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The curious case of Vertucci's type III root canals: A case series

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Abstract

Success of endodontic therapy depends to a large extent on the thorough mechanical cleansing of each root canal. One of the main reasons for failure in root canal therapy is a lack of knowledge of the anatomy of the pulp cavity and the inability to detect the presence of an additional canal which can then not be prepared and filled during treatment. In this case report, we present a very rare case of successful endodontic treatment of a maxillary second premolar and mandibular central incisor having Vertucci Type III root canal morphological system. This case report series highlights the importance of having a thorough knowledge of all possible root canal irregularities.

Keywords: Mandibular incisors, maxillary premolar, root canal variations, Vertucci type III

1. Introduction

Successful endodontic therapy depends to a large extent on the thorough mechanical cleansing of each root canal. One of the main reasons for failure in root canal therapy is a lack of knowledge of the anatomy of the pulp cavity [1]. An awareness of root canal morphology and careful interpretation of preoperative radiographs is necessary for success in endodontic therapy. However, radiographs are two-dimensional images of a three-dimensional object. The clinician must be aware of this limitation during radiographic interpretation [2, 3].

The morphology and anatomy of the teeth have been widely studied by means of a variety of in vivo and in vitro methods. When root canal systems are evaluated by a clearing technique, it gives more comprehensive knowledge than other techniques for the study of variations in the root canal system [4]. Thus, when the results of clearing techniques are compared with other studies, a higher incidence of variation is found in root canal morphology [5]. In his extensive study, Vertucci classified and described the root canal systems of human permanent teeth into eight different types [6, 7].

The configurations of the root canal systems can be classified into the following eight types [8]

- **Type I:** A single canal from the pulp chamber to the apex.
- **Type II:** Two separate canals leaving the pulp chamber but joining short of the apex to form one canal.
- **Type III:** One canal leaving the pulp chamber, dividing into two within the body of the root, and merging again to exit as one canal.
- **Type IV:** Two separate and distinct canals from the pulp chamber to the apex.
- **Type V:** One canal leaving the pulp chamber and dividing short of the apex into two separate and distinct canals with separate apical foramen.
- **Type VI:** Two separate canals leaving the pulp chamber, merging in the body of the root and re-dividing into two distinct canals short of the apex.
- **Type VII:** One canal leaving the pulp chamber, dividing and then re-joining within the body of the root, and finally re-dividing into two distinct canals short of the apex.
- **Type VIII:** Three separate and distinct canals from the pulp chamber to the apex.

According to a study by Vertucci FJ on the Root canal anatomy of the human permanent teeth, only 5% of Maxillary Second Premolars and 22% of mandibular central incisors exhibited Type III (1-2-1) Canals [9]. In this case report, we present a very rare case of successful endodontic treatment of a maxillary second premolar and mandibular central incisor having Vertucci Type III root canal morphological system.

2. Case Report-1

29-year-old male patient reported with a complaint of pain on chewing in upper left back tooth region since two weeks. Clinical examination revealed dental caries and mild tenderness on percussion in relation to the left maxillary second pre-molar and first molar. Cold test and Electric Pulp Test were performed, and the teeth were diagnosed with Irreversible pulpitis. An Intraoral periapical radiograph was taken to confirm the diagnosis. The radiograph of left maxillary second pre-molar showed the presence of Type III Vertucci canal configuration. (Figure-1) Root Canal Treatment was initiated on second pre-molar and first molar under local anaesthesia and rubber dam isolation. Calcium Hydroxide dressing was given for one week. Obturation using warm vertical compaction was completed in the second appointment. (Figure-2) Following permanent restoration using composite resin, patient was referred to the department of prosthodontics for post endodontic crown. (Figure-3)



Fig 1: Pre-operative Radiograph



Fig 2: Post-obturation Radiograph

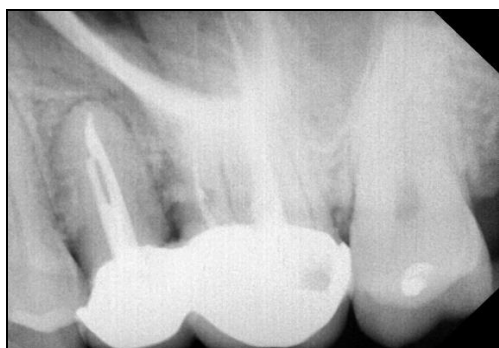


Fig 3: Two week recall after post-endodontic crown

3. Case Report-2

A 27-year-old female patient presented with a chief complaint of swelling and pain in the front region of lower jaw. Clinical examination revealed an intraoral abscess in relation to mandibular central incisors. Based on clinical and

radiographical findings a diagnosis of periapical abscess and pulp necrosis in relation to the right mandibular central incisor was made. Preoperative radiograph showed a presence of Vertucci type III canal in mandibular right central incisor. (Figure-4) Treatment was planned as an emergency access opening in the central incisor followed by intracanal-calcium hydroxide dressing for two weeks. Obturation using warm vertical compaction was completed in the second appointment. (Figure-5) Following root canal treatment, the tooth was restored using composite resin.

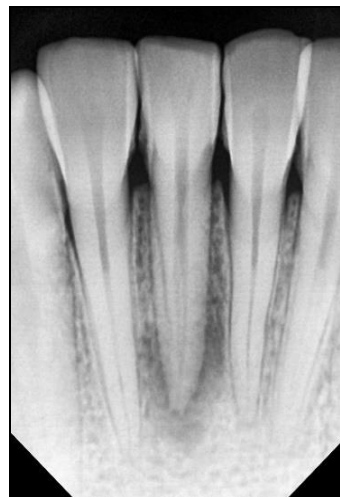


Fig 2: Pre-operative Radiograph

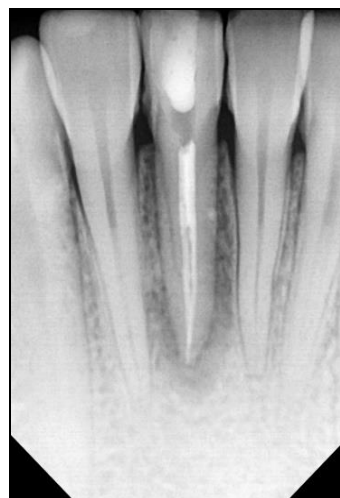


Fig 3: Post-obturation Radiograph

4. Discussion

In a study reported by Raj UJ and Mylswamy S, on the root canal morphology of maxillary second premolars in an Indian population, variable root canal configurations were found in maxillary second premolars. Type II configuration was most prevalent (33.6%) followed by type IV (31.1%), type I (29.2%), type V (2.1%), type III (1.3%), type VI (1.2%), and type VII (1%) [10]. There can be little hope of success in root canal therapy without some understanding of the morphology of the pulp cavity. During the past 100 years, there have been many studies on pulp form [8]. Because of these differences in the morphology of teeth in patients of different geographic and ethnic groups (on different continents), a caution is necessary when relying on the results obtained from studies done in other populations [11].

Generally, the mandibular incisors show presence of any of the first three types [7]. A huge variation in the percentage of

occurrence of type III canals in mandibular anteriors have been noted by various authors ^[12, 13]. Kabak YS and Abbott PV reported a case series of mandibular incisors with double canals. These cases were managed successfully with non-surgical endodontic approach. The main reason for unfavourable outcomes in endodontic treatment of mandibular incisors is the inability to detect the presence of a second canal which can then not be prepared and filled during treatment ^[14].

5. Conclusion

This case report highlights the importance of having a thorough knowledge of all possible root canal irregularities.¹⁴ Every tooth may have a complex root and canal morphology. The clinicians should be aware of the morphological variations in different teeth types and use all the available tools to detect and manage them for a successful outcome of the treatment ^[15].

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