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Indian J.Sci.Res. 14 (2): 91-97, 2024 Case Report

CASE REPORT ON DIFFERENT ROOT CANAL MORPHOLOGIES OF MAXILLARY 2nd MOLARS ALONG WITH CBCT

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ABSTRACT

A comprehensive understanding of the anatomy of the root canal is necessary for an endodontic procedure to be successful. The shape of root canals varies from case to case. Maxillary 2nd molars require advanced imaging modalities, such as cone-beam computed tomography (CBCT), which offers advantages over traditional radiography methods due to their diverse morphologies. This article discusses cases of maxillary second molars. This article focuses on how to typically detect teeth with such a wide range of morphologies using computed tomography (CBCT) and to help develop treatment modalities for those teeth.

KEYWORDS: CBCT, Endodontic Treatment, Maxillary 2nd Molars, Palatal Canals

Multirooted teeth provides a varying root canal anatomy which requires a correct diagnosis and expert management. The dentist needs to be familiar about these distinctive root canal configurations and their variations for effective endodontic management (Al-Qudah *et al.*, 2023). Inability to detect and negotiate the complexities of the root canal system results in unpredictability about the treated tooth which leads to failure of the treatment (García-Guerrero *et al.*, 2020). Endodontic treatment of maxillary second molars (MSMs) can be most difficult to treat due to the confound root canal anatomy and diverse internal structures whereas the most commonly encountered type, known as standard morphology, has three roots: one mesiobuccal, one distobuccal, and one palatal, each with a single canal. (Ahmed *et al.*, 2017; Stone and Stroner, 1981; Khadilkar *et al.*, 2023)

There have been accounts of some unusual MSM anatomies in the literature. According to several authors, MSMs have one mesial and one distal root, which resemble mandibular molars and each root has two root canals. Several cases had been reported in past like: maxillary second molar with three buccal roots, MSM with three canals in the MB(mesiobuccal) root, maxillary second molar with 5 roots and 5 canals. (Kottoor *et al.*, 2010)

Identification of the root canal morphologies of teeth in various ethnic groups is necessary because the root canal anatomy and its complexity are genetically determined and are of paramount importance in anthropology. This case report presents the endodontic management of MSMs with different canal morphologies.

CASE REPORT 1

A 40-year-old female patient reported to Department of Conservative Dentistry and Endodontics with a chief complaint of pain in the upper right back region of jaw from the past 1 month which increased in severity since last 4 days. The pain was severe, throbbing in nature which aggrevated on lying down. A carious upper right maxillary second molar detected on clinical examination, which was tender on percussion and a diagnosis of chronic irreversible pulpitis of the right maxillary second molar was made based on clinical and radiographic examination, necessitating endodontic treatment. The affected tooth's radiographic analysis revealed a complex root canal anatomy with roots that overlapped one another. Due to superimposition of roots, accurate radiographic assessment was difficult. So, a CBCT was adviced to know the exact morphology of the roots and canals of the same tooth which CBCT revealed that on axial and saggital section there are 4 roots which are mesiobuccal, mesiopalatal, distobuccal & distopalatal and corresponding with four canals respectively. The tooth was anesthetized and isolation of tooth was done with a rubber dam.

A conventional access opening was done using Endo-Access bur (Dentsply Sirona) which showed, four canal orifices, two on the buccal & two on palatal side of the pulpal floor. Pulp tissue was extripated using barbed

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broaches and the pulp chamber was flushed with 3% Sodium hypochlorite. The patency of canal was confirmed with #10 no. K file (Dentsply). Working length was determined using Ingle's method. Cleaning and shaping with the ProTaper Gold rotary system (Dentsply Maillefer) up to F1 was completed. During instrumentation, the canals were periodically irrigated with 5.2% sodium hypochlorite, EDTA liquid and the last rinse was done with 2ml saline. The position of the master cone was verified using a radiograph. Bioceramic sealer (Safe Endo) was used to complete the obturation of all the canals. After that, Bulk fill composite restorative material (Mani Bulk) was used to restore the access. (Figure 1)

