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RESEARCH ARTICLE

VARIATIONS IN THE ROOT CANAL CONFIGURATION OF MAXILLARY SECOND PREMOLAR: A CASE SERIES

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ABSTRACT

Successful endodontic treatment depends on accurate diagnosis and a thorough knowledge of the anatomy of the tooth and morphology of the root canal. Clinicians should be aware of anatomical variations in maxillary premolars and be able to apply the knowledge in radiographic and clinical interpretation. The maxillary second premolars are among the most difficult teeth to be treated endodontically. This could be due to many factors namely the number of roots, the number of canals, the direction and longitudinal depressions of the roots, the various pulp cavity configurations, and the difficulties in visualizing the apical limit by radiographs. This case series describes a case of maxillary second premolar with Vertucci's class II, Class II, Class IV and Class VI canal configuration respectively as the incidence of two canals (with either shared or separate apical foramina) is very high in the maxillary second premolars.

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INTRODUCTION

Root canal morphology varies from tooth to tooth. The dental pulp is the soft tissue component of the root canal system. It occupies the internal cavities of the tooth. The external boundary of pulp space resembles the shape of a root of the tooth (Bansal, 2018). A thorough knowledge of the anatomy of the tooth and morphology of the root canal is essential for the success of root canal treatment (Saini, 2015). The inadequate knowledge can lead to inadequate biomechanical instrumentation of root canal system, and this will cause failure of endodontic treatment (Al-Ghananeem, 2014). Second maxillary premolar is among the most commonly endodontically treated teeth. Hull and co-workers in 2003found its frequency to be 10.3%.Usually, the number of canals in maxillary second premolar is one. However, there is enough evidence in the published literature about the presence of second and third canal (Sardar, 2007). Therefore, the correct location, clean, shape and obturation of all canals are indispensable procedures.

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Similarly, Vertucci and De Grood and Cunninghan reported that a considerable number of failures could be assigned to anatomical variations, such as the presence of canals not usually found (Almeida-Gomes, 2009).

The canal configurations were categorized into the first seven types of Vertucci's classification (1984) as follows (Raj, 2010):

- Type I. A single canal present from the pulp chamber to the apex;
- Type II. Two separate canals leave the pulp chamber and join short of the apex to form one canal;
- Type III. One canal leaves the pulp chamber, divides into two within the root, and then merges to exit in one canal;
- Type IV. Two separate and distinct canals are present from the pulp chamber to the apex;
- Type V. Single canal leaves the pulp chamber but divides into two separate canals with two separate apical foramina;
- Type VI. Two separate canals leave the pulp chamber but join at the midpoint and divides again into two separate canals with two separate apical foramina; and

- Type VII. One canal leaves the pulp chamber, divides and rejoins within the canal, and finally redivides into two distinct canals short of the apex.

Following are the case reports showing diagnosis and management of different patterns in maxillary second premolar canal configuration.

CASE SERIES

Case 1: A 27 year old male patient reported to department of Conservative dentistry and Endodontics, Dr H.S.R.S.M's Dental College and Hospital, Hingoli. Patient reported with the chief complaint of food lodgment and pain in maxillary left posterior teeth region of jaw since 3 months. A thorough clinical examination and routine radiographic examination was done which revealed deep distoproximal caries approaching to the pulp on 25. After clinico-radiological examination Electric pulp tester was used for checking the vitality of pulp. Tooth was diagnosed as a chronic irreversible pulpitis. After proper diagnosis root canal treatment was planned. After access opening Vertucci's Type II canal configuration was noticed.

Figure 1.

Case 2: A 40 year old female patient visited to department of Conservative dentistry and Endodontics, Dr H.S.R.S.M's Dental College and Hospital, Hingoli with chief complaint of food lodgment in upper right back teeth region of jaw since 8 days.

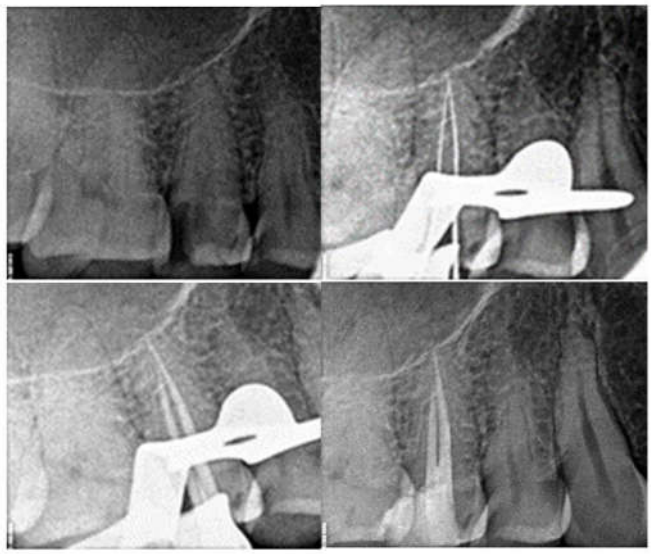

Figure. 2

After thorough clinical examination and routine radiographic examination deep distoproximal caries approaching to the pulp were noticed with respect to 15. Electric pulp tester was used for checking the vitality of pulp. Tooth was diagnosed as acute irreversible pulpitis. Treatment planned was root canal treatment. After access opening Vertucci's Type II canal configuration was noticed.

