CASE REPORT

Unusual Anatomical Variation in Maxillary First Molar and Its Management

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ABSTRACT

Aim: To present and describe the identification and treatment of two unusual cases of maxillary first molars, One of the cases exhibit two separate canals in the palatal root while the other had two separate palatal roots and canals.

Summary:. The thorough knowledge of root canal space anatomy is a basic prerequisite for successful completion of endodontic treatment; especially extra root canals must be looked for in all cases otherwise treatment failure is extremely possible. Maxillary first molar is the largest tooth in volume and complex in root and canal anatomy. It is the posterior tooth with highest endodontic failure rate and unquestionably one of the most important teeth. This case report emphasises that clinicians should be aware of both external and internal anatomical variations, and accordingly the access cavity modifications may be required for stress–free entry to complex pulpal anatomy. As in these two cases all the canals were cleaned, shaped and obturated. However, in cases where the radiographic images are not clear or the direct visualization of the internal anatomy is impaired, it is recommended that magnification devices be used. Enhancement of color contrast by means of dye may also help to better visualize deeply situated orifices.

Key words: Maxillary first molar, Unusual root anatomy, Unusal canal anatomy

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INTRODUCTION

The complexity of root canal morphology, especially in multirooted teeth, is a constant challenge for diagnosis and successful endodontic therapy.[1] Knowledge of the most common anatomic characteristics and their possible variations is fundamental, because the non treatment of one canal can lead to endodontic treatment failure.[2] Anatomic characteristics of permanent maxillary molars are generally described as a group of teeth with three roots, one palatal and two buccal, each root with one root canal. The occurrence of a second mesiobuccal canal when there are four canals also is common. The anatomic variability percentile with mesio-buccal root varies according to various authors, but they all agree on one fact: they may be present in more than half of cases.[3-8] The distobuccal and palatal roots always have one canal each, although on a very rare occasions either may have a second canal too or two separate roots.

Christie *et al*.[2] reported 16 cases of maxillary molars with two palatal roots found during 40 years of daily clinical practice. They classified these teeth according to the shape and root separation as type I, II, and III. Type I maxillary molars have two widely divergent palatal roots, which often are long and tortuous. The buccal roots often are "cow-horn"[2,9] shaped and less divergent. Four separate root apices are seen on the radiograph. Type II maxillary molars have four separate roots, but the roots often are shorter, run parallel, have buccal and lingual root morphology, and have blunt root apices. Type III maxillary molars also are constricted in root morphology with the mesiobuccal, mesiopalatal, and distopalatal canals encaged in a web of root dentin. The distobuccal root in these cases seems to stand alone and may even diverge to the distobuccal. The term "Radiculae Appendiciformes"[10] is applied when small accessory roots are seen by extensive growth of dental enamel. This could be due to genetic or exogenous disturbances.

It has been shown from previous *in vitro* studies that a wide morphological variation does exist as regards to the root canal system of maxillary first molar. The use of operating microscope is very important for the clinicians to be familiarized with the internal morphology and to ensure through a microscopic camera that no other canal exists.

CLINICAL REPORTS

Case 1:

A 21 year old female reported to the Post-graduate Clinic of Conservative Dentistry and Endodontics. She complained of a dull and intermittent pain in her upper right jaw region since one year. On intra-oral examination, the maxillary right first molar (16) with an extra cusp mesial to mesio-palatal cusp (Protocone) and proximal caries was observed. The vitality tests (thermal, electric pulp tester) showed abnormal responses indicating irreversible inflamed tooth. The routine intra-oral periapical radiograph revealed carious exposure of pulp but was inconclusive of any morphological variation in the roots or the root canals. Clinical and radiographic features lead to a diagnosis of acute irreversible pulpitis, indicating the need for endodontic treatment in both right maxillary second premolar (15) as well as in right maxillary first molar (16). The proximal caries was excavated and restored temporarily with re-inforced glass ionomer (Ketac Molar 3M ESPE). After anesthesia, access cavity was prepared in tooth 16 under rubber dam. The floor of the pulp chamber divulged four canal orifices, two on the buccal and two on the palatal (Fig.1). To get a straight line access to the mesio-palatal root canal the access cavity was extended mesially. The periapical radiograph for the working length determination further divulged the presence of four independent roots (Type I Christie *et al*.) Cleaning and shaping was completed using Protaper system and 1% sodium hypochlorite as an irrigant. The root canals were obturated using lateral condensation technique (Fig. 2). Later the tooth was restored with composite and patient was called for check up and post endodontic restoration.

Figure 1: Tooth 16 shows floor of the pulp chamber divulged with four canal orifices, two on the buccal and two on the palatal side.

Case 2:

A 30 year old male patient was referred from the department of Oral Medicine and Radiology for root canal treatment on a maxillary right first molar (16). The patient reported that he felt a localized steadily provoked momentary pain on chewing. However, the tooth was sensitive to percussion and there was no mobility. The vitality tests (thermal, electric pulp tester) showed abnormal responses indicating irreversibly inflamed tooth. The radiograph revealed periapical radiolucency with advanced caries (Fig. 3). As root canal therapy was planned, posterior superior alveolar nerve block and infiltration was administered and the tooth was isolated with rubber dam. Access to the pulp chamber was made; three canal orifices (mesio-buccal, disto-buccal and palatal) were immediately detected using DG16 explorer. After thorough probing the groove between mesio-buccal and palatal canals a soft and sticky area was located; this revealed an additional fourth canal (Fig. 4). Two different size files were introduced into two palatal canals. An Apex locater Root Zx (J Morita, USA) was used to verify working lengths. Pulp extirpation was

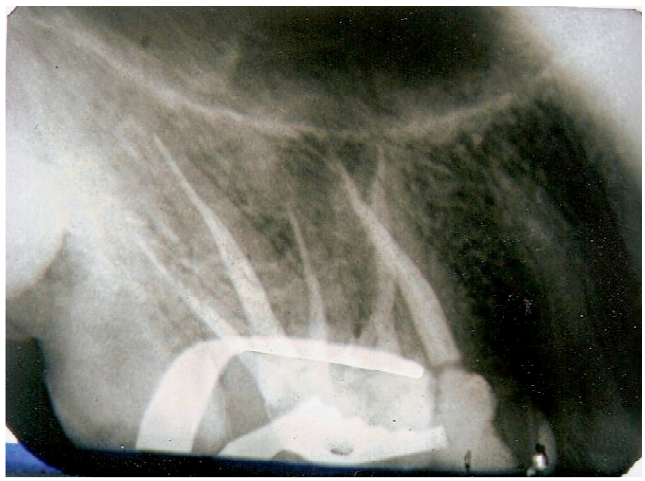

Figure 2: Radiograph taken immediately after obturation shows two separate palatal roots in case of tooth 16 while the tooth 15 shows only one root and one canal.

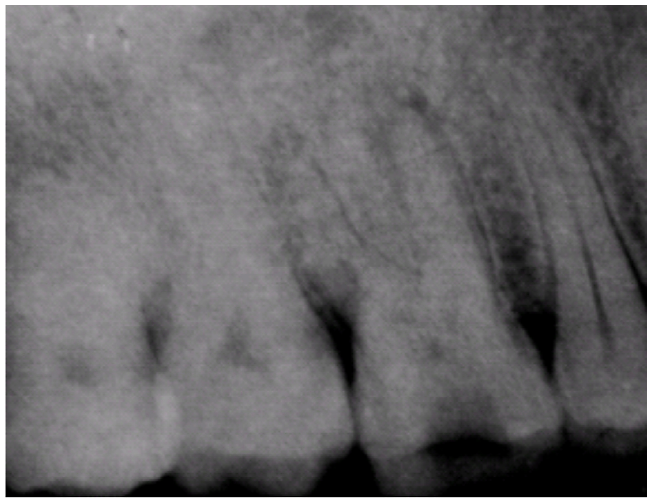

Figure 3: Shows a radiograph of tooth 16 which revealed periapical radiolucency with advanced caries.

Figure 4: Shows an additional fourth canal on palatal side of tooth 16.

performed at the first visit. All the four canals were instrumented with rotary Protaper (Dentsply, Germany) up to size F2. During instrumentation, copious irrigation was performed with 2.5% sodium hypochlorite. After completing cleaning and shaping, root canals were dried using sterile paper points. Obturation was performed using F2 Protaper guttapercha cones (Dentsply, Germany) and Endomethasone root canal sealer (Septodont, France). Post operative verification was done and the access cavity was filled with reinforced Glass ionomer cement (Ketac Molar 3M ESPE) (Fig. 5).

Figure 5: Shows a radiograph taken after obturation of tooth 16 which had two separate palatal canals.

DISCUSSION

Although anatomic variations in permanent maxillary molars are unusual, variations involving the number of root canals or number of roots can occur.[1] According to Christie *et al*.,[2] the presence of two palatal roots in maxillary molars, such as reported in this study, would be detected once every three years in an intense daily clinical practice. Peikoff *et al*.[11] observed that 1.4% of maxillary molars may have second palatal roots. Case one shows post obturation radiograph having two palatal roots and canals while case two shows post endodontic restoration radiograph with one palatal root and two palatal canals. From a clinical standpoint, radiographic or other images provide clinicians with the most appropriate method to detect variations in both root and canal anatomy.[5] Pecora[12] recommended the use of two diagnostic radiographs, of which one was ortho-radial and the other taken either 30° mesially or distally, according to the anatomical location of the tooth being examined. If a radiograph shows a sudden narrowing or even a disappearing pulp space, the canal diverges at that point into two parts that may either remain separate or merge before reaching the apex.[12,13]

Slowey *et al*.[7] observed that if a radiolucent line is present mesial or distal to the main canal, an additional canal should be suspected. The presence of an additional canal should be suspected whenever an instrument demonstrates an eccentric direction on deeper penetration into the canal, termed directional control, as reported by Tagger *et al.*[10] or if a length file appears off-centre on the radiograph. However, in cases where the radiographs are not clear or the direct visualization of the internal anatomy is impaired, it is recommended that magnification devices to be used as an adjunct.[14-16] Enhancement of color contrast by means of dye may also prove helpful to better visualize deeply situated orifices when magnification does not suffice.[17]

The basic prerequisites for successful completion of endodontic treatment are thorough knowledge of root canal space anatomy; extra root and canals however, must be looked for in all cases. Several aids like endodontic microscope, with or without using the dyes to change the contrast can also prove helpful to enhance the visibility. While in some cases, access cavity modifications may be required for stress-free entry to complex pulpal anatomy.[18] All these prove extremely significant for increasing the success rate of the treatment; although in the cases reported here, there was no need to use either the magnifying microscope or dye, since it was quite clear from the radiograph itself. These, if need be are, and can be, used as adjuncts to radiographs.

CONCLUSION

This report shows that correct root-canal therapy can be performed respecting the possible challenges of pulp space anatomy. Clinician should be aware of both external and internal anatomical variations as reported in this case report. Access cavity modifications may also be required for stress-free entry to complex pulpal anatomy. Practice doesn't make a man perfect, but a perfect practice makes a man perfect.

REFERENCES

1. Malagnino V, Gallotini L, Passariello P. Some unusual clinical cases on root anatomy of permanent maxillary molars. J Endod 1997, 30: 451-5
2. Christie WH, Peikoff MD, Fogel HM. Maxillary molars with two palatal roots: a retrospective clinical study. J Endod 1991; 17: 80–4.
3. Beatty RG. A five-canal maxillary first molar. J Endod 1984; 10: 156–7.
4. Bond JL, Hartwel G, Portell FR. Maxillary first molar with six canals. J Endod 1988; 14: 258–60.
5. Martinez-Berná A, Ruiz-Badanelli P. Maxillary first molars with six canals. J Endod 1983; 9: 375–81.
6. Diamond M. Dental anatomy including anatomy of head and neck. 3rd ed. New York: MacMillan, 1952, 203–5.
7. Slowey R. Radiographic aids in the detection of extra root canal. Oral Surg Oral Med Oral Pathol 1974; 28: 419–25.
8. Libfeld H, Rostein I. Incidence of four rooted maxillary second molars: literature review and radiographic survey of 1200 teeth. J Endod 1989; 15: 129–31.
9. Baratto-Filho F, Fariniuk L, Ferreira E, Pecora JD, Cruz-Filho A, Sousa-Neto MD. Clinical and macroscopic study of maxillary molars with two palatal roots. Int Endod J 2002; 35: 796–801.
10. Tagger M, Tamse A, Katz A, Korzen B. Evaluation of the apical seal produced by a hybrid root filling method, combining lateral condensation and thermatic compaction. J Endod 1984; 10: 299–303.
11. Peikoff MD, Christie WH, Fogel HM. The maxillary second molar: variations in the number of roots and canals. Int Endod J 1996; 29: 365–9.
12. Pecora JD, Woelfel JB, Sousa-Neto MD, Issa EP. Morphology study of the maxillary molars. Part II: internal anatomy. Braz Dent J 1992; 3: 53–7.
13. Jerome CE, Hanlon RJ Jr. Identifying multiplanar root canal curvatures using stainless-steel instruments. J Endod 2003; 29: 356–8.
14. Benenati FW. Maxillary second molar with two palatal canals and a palatogingival groove. J Endod 1985; 11: 308–10.
15. Maggiore F, Jou YT, Kim S. A six- canal maxillary first molar: a case report. Int Endod J 2002; 35: 486–91.
16. De Moor RJ, Calberson FL. Root canal treatment in a mandibular second premolar with three root canals. J Endod 2005; 31: 310-3
17. Ferguson DB, Kjar KS, Hartwell GR. Three canals in the mesiobuccal root of a maxillary first molar: a case report. J Endod 2005; 31: 400-2
18. Soares JA, Leonardo RT. Root canal treatment of three rooted maxillary first and second premolars- a case report. Int Endod J 2003; 36: 705-10.