Endodontic Management of Fused Maxillary Central Incisor with the Help of Endovac - A Case Report

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Abstract:
Variations in canal morphology in fused teeth presents a clinical challenge when endodontic treatment is planned. Presence of pulpal remnants at the region of isthmus between the two root canals in fused teeth can compromise the success of endodontic treatment. To achieve a technically satisfactory treatment outcome, the clinician must have adequate knowledge of the internal canal anatomy and its variations to completely debride and obturate the root canal system. The aim of this case report is to present the endodontic management of left maxillary central incisor fused to a supernumerary tooth with the help of EndoVac. In the present case, we have used Endovac for establishing the presence of communication between the two root canals and for disinfecting the same.

Introduction
Tooth fusion is a developmental anomaly characterized by the union of two adjacent tooth buds during the early developmental stages of the dental organ. This process involves the epithelial and mesenchymal interaction resulting in a tooth with abnormal morphology (1). The etiology of fusion of tooth germs is unclear, but many factors like close approximation of the developing tooth buds, physical forces and a genetic predisposition have been considered. Hitchin and Morris (2) demonstrated that the persistence of interdental lamina which maintains the continuity between the tooth germs could initiate fusion. The prevalence of this anomaly in paediatric patients is less than 1% in Caucasian populations, although a higher prevalence has been reported in Japanese and in American Indians (3-5). Variations in the canal morphology presents a clinical challenge when endodontic treatment is planned as the pulp chamber and root canal may be fused or separate, depending on the stage of development and the time of union (6). This case report discusses the endodontic management of fused maxillary central incisor with the help of endovac (apical negative pressure irrigation system).

Case report
A 20 year old male patient with non-contributory medical history reported to the department of endodontics with the chief complaint of pain in relation to left upper anterior region. On clinical examination, left maxillary central incisor (tooth 21) exhibited morphologic variation of its crown. It was considered to be a case of fusion of left maxillary central incisor with a supernumerary tooth as per Levita’s criteria (fig.1A). Dental caries and mobility was absent. A Deep developmental groove was seen at the junction of union between the supernumerary tooth and its normal counterpart, but no discernible separation between the two was noticed (fig.1B). The patient also exhibited angle’s class 2 malocclusion with single tooth cross-bite in relation to tooth 22 (maxillary left lateral incisor) (fig.1B). OPG of the patient revealed multiple retained deciduous teeth and impacted permanent tooth in relation to mandibular anteriors (fig.1C). Extra oral examination revealed the presence of bilateral labial lip pits (fig.1A). The above findings were correlated to the patient’s family history, but none of the family members exhibited similar findings.

Pre-operative radiograph of the fused teeth revealed the presence of two distinct root canals (fig.2A). Periapical radiolucency was also present in relation to fused 21. The tooth did not respond to both electric (Parkel Electronics Division, Farmingdale, NY) and thermal pulp testing (RC Ice; Prime Dental Products, Mumbai, India). A diagnosis of pulpal necrosis with asymptomatic apical periodontitis was made based on the clinical and radiographic findings.

Endodontic intervention followed by esthetic rehabilitation was planned. Two halves of the fused teeth was considered as separate entities and access opening was performed under rubber dam isolation. ISO .02 taper 15 size K files (Mani Inc, Japan) was placed in both the orifices and the working length was determined using electronic apex locator (Morita corp, Tokyo, Japan) and confirmed radiographically (fig.2C). The orifices were enlarged to size 3 Gates glidden drill (Dentsply Mailfer; Switzerland) and were viewed using a surgical operating microscope at 3x and 5x magnifications (Seiler Revelation, StLouis, MO) (fig. 2B). At this
point no obvious communication between the root canals could be detected. The canals were cleaned and shaped with ISO.02 taper K-files (Dentsply Maillefer, Switzerland) using step back technique to an apical size 60 under copious irrigation with 2.5% sodium hypochlorite, 17% EDTA and saline. During irrigation of one of the root canals, the irrigant fluid was expressed out of the neighbouring canal. Hence the possibility of a communication between the two root canals was suspected.