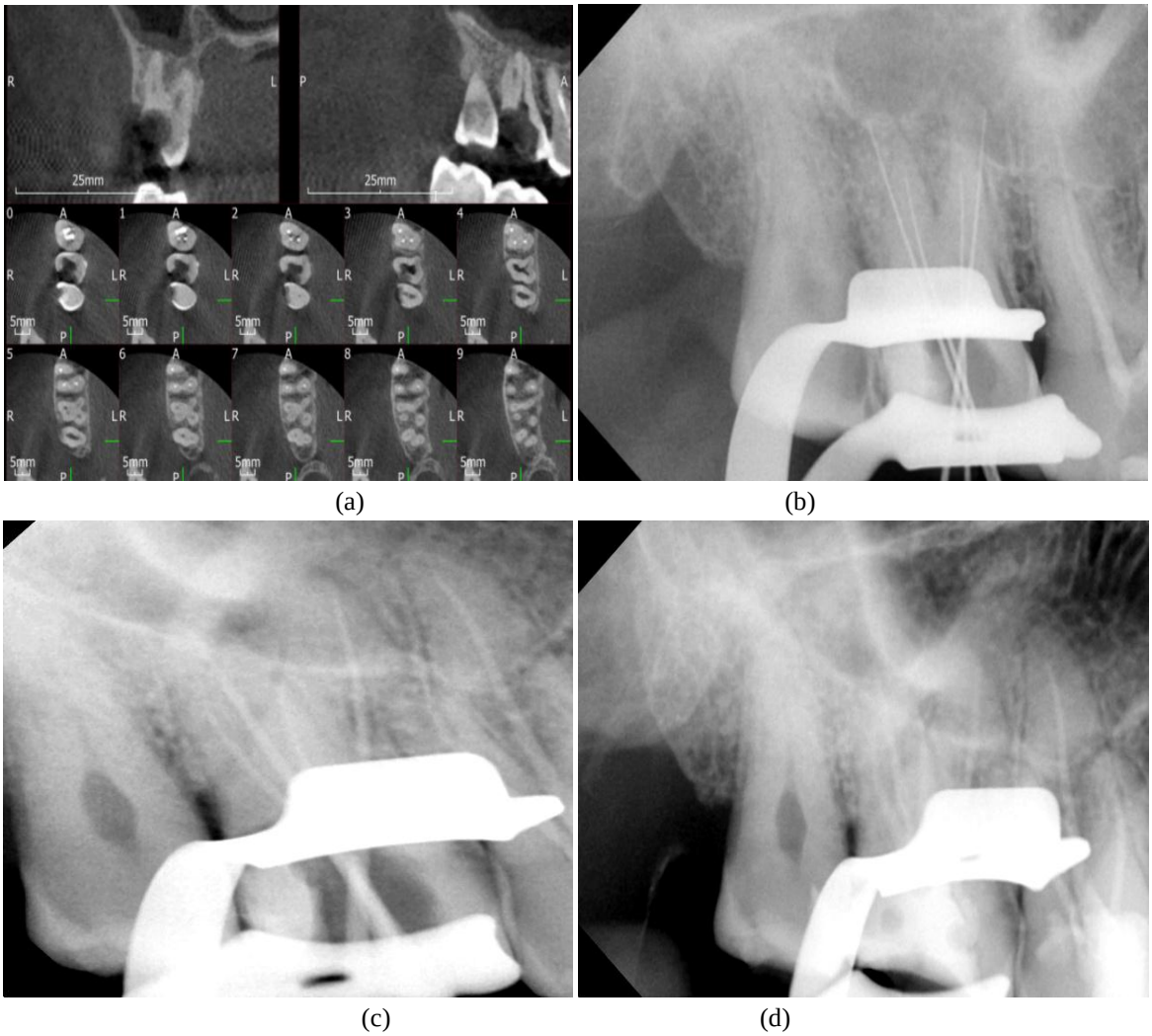

Figure 1: a) CBCT showing axial section of tooth presenting 4 roots 4 canals (17). b) radiograph showing working length determination c) radiograph showing master apical file. d) radiograph showing obturation

CASE REPORT 2

A 75 year old patient referred to the Department of Conservative Dentistry and Endodontics for intentional root canal treatment of maxillary 2nd molar of right quadrant followed by prosthetic treatment.

Clinical examination revealed that the tooth had no decay but there was pocket formation.

The periapical radiograph of the tooth showed slight widening of the apical lamina dura associated with the palatal root and tooth roots appeared bulbous and presence of extra canal lining was also seen. To confirm the presence of extra canals CBCT was advised.

CBCT findings revealed that the axial and saggital section shows presence of 3 roots which were mesiobuccal, distobuccal and palatal respectively with 2 canals in mesiobuccal root, 1 canal in distobuccal root and 2 canals in palatal root.

The tooth was anesthetized and isolation of tooth was done with a rubber dam. A conventional access opening was done using Endo-Access bur (Dentsply

Sirona). Pulp tissue was extripated using barbed broaches and the pulp chamber was flushed with 3% Sodium hypochlorite. The patency of canal was confirmed with #10 no. K file (Dentsply).Two mesial canal opening, one distal and two palatal canal openings were obsereved clearly, clinically.

Cleaning and shaping with the ProTaper Gold rotary system (Dentsply Maillefer) up to F1 was completed. During instrumentation, the canals were periodically irrigated with 5.2% sodium hypochlorite, EDTA liquid and the last rinse was done with 2ml saline. The position of the master cone was verified using a radiograph. Bioceramic sealer (Safe Endo) was used to complete the obturation of all the canals. After that, Bulk fill composite restorative material (Mani Bulk) was used to restore the access. (Figure 2)

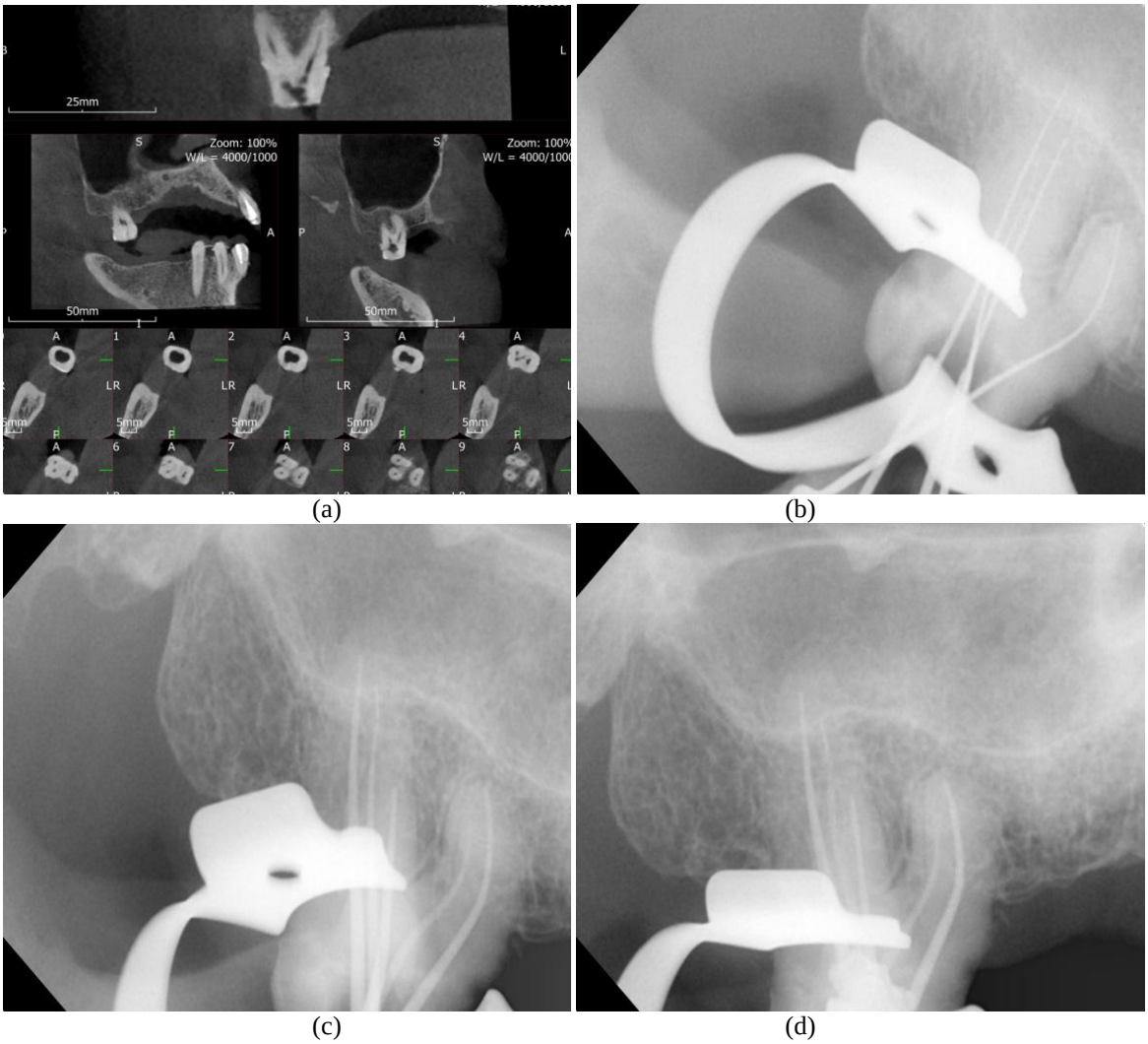

Figure 2: a) CBCT showing axial section and saggital section of tooth presenting 3 roots 5 canals (17). b)radiograph showing working length determination c) radiograph showing master apical file. d) radiograph showing obturation

DISCUSSION

For a successful endodontic treatment, understanding of root canal anatomy is crucial, and inadequate understanding of it might result in treatment failure.