Case 3: A 36 year old female patient visited to department of Conservative dentistry and Endodontics, Dr H.S.R.S.M's Dental College and Hospital, Hingoli with chief complaint of pain in upper left back teeth region of jaw since 8 days. After thorough clinical examination and routine radiographic examination deep distoproximal caries approaching to the pulp were noticed with respect to 15. Electric pulp tester was used for checking the vitality of pulp. Tooth was diagnosed as an acute irreversible pulpitis. Treatment planned was root canal treatment. After access opening Vertucci's Type IV canal configuration was noticed.

Figure 3.

Case 4: A 25 year old male patient came to department of conservative dentistry and endodontics with coplaint of pain and pus discharge in maxillary left posterior region of jaw since 1 month.patient was diagnosed with periapical abcess .treatment done was proper root canal treatment with intermitent placement of intracanal medicament(Rc Cal) followed by obturation after interval of 1 month.patient was recalled after 3 months which shows complete healing periapically on the radiograph. In this case after access opening Vertucci's Type VI canal configuration was noticed.

DISCUSSION

Awareness of the morphology of the root canal system is essential for proper cleaning and shaping of the root canal system and ultimately endodontic treatment success[7]. Examination of the floor of the pulp chamber gives some cluesabout existing root canal types (Kartal, 1998). The canal configurations were categorized into the first seven types by Vertucci's in 1984 (Raj, 2010), (Figure 5). Kokane VB in 1995 studied Canal configuration in the roots of maxillary second premolars.

Figure 4.

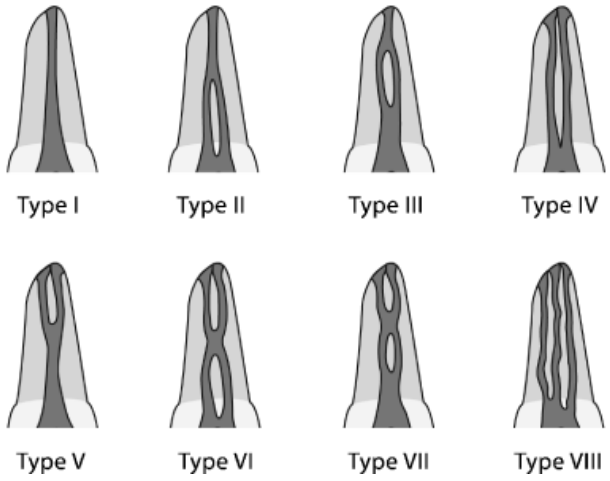

Figure 5. Diagrammatic representation of Vertucci's canal configurations[9]

He found that in 90 percent of the cases, two canals were located and treated. Of these 33.33 percent had two separate apical foramen and 51.66 percent had two canals, joined at the apical 2/3rd or 1/3rd. In 5 percent of the cases, two roots with two different canals were located and in only 10 percent of the cases, one canal was located (Kokane, 1995). Bellizzi in 1985 found that out of the 630 maxillary second premolars, 40.3% contained one canal, 58.6% contained two canals, and 1.1% contained three canals (Bellizzi, 1985). In present case series Vertucci's class II, Class II, Class IV and Class VI canal configuration was found in the respective cases.

Conclusion

Endodontic success in teeth with more-than-expected canals requires a correct diagnosis and careful clinical and radiographic examination (Golmohammadi, 2016 and Aly Ahmed, 2012). The incidence of two canals (with either shared or separate apical foramina) is very high in the maxillary second premolars. Inspection should be done for the presence of second canal whenever endodontic treatments planned for those teeth. The possible anatomic configurations of maxillary premolars are well documented in the literature. High quality preoperative radiographs and their careful examination are essential for the detection of additional root canals. So Clinicians should be very careful when treating maxillary second premolars because of the extreme variability of the anatomy of those teeth; the risk of missing a canal in those teeth is always present. That's why thorough knowledge of both normal and unusualdental morphology is essential for the practice of endodontics (Aly Ahmed, 2012).

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