

**Root canal treatment of type IV canal morphology in a maxillary central incisor under direct operating microscope: A case report**

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**Conflicts of Interest:** Nil

**Abstract**

The current case reports the endodontic management of left maxillary central incisor having 2 canals with type IV Vertucci canal configuration. Internal morphology of root canals is often variable and complex. Therefore, to achieve optimum endodontic treatment healing outcome, the clinician must have adequate knowledge of the internal canal morphology and its variations in order to adequately debride and obturate the entire root canal system thoroughly.

**Keywords:** Maxillary Central Incisor, Root Canal Treatment, Morphological variation.

**Introduction**

Complete knowledge of the root canal anatomy, complexities and variations is essential for successful diagnosis and subsequent root canal treatment outcome. <sup>[1]</sup> According to Ingle, one of the most common causes for failure of endodontic treatment is incomplete canal instrumentation and obturation. Inability to diagnose the extra canals in the root canal system can often lead to flare

ups during treatment and root canal treatment failure. <sup>[2]</sup>

Maxillary central incisor is often considered to be the least difficult tooth for RCT, commonly associated with a single root and single root canal. <sup>[3]</sup> Morphological variations in the internal anatomy of maxillary incisors are extremely rare and in most cases are associated with developmental anomalies such as gemination, fusion, dens invaginatus or presence of supernumerary root. <sup>[4]</sup> The incidence of an extra canal in a maxillary central incisor is very rare at 0.6% . <sup>[5]</sup> Management of such rare anatomic variations are possible with the aid of under direct operating microscopes. The microscope makes it easier to navigate the root canal system and locate the extra canals and orifices, which is imperative for successful endodontic treatment outcome.

The current case report highlights successful endodontic management of Vertucci’s type IV canal configuration in a maxillary central incisor with the aid of direct operating microscope.

## **Case Report**

A 70 year old male patient reported to the Department of Conservative Dentistry and Endodontics, Manav Rachna Dental College, Faridabad. The patient was undergoing Prosthodontic treatment and was referred for intentional root canal treatment to be carried out in maxillary incisors. The medical history was noncontributory. On clinical examination, left maxillary central incisor did not exhibit any dental caries. There was no tenderness to percussion or palpation, no noted swelling and no sinus tract was seen with respect to the concerned tooth. Periodontal probing and mobility was within physiologic limits. The tooth did not respond to both electric and thermal pulp testing. Therefore, a provisional diagnosis of pulpal necrosis was made.

Preoperative orthopantomogram (OPG) radiograph was taken which revealed the presence of a single root with periodontal widening in left maxillary central incisor with receded pulp chamber [Figure 1]. A faint radiolucent line was observed in left central incisors in addition to the main canal on the radiograph. Hence presence of an additional root canal in both the incisors was suspected. Multiple angulated radiographs were taken to confirm the presence of extra canals. Informed consent was taken from the patient and it was decided to go ahead with the root canal treatment in two appointments.

Local anaesthesia was administered and rubber dam isolation was done. Access preparation was done and main canal was located. Using an operating microscope (Zumax Medical Co. Ltd) under  $\times 3$  magnification, the access was further modified to locate the additional canal which was found to be labial to the main canal [Figure 2A].

Working length was determined radiographically using ISO 0.02 taper K-files [Figure 2B]. The canal was cleaned and shaped with K-files using step back

technique. Copious irrigation was carried out with 3% NaOCl, 17% EDTA and saline. Calcium hydroxide (Vitapex, J. Morita, Tokyo, Japan) was placed as an intracanal medicament using lentulo spirals (Dentsply, Ballaigues, Switzerland) and the access was sealed. The patient was recalled after 3 weeks.

On subsequent appointment, the patient reported with no signs or symptoms, so it was decided to obturate the canals. Calcium hydroxide was retrieved using ultrasonics (Satelec, P5XS, Acetonequipments, NA, USA) and the canals were rinsed with saline and dried using absorbent paper points. Obturation was carried out with gutta-percha (Dentsply Ballaigues, Switzerland) using cold lateral compaction technique with AH plus resin as a sealer (Maillefer, Konstanz, Germany) [Figure 2C]. The access cavity was restored with composite resin Filtek Z250 (3M Dental Products, St Paul, MN, USA).

At the 6<sup>th</sup> month follow up visit, patient was asymptomatic [Figure 2D].

## **Discussion**

The anatomy of the root canal system has a direct impact on the thoroughness and extent of debridement and root canal shaping.<sup>[6]</sup> These morphological variations are due to the disturbances in the normal development of Hertwig's epithelial root sheath and such variations further adversely affect the healing outcome of root canal treatment.

The presence of extra roots or canals poses an endodontic challenge. The challenge lies in diagnosis of the variation from normal and its subsequent successful treatment. Proper and accurate interpretation of radiographs taken at different angulations, using paralleling technique and using dental operating microscope is important for reliable diagnosis of the number of roots and the canals that exist in the tooth.<sup>[7,8]</sup>

A thorough review of literature reveals that the canal variations of maxillary central incisor include the presence of two/three canals most often associated with gemination, fusion or supernumerary root (Table 1).

In the present case report, the dental microscope also proved to be a useful adjunct as it helped in thorough examination of the pulp chamber, including the walls and the floor in order to detect additional root canal during access opening that might not be found easily.

### **Conclusion**

It is highly imperative for each case to be inspected carefully clinically, and radiographically, prior to beginning of endodontic procedure so as to avoid treatment failure, that might happen as a result of missed extra canals. Thorough knowledge and careful clinical and radiographic examination to determine the root canal anatomy, in clinical conditions, are essential parts of successful management of anatomical variations in endodontic treatment.

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