



## CASE REPORT

### Maxillary Central Incisor with Two Root Canals: A RARE Case Report

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#### Abstract

The success of endodontic therapy requires knowledge of the internal and external dental anatomy and its variations in presentation. The internal anatomy of the maxillary central incisor is well known and usually presents with one root and one radicular canal system.

This case report presents an uncommon case of a two-root canal maxillary central incisor. A patient was referred for dental consultation for old discolored esthetics restoration with root canal calcification.

The maxillary right central incisor had a presence of two canals that was confirmed by radiographs taken at different angles. Nonsurgical endodontic therapy was performed. Post operative Cone beam computed tomography (CBCT) was done to confirm the obturation.

Key words-Root canal anatomy, Maxillary central incisor with two root canals, Cone beam computed tomography (CBCT).

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## Introduction

One of the main objectives from nonsurgical endodontic treatment is the elimination of infections from root canal system and the prevention of its re-infection. The chances of curing the pulp affections require endodontic treatment, which involves the removal of the pulp and root canal obturation. This might also be the source of possible failures. (Table-1)

However, endodontic treatment can fail for many reasons, such as diagnostic errors, untreated canals, errors in cleaning and shaping of the root canal systems, instrument fractures, and poor coronal restorations. According to Ingle<sup>(1)</sup> one of the most important causes of endodontic treatment failure is the incomplete obturation of the root canal system. Therefore, the correct identification, cleaning, shaping and obturation of all canals are indispensable procedures.

Among all these factors another common cause is missed canals. Missing additional canals may result in treatment failure and may cause during or post treatment flare ups. Thus, the knowledge of the internal dental anatomy is of great importance for the success of endodontic treatment. Vertuci<sup>(2)</sup> and De Grood Cunningham<sup>(3)</sup> reported that a considerable number of failures could be assigned to anatomical variations, such as the presence of unusual root canals.

Consistent high levels of success in endodontic treatment require an understanding of root canal anatomy and morphology and that the entire root canal system must be shaped, disinfected and filled. Thus, it is necessary for the clinician to have knowledge of not only to understand dental anatomy but also its variations<sup>(4)</sup>.

Maxillary central incisor is considered to be the least difficult tooth for (Root Canal Treatment) RCT. It is generally considered as tooth with a single root and single root canal.

However, the internal anatomy of the tooth can present a number of variations; these are extremely rare and in most cases are associated with anomalous tooth development such as gemination, fusion, dens invaginatus or presence of supernumerary root. The incidence of an additional canal in the maxillary central incisor is 0.6%<sup>(5)</sup>.

The endodontic anatomy of maxillary central and lateral incisors is generally simple with one canal in one root. Vertucci<sup>(2,6)</sup> reported a type I configuration (one canal) for maxillary incisors in 100% of teeth.

Morphological variations in maxillary anterior teeth may occur with a frequency of up to 2% in central incisors and 10% in lateral incisors,<sup>(7)</sup> this frequency can increase to 22% in lateral incisors<sup>(8)</sup>. When more than one canal is present, the possible configurations include: Vertucci's type II with two canals joining in one apical foramen<sup>(7,9)</sup>.

Vertucci's type IV with two separate canals in one root (10–11); two canals inseparated roots and two or more canals associated with abnormal development of the tooth such as gemination, fusion, concrescence, and dens invaginatus. Furthermore, Walvekar & Behbehani<sup>(12)</sup> published a case report of a maxillary lateral incisor with three canals and Mangani & Ruddle reported a central incisor with four canals<sup>(13)</sup>.

The presence of an additional root canal in the maxillary central incisor is extremely rare<sup>(14)</sup>. A number of studies of root canal anatomy have described that the maxillary central incisor has only one root and one canal in 100% of examined cases<sup>(2, 15)</sup>, with variations only in the number of lateral canals and the position of the apical foramen.

Many studies have described root canal variations<sup>(16-19)</sup> and some of these studies described a maxillary central incisor with two canals or two roots<sup>(20-22)</sup>

All cases so far documented have used radiographs or operating microscope for location and treatment of these additional canals.

Cone beam computed tomography (CBCT) has been established to be superior to conventional intra and extra oral radiography in diagnostic accuracy. CBCT is capable of producing high contrast images with good resolution in a short period of time. In endodontics, this particularly relates to early diagnosis of periradicular disease with greater precision of lesion size, extent, nature and position<sup>(23, 24)</sup>. Furthermore, 3 dimensional volume of information captured by CBCT can also aid clinicians in the diagnosis of root canal morphology, root fractures, root resorption, perforations, obturation voids and defects<sup>(25,26)</sup>.

The purpose of the present article is to present and describe a clinical case of endodontic treatment of a maxillary central incisor with two root canals, demonstrated by radiograph and confirmed by cone beam computed tomography (CBCT) examination

## CASE REPORT

A 56 -year-old male patient was referred to The department of Conservative Dentistry and Endodontics of Guru Nanak Institute of Dental Science And Research, Kolkata for endodontic treatment of the right maxillary central incisor (Fig-1). In the referral letter, it was reported that the tooth presented a calcified root canal.

In the medical history it was found that the patient has Bronchial Asthma.

Clinical examination revealed 10 years old discolored Class IV light cured composite restoration in the Maxillary right central incisor. The tooth was not tender on palpation and percussion. Pulp vitality test was carried out with heat test-using a stick of heated gutta-percha and electric pulp tester. A negative response confirmed the diagnosis of pulp necrosis with normal periradicular tissue.

Preoperative radiograph revealed the presence of a single root in right maxillary central incisor with receded pulp chamber. A faint radio-opaque line (presence of intra canal medicament) was observed in the right central incisors in addition to the main canal on the radiograph (Fig-2). Hence presence of an additional root canal in right incisor was suspected. Multiple angulated radiographs were taken to confirm the presence of extra canals.

As the presence of two canals observed in the IOPA radiograph and so CBCT was planned post operatively for better evaluation of the root canal system and confirm the obturation space. Single visit non-surgical endodontic treatment was planned for this tooth. Pre-operative mouth rinsing with 0.2% chlorhexidine was carried out. The tooth was isolated with cotton roll as the patient has a history of chronic Asthma and access was regained to the pulp chamber with high-speed round diamond number #2.

At the floor of the pulp chamber we found that there was two opening of canal. The main canal centrally located another small opening located more mesially in buccal direction.

The working length of two canals were determined with the help of electronic apex locator [Root ZX; Morita, Tokyo, Japan] and confirmed by IOPA radiograph (Fig3).

It was followed by the chemo-mechanical preparation by Crown-Down technique with Protaper (Maillefer-Dentsply, Switzerland) hand instrument, along with copious irrigation with sodium hypochlorite (2.5%) and EDTA (17%) solution. Mesial canal (accessory canal) was enlarged up to #F3. Distal canal (main canal) was enlarged up to #F5. Final irrigant used was 2% Chlorhexidine. The canals were obturated by lateral condensation method using gutta-percha points and root canal sealer (AH Plus Maillefer-Dentsply, Switzerland). Access cavity was restored with light cure composite resin (TetricIvoclar Vivadent AG). After the obturation, the final radiographic exam showed two distinct canals with separate apical foramens (Fig 4). A postoperative CBCT examination was carried out to confirm the obturation. (Fig 5,6) The patient was observed for 3 months through clinical and radiographic examination and the tooth remained asymptomatic.

## Discussion

Root canal anomalies, usually those caused by fusion or gemination, are revealed when coronal anomalies occur. However, some teeth with clinically normal crowns can have root canal anomalies.

In cases of fusion of two adjoining tooth germs during development there is one less tooth than normal in the affected dental arch. Alternatively, an abnormal tooth can fuse with a supernumerary tooth, in which case the number of teeth remains normal and diagnosis is easy because the supernumerary tooth is often atypical. There may be a common root canal or entirely separate root canals depending on whether fusion occurs during very early tooth formation or later. Germination is the attempted division of a single tooth germ by invagination during the growth cycle. The number of teeth is normal. Division is usually incomplete and the result is two completely or incompletely separate crowns with a single root and root canal space, the crowns of which are wider than normal and often have a vertical inciso-gingival groove.

The present report illustrates a rare case of maxillary central incisor with two root canals, without morphological anomaly of the crown.

According to the literature <sup>(27)</sup>, there are no limits for the morphological variability of the root canal. This emphasizes the need for practitioners to take into consideration anatomical variations in number and architecture of the root canal systems.

Finding more than one canal in maxillary central and lateral incisors is rare. In fact, according to the literature <sup>(2)</sup>, 100% of these teeth show single canals, although the previously many authors reported that 3% of maxillary lateral incisors may have two canals.

Use of multiple angulated IOPA radiographs are usually aid in discovery of addition canals.

This is dependent on the amount of separation between the canals and is reported to lie between 20° and 40° <sup>(28)</sup>.



Fig 1- shows patients profile photograph with discolored composite restoration in maxillary right central incisor



Fig 2 - pre operative radiograph shows two canals in maxillary central incisor,(presence of intra-canal medicament in mesial canal)



Fig 3- working length radiograph demonstrated two canals.



Fig 4- post obturation radiograph



Fig 5- CBCT Examination, longitudinal.



Fig 6- CBCT Examination, transversal.

Table no 1

Preoperative Cause	Operative cause	Post operative Cause
Incorrect diagnosis	Anatomical Variations.	Failure following retreatment
Endo- periodontal lesions	Technical difficulties.	Failure following surgical retreatment.
Altered canal space.	Infections.	
Traumatic injuries.	Poor debridement.	
Internal resorption.	Broken instruments	
Systemic diseases	Mid-treatment flare up	
	Mechanical & chemical irritants	
	Access preparation	
	Excessive haemorrhage	
	Under extended filling	
	Over extended filling	
	Sliver points corrosion	
	Improper obturation	
	Improper placement of posts	
	Corrosion of posts	
	Iatrogenic causes( perforation)	

## Conclusion

The lack of knowledge about all possible root canal anatomical configurations and the nonuse of different diagnostic resources can lead dentists to leave remaining necrotic tissue and toxic products used during endodontic procedures in the interior of the non treated canal, resulting in an unsuccessful endodontic treatment. Thus, this study demonstrated the importance of a correct diagnosis with the help of proper diagnostic aid for the endodontic practice.

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