The maxillary second molars, can have a complex and varied root and canal morphologies. The endodontic treatment of maxillary second molars is difficult because of the variance in morphology. (Gopikrishna *et al.*, 2018; Holderrieth and Gernhardt, 2009)

In maxillary second molars, the most typical appearance of maxillary second molars (MSMs) is three roots with three separate canals (mesio-buccal, disto-buccal, and palatal), which is followed by three roots with four canals. The fourth canal, often known as a second mesio-buccal (MB) canal, is frequently located in the

mesiobuccal root (Gopikrishna *et al.*, 2018). According to reports in the dental literature, some MSMs have peculiar root and canal anatomy.

MSM with having two roots—the distal and mesial roots—each having two canals was described by Zhang *et al.* (2010); Di Fiore, (1999) reported the presence of 3 canals in the MB root (Martins *et al.*, 2017)

There have also been reports of five roots and five canals in MSM (Aggarwal *et al.*, 2009). Some authors have reported the presence of two palatal roots (Pérez-Heredia *et al.*, 2017). Using micro-computed tomography (Plotino *et al.*, 2013), showed the existence of a palato-mesiobuccal canal in an excised 3-rooted MSM. Using micro-computed tomography, Versiani *et al.* (2012) studied 4-rooted MSMs taken from a pool of extracted teeth. Except for the MB root, which showed two canals in 24% of cases, they discovered that all roots only showed one canal. A MSM with five canals—two MB, two DB, and one palatal—and four roots—one palatal, one MB, and two DB—was described by Zeng *et al.* in 2016. Five maxillary molars—four first molars and one second molar—with bifurcated palatal canals (type 1-2 canal structure) were presented by Nosrat *et al.* in 2017.

In dentistry, cone beam computed tomography (CBCT) is a cutting-edge, practical technique that is frequently employed (Gopikrishna *et al.*, 2008)

Posterior location and superimposition of the anatomic structures on the radiographs are two important reasons for the possibility of failure to diagnose a second palatal root canal. Owing to the challenges in interpreting the morphologic variations on radiographs, the use of operating microscope, visualization techniques, cone beam or spiral computed tomography scan are recommended.

CBCT, as opposed to standard radiography, can produce three-dimensional (3D) illustrations of teeth, which can help with more accurate imaging of the root and canal system as well as analysis of the internal and exterior architecture of the tooth. It is a non-invasive method that yields higher-resolution images than traditional radiography. (De Moor *et al.*, 2002)

Hence Janik has proposed extension of the lingual wall to involve more of the cingulum area in order to explore the lingual canal.While in cases with moderate to extensive incisal wears, Historically, the lingual approach was used foresthetic and restorative reasons; but, with the improvement of restorative materials this should be less of a concern today. When a lingual access is made, a prominent bulge of dentin is often left in the cingulum area which makes detection and debridement of a lingual canal Mauger has proposed an incisal access for straight line access to both the canals. Root canal treatment is based primarily on the removal of microbial infection from the complex root canal system.Numerous antimicrobial agents have been recommended as inter appointment dressings. Calcium hydroxide paste being one of the simplest and remarkably effective antimicrobial medicament was used in this cases. (Jo *et al.*, 2016)

CONCLUSION

Any tooth might have variations in the number of roots and root canals which is something every endodontist treating root canals should be aware of, and they should always be on the lookout for abnormal anatomy. In order to carefully examine the pulpal floor and negotiate the concealed root canal anatomy, clinicians must concentrate on using modern tools like dental operating microscopes and CBCT which is emphasised by our study.

The complexity of the root canal system is best understood by the integration of thorough knowledge of tooth anatomy and correct interpretation of radiographs is important. Radiographs taken from at least two different angles must be studied. Modification of the access opening were required, which will assist the clinician for a more thorough assessment and successful treatment. (Jo *et al.*, 2016)

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