27]

Conclusion

The diagnosis and treatment of additional roots or root canals is a difficult task for endodontists. The clinician must have a solid awareness of the normal root canal anatomy and its usual deviations in order to be successful. To avoid canals being overlooked, a detailed evaluation of root canal multiplicity on radiographs is required prior to treatment. The inability to locate and obturate a root canal has been identified as a key reason of endodontic therapy failure. Post and core therapy is required for the restoration of endodontically treated teeth with severe tooth structural loss. Post and core treatment have a long-term prognosis.

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