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Endodontic Management of Maxillary first molar with 2 palatal and 3 buccal canals and associated with multiple space infection

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Abstract:

Aberrations in the root canal anatomy are a commonly occurring phenomenon. A thorough knowledge of the basic root canal anatomy and its variations is necessary for successful completion of the endodontic treatment. Maxillary first molars usually have three roots and three or four canals (two mesiobuccal canals, one distobuccal and one palatal canal). The incidence of two palatal canals in a palatal root is quite rare. When such a case is associated with multiple space infection endodontic management becomes more complicated. This case report presents endodontic management of a maxillary first molar with five canals (two mesiobuccal, one distobuccal and two palatal canal) and causing multiple space infection (buccal, canine and infra-orbital space).

Keywords: Space Infection, Endodontic Management

Introduction:

Knowledge of both normal and abnormal anatomy of the root canal system dictates the parameters for execution of root canal therapy and can directly affect the outcome of the endodontic therapy[1]. It is highly imperative that the clinician be cognizant of possible morphological variations of teeth for endodontic therapy to be successful. There are numerous

variations in the canal number and configuration in maxillary molars[2].

In maxillary first molars, mesiobuccal roots tend to have more variations in the canal system followed by the distobuccal root, whereas the palatal root has the least.

Anatomic characteristics of permanent maxillary molars are generally described as a group of teeth with 3 roots, 2 buccal and 1 palatal and each root having 1 root canal[3].

However, the literature describes wide variations in root canal morphology of maxillary first molars. Cleghorn et al. did a comprehensive review of the root and root canal morphology of the maxillary first molar. Several case reports of maxillary first molars with unusual canal morphology have been reported in the literature[4]. Such adverse anatomy warrants, the clinician to be more judicious (careful) in locating and cleaning and obturating all the canals. When such cases are associated with multiple space infection, endodontic management becomes more complex.

This case report intensifies the complexity of maxillary molar variation and is intended to reinforce the clinician's awareness of the rare morphology of root canals. It presents endodontic treatment of a maxillary first molar having five canals and associated buccal, infra orbital and canine space infection.

Case Report:

A 22 year old female patient reported to the Department of Conservative Dentistry and Endodontics, Pacific Dental College and Hospital, Udaipur with complaint of pain and swelling in back region of upper right jaw. An extra oral swelling was observed, the swelling extended Anteriorly to the right lateral wall of nose, posteriorly to the tragus, superiorly to the lower eye lid and inferiorly to the right upper lip. It was suggestive of multiple space infection. The involved spaces were buccal space, canine space and infra orbital space.

On intra oral examination, the right maxillary first molar was decayed with an associated intra oral swelling in the right buccal vestibule. The patient's medical and family history was non-contributory.

Radiographic examination revealed dental caries involving enamel, dentin and pulp in tooth no.16.

On the basis of clinical and radiographical examination, it was diagnosed as chronic peri apical abscess causing multiple space infection (buccal, canine and infra orbital the space).

After extensive clinical and radiographic examination, the maxillary right first molar was prepared for nonsurgical endodontic therapy. The tooth was isolated with rubber dam and a conventional emergency endodontic access cavity was prepared. Clinical evaluation of the internal anatomy revealed 3 principal root canal systems: mesiobuccal (MB), distobuccal (DB), and palatal. Examination of the floor of the pulp chamber with an endodontic explorer revealed 5 canal orifices, two mesiobuccal canals, one distobuccal canal and two palatal orifices.

Pus was drained through the canal. Subsequently the canals were left open and patient was put on systemic antibiotic and anti inflammatory medication. Patient was recalled on the following day.

During the second visit there was a marked reduction in swelling and pain. After relocating the root canal orifices, working length was determined using conventional radiograph and reconfirmed with an electronic apex locator. The canals were initially instrumented with no #15 nickel-titanium files under irrigation with 3% and 1.5% sodium hypochlorite and normal saline. All canals were cleaned and prepared under rubber dam isolation, using the rotary Protaper Ni-Ti system with Glyde as lubricant. When the tooth was asymptomatic and soft tissues had returned to normalcy, the canals were obturated with GP points and resin based sealer (AH Plus). Final radiograph was taken to evaluate the quality of the obturation. After completion of root canal treatment, the tooth was restored with silver amalgam

.

Figure1. a) Preoperative view, multiple space infection, b) Access cavity prepared showing two mesiobuccal and one distobuccal orifice, c) Two palatal orifices, d) Working length radiograph, e) Master cone radiograph f) Post obturation radiograph.

Table I. Case reports of maxillary first molar with unusual canal morphology

Author	Unusual morphology of the maxillary first molar
Harris (1980)[5]	4 canals with 1 mesiobuccal, 1 distobuccal, and 2 palatal roots
Cecic et al. (1982)[6]	5 canals with 2 mesiobuccal, 1 distobuccal, and 2 palatal roots
Stabholz A and Friedman S (1983)[7]	5 canals with 3 buccal and 2 palatal roots (presumably fusion of the maxillary right first molar and second premolar)
Beatty (1984)[8]	5 canals with 3 mesiobuccal, 1 distobuccal, and 1 palatal roots
Wong (1991)[9]	Palatal root characterized by a single canal orifice a trifurcation on the apical one-third of the root, and 3 separate foramina
Holtzman (1997)[10]	(2 cases) 5 canals with 2 mesiobuccal, 1 distobuccal, and 2 palatal roots
Hulsmann (1997)[11]	4 canals with 2 distobuccal, 1 mesiobuccal, and 1 palatal roots
Di Fiore (1999)[12]	4 roots: distobuccal, distopalatal, mesiobuccal, and mesiopalatal
Johal (2001)[13]	5 canals with 2 mesiobuccal, 1 distobuccal, and 2 palatal roots
Baratto-Filho et al. (2002)[14]	2 palatal roots, each with separate canal, i.e., 2 palatal canals, 1 mesiobuccal, and 1 distobuccal canal
Ferguson et al. (2005)[15]	5 canals with 3 mesiobuccal, 1 distobuccal, and 1 palatal roots
Chen and Karabucak (2006)[16]	4 canals with 2 distobuccal, 1 mesiobuccal, and 1 palatal roots
Favieri et al. (2006)[17]	5 canals with 3 mesiobuccal, 1 distobuccal, and 1 palatal roots

Adanir (2007)[18]	4 roots (mesiobuccal, mesiopalatal, distobuccal, and palatal) and 6 canals with 1mesiobuccal, 2 mesiopalatal, 2 distobuccal, and 1 palatal roots
Gopikrishna et al. (2008)[19]	2 palatal roots and a single fused buccal root
Vivek Agrawal et al. (2009)[1]	First maxillary molar with two palatal canals (with the aid of spiral CT)

Discussion:

This report highlights the unusual anatomy of a maxillary first molar with 2 separate palatal canals. The majority of endodontic literature describes the maxillary first molar as having 3 roots with 3 or 4 root canals. The prevalence of maxillary first molars with 2 palatal canals is rare. Also literature is scarce regarding presence of 2 separate palatal canals with separate orifices[(5,8-10)].

Hoen and Pink found 42% incidence of missed roots or canals in the teeth that needed retreatment). Hence, it is of utmost importance that all the canals be located and treated during the course of nonsurgical endodontic therapy.

In the present case, the presence of a missed and incompletely obturated root canal could have probably led to the persistence of clinical symptoms and subsequent failure of endodontic therapy.

Shape of pulp cavity is variable, making every treatment unique. Properly designed and prepared access cavities help the clinician to diagnose and negotiate the root canal morphology[20].

Before initiating treatment, the dentist cannot precisely determine the actual number of root canals present. The varying morphology of the root canals is normally ascertained with radiographs of different angulations or careful examination of the floor of the pulp chamber[21]. Floor of the pulp chamber and wall anatomy provide a guide to determining what morphology is actually present. Krasner and Rankow[22] made a rational approach to study the relationships of the pulp chamber to the clinical crown and pulp chamber floor. Their observations, put forth in the form of laws, are valuable aids to the clinician in searching for elusive canals.

Although extra canals are more of a rule than an exception, if the clinician is aware that the possible anatomic variations include teeth with a lesser number of roots and canals, as in the present case, iatrogenic errors can be reduced[23].

Although there are inherent limitations, radiographs provide a clue to the type of canal configuration present. In the case reported by Agrawal et al. used dental imaging with the help of spiral computerized tomography (CT) to ascertain the 3-dimensional morphology of the tooth[1]. The recent imaging technologies and the use of operating microscopes may be helpful in detecting variations of root canals in all doubtful circumstances related to unusual root canal anatomy. In the present case, however, we did not feel the need for any objective analytical tool, such as CT and spiral or helical CT, to ascertain root canal morphology, because there were no doubtful circumstances in either radiographs of different angulations or examination of the floor of the pulp chamber. Furthermore, such equipment may not always be present in routine clinical practice and the patient can be exposed to unwarranted radiation[23].

Radiographs of different angulations must be taken and, if an extra canal is confirmed, a broad coronal access will allow the correct localization of the root canal without any an iatrogenic error.

From a clinical standpoint, when the initial radiograph shows the image of an unusual anatomic form, it is recommended to take a radiograph of the contralateral tooth[24].

Consequently, although such cases occur infrequently, the clinician should be aware of them when considering endodontic treatment of a maxillary first molar, so that correct root canal

therapy can be performed, respecting the possible challenges of pulp space anatomy.

A good understanding of anatomical variations is necessary for successful endodontic practice. Skilful clinical and radiographical examination is also necessary for adequate evaluation of variations in root canal anatomy, thereby enabling long-term therapeutic success.

Conclusion:

Successful nonsurgical endodontic management of a maxillary first molar with five root canals has been presented. Knowledge of possible variations in internal anatomy before initiation of endodontic therapy is important for endodontic success. Careful interpretation of the radiograph, close clinical inspection of the floor of the chamber, and proper magnification of the chamber floor are essential for a successful treatment outcome.

For successful non-surgical root canal therapy, it is must to locate all the canals and perform through cleaning and shaping to achieve three dimensional seal and promote normal healing process.

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