In the present case after completion of the cleaning and shaping of the root canals, EndoVac (Discus Dental, Culver City, CA) was employed to disinfect the communication (isthmus). Conventional needle was placed in the middle third of one of the root canals and the macrocannula of the EndoVac attached to the chair side suction was placed in the adjacent canal (fig. 2D). 3 ml of 2.5% sodium hypochlorite, 3 ml of 17% EDTA with intermittent flushing of saline was used for disinfection

communication. Calcium hydroxide (vitapex) (Morita corp, Tokyo, Japan) was placed as an intracanal medicament using lentulospiral (Dentsply Maillefer, Switzerland) and the access was sealed with cavit (ESPE America, Norristown, PA).

During the subsequent appointment, the patient was asymptomatic. Calcium hydroxide was removed using ultrasonics (Satelec P5XS, Aceton equipments, NA) and final rinsing of the canals was performed using 2% chlorhexidine digluconate. The canals were dried with absorbent points and obturated using Guttapercha and AH plus sealer (Dentsply Maillefer, Konstanz, Germany). Sectional obturation of apical third of the canal system was done using warm vertical compaction technique. The reminder of the canal was obturated using obtura II (Obtura Corp., Penton, MO, USA) (fig.2E). The access cavity was restored with composite resin filtek™ Z250 (3M Dental Products, St Paul, MN). Patient remained asymptomatic during the follow-up period.

![Fig 1](image-url)
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Discussion

In dental literature the terms fusion and gemination have often been used interchangeably to refer to a tooth with large clinical crown (double teeth). Fusion, according to the classification of Wedl and Busch (7), is defined as the organic dentinal union of two or more individual teeth, whereas the gemination refers to incomplete division of a single tooth (8). Both gemination and fusion are prevalent in both primary and permanent dentition with incisors being more commonly affected. The frequency of distribution appears to be 0.5% in the primary dentition and 0.1% percent in the permanent dentition (9). Incidence of 2.6 % has been reported by Hamasa and Al-Khateeb in Jordanian population (10). Hosomi et al (11) reported a case of gemination and fusion resulting in a tooth with 3 root canals. Clinically this anomaly may result in esthetic and periodontal problems and thus require interdisciplinary approach for management.

The etiology of fusion is still unknown. Shafer et al (1) speculated that the pressure produced by some physical force prolongs the contact of the developing teeth causing fusion. Authors have also suggested the hereditary involvement as an autosomal dominant trait with reduced penetrance. Knudsen et al (12) suggested that a possible inductive effect of the neural crest cells in development of tooth fusion.

This case is considered to be a typical case of fusion of maxillary central incisor with a supernumerary tooth in accordance with Levita’s criteria (14) and the ‘two-tooth rule’ of Mader (13), as there was no missing permanent counterpart seen in the patient. Though radiographic examination revealed fusion of crown with separate root canals, but in actuality there was pulpal communication between the supernumerary tooth and the permanent left maxillary incisor. Higher imaging modalities like the SCT and CBCT could have provided valuable information regarding the canal configuration, but it was avoided due to patient’s concern for radiation exposure (15).

It is a well-established fact that the presence of pulpal remnants at the region of isthmus between the two root canals can compromise the success of endodontic treatment. Moreover anastomosis, fins, cul-de-sacs and other parts of the canal system are also difficult to debride via mechanical instrumentation. In the present case during conventional needle irrigation at the middle third of one of the root canals,
the irrigant fluid was expressed out of the neighbouring canal. Sushin et al have demonstrated the isthmus debridement efficacy of EndoVac in a closed canal system (16). Hence we decided to make use of endovac irrigation system for disinfecting the communication between the root canals. EndoVac is a true apical negative pressure system that draws fluid apically by way of evacuation (17,18). Disinfection of the communication between the root canals was performed by placing the conventional irrigation needle in the root canal of central incisor and the macrocannula in the supernumerary counterpart at the middle third. On irrigation, we were able to notice that the irrigating solution delivered by the conventional needle in one of the root canals was completely evacuated by the macrocannula placed in the neighbouring canal. Thus the use of endovac aided in establishing the presence of communication between the two root canals and also in disinfecting it.

Warm vertical compaction using “touch and heat” followed by backfilling with obtura II aided in more complete obturation of the intercanal communication, which was evident on the post obturation radiograph (19,20). After the completion of endodontic treatment, esthetic management was planned which included orthodontic alignment followed by prosthodontic rehabilitation of the fused teeth.

Conclusion

This case report describes the possible use of endovac for detection and disinfection of the communication present between the root canals in cases of fused central incisors.

Reference: