Case Report

Endodontic Management of Maxillary Second Molars Fused with Paramolar Tubercles Diagnosed by Cone Beam Computed Tomography - Two Case Reports

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Abstract

The main objective of nonsurgical endodontic treatment is to eliminate micro-organisms from the root canal system. Adequate knowledge of the root canal morphology and its complexities is essential to render successful endodontic treatment. Variations in tooth form and morphology may be found in the form of anomalous cusps in the crown region or additional roots. In permanent molars, changes in the crown morphology may occur either in the form of an additional tooth (paramolar) or supernumerary cusp termed as "paramolar tubercle".

Key Words: Paramolar Tubercle; Endovac Irrigation system; CBCT.

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INTRODUCTION

Variations in tooth form and morphology may be found in the form of anomalous cusps in the crown region or additional roots. In permanent molars, changes in the crown morphology may occur either in the form of an additional tooth (paramolar) [1] or supernumerary cusp termed as "paramolar tubercle" [2].

In 1945, Dahlberg [3] referred to this kind of anomaly as "Parastyle" when the supernumerary cusp develops in relation to the buccal surface of the mesiobuccal cusp in upper molars and "Protostylid" when the supernumerary cusp is in relation to the buccal surface of the lower molars. The incidence of paramolar tubercle varies from 0% to 0.1% in maxillary first molars, 0.4% to 2.8% in maxillary second molars and 0% to 4.7% in maxillary third molars [4, 5]. In such cases, the abnormal morphology can result in crowding and improper occlusion predisposing the tooth to caries and periodontal diseases [6].

This kind of unusual anatomy makes endodontic treatment challenging. Hence, a proper understanding of these variations is important in order to ensure success in endodontic treatment. Conventional intraoral radiographs have inherent limitation that may restrict their use in the management of complicated cases [7] Cone beam computed tomography (CBCT) can be an adjunctive tool in the interpretation of such complicated cases [8].

This article presents two case reports on the endodontic management of two maxillary

second molars fused to paramolar tubercles that was successfully managed with the aid of cone beam computed tomography and Endo-Vac irrigation system.

CASE REPORT (1)

A 23-year-old male patient with non-contributory medical history was referred to the Department of Endodontics with the chief complaint of continuous, throbbing pain in the left upper back tooth region for the past 2 days. The patient also gave a history of undergoing a failed extraction of the same tooth one week earlier. On clinical examination, the left maxillary second
molar (tooth # l5) exhibited abnormal crown morphology. The tooth was wider buccopalatally and revealed a paramolar tubercle fused to the buccal aspect of tooth # l5. Fracture of the coronal portion of the fused paramolar tubercle was also noticed. The tooth was tender to percussion. Mobility was absent and periodontal probing around the tooth was within physiological limits. A distinct developmental occluso-gingival groove was seen between the paramolar tubercle and its normal counterpart and no reduction in the number of teeth was noticed.

Diagnostic preoperative radiographic evaluation of tooth #15 indicated variation in the root/root canal anatomy. No periapical changes were noted in the preoperative radiographs (Fig 1a). The tooth in question did not respond to both thermal (heated GP) and electric pulp stimulation (Parkel Electronics Division, Farmingdale, NY, USA). A diagnosis of pulpal necrosis was made and endodontic treatment was suggested.

After administration of local anesthetics (Xylocaine; AstraZenca Pharma Ind Ltd, Bangalore, lndia), the tooth was isolated with rubber dam. Conventional endodontic access cavity was prepared using Endo access bur #2 (Dentsply Maillefer, Ballaigues, Switzerland) in tooth #15 and its fused counterpart. On access, 3 canals were located; namely, the mesiobuccal (MB), distobuccal (DB), and palatal canal (P) in #15 and a separate canal in the fused paramolar tubercle. Further exploration using a DG-l6 explorer (Hu-Friedy, Chicago, lL, USA) under surgical operating microscope (Seller Revelation, St. Louis, MO, USA) revealed the presence of an additional canal located palatal to the MB canal (MB2) (Fig 1b). Root canals were explored with an ISO #10 K-file (Mani, Japan) and Protaper Sx (Dentsply Maillefer, Ballaigues, Switzerland) was used to enlarge the orifices.

The root canal configurations of the fused molar was not clear even after access opening. When ISO#l0 k-file (Mani, Japan) was introduced into the canal of the paramolar tubercle, it was curved toward the mesiobuccal canal of tooth #15 and the lSO size l0 K file placed in the MBl canal curved bucally. Hence a communication between the two canals was suspected. To understand this complex canal configuration, a CBCT scan using Galileo's 3D CBCT (Sirona Dental systems, USA) was performed. The three dimensional reconstructed CBCT images of tooth #15 revealed the presence of three roots. One large conical buccal root (formed due to the fusion between the mesiobuccal root, distobuccal root and the root of the paramolar tubercle), one palatal root and another root located between the buccal and palatal root (Fig 2a).

The axial images revealed fusion between the paramolar tubercle canal and the mesiobuccal canal (MBl) at the coronal one third (Fig 2b). The distobuccal canal (DB), second mesiobuccal canal (MB2) and the palatal canals (P) remained separate at this level (Fig 2c). In the apical one third sections, DB canal also joined with the already fused MBl and SN canals and all the three canals had a single portal of exit (Fig 2d). The MB2 and palatal canal remained separate throughout and had separate portals of exit.Working length was determined using an endodontic apex locator (Root ZX; Morita, Tokyo, Japan) and was later confirmed radiographically (Fig l c).

Fig 1. Case Report 1.
a. Preoperative photograph of tooth #15 and the fused supernumerary
b. access opening showing four root canal orifices in #15 and a separate orifice in the fused supernumerary
c. working length radiograph

Fig 2. a. CBCT image showing the pulpal communication between the supernumerary tooth and #15
b. CBCT image showing union between the MB1 and distal canal at the apical third. (b-d) Enlarged axial section CBCT images of tooth #15 at the (2b) cervical (2c) middle and (2d) apical level showing fusion between root canals.

Cleaning and shaping was performed using ProTaper NiTi rotary instruments (Dentsply Maillefer) in a crown-down technique. Irrigation was done with normal saline, 5 ml of 2.5% sodium hypochlorite solution and 3 ml of l7% EDTA. Further debridement of the communication between the root canals was carried out for two cycles using Endo\/ac (apical negative pressure irrigation system) (Discus Dental, Culver City, CA) with 2.5% NaOCl and l7% EDTA.

The canals were medicated with calcium hydroxide (RC cal, Prime Dental products, Mumbai, India) using lentulo spiral and the access cavity was sealed with Cavit (3M ESPE AG, Seefeld, Germany). The patient remained asymptomatic. In the subsequent appointment 2 weeks later, calcium hydroxide was removed using ultrasonics (Satelec (India) Pvt. Ltd, Gandhinagar, Gujarat) and the canals were irrigated with a prefinal rinse of 2ml of 17% EDTA and final flushing with saline.

Canals were dried with paper points (Kavo group, Mumbai, India) and obturation was performed using Gutta percha with warm vertical compaction technique with an epoxy resin sealer (AH Plus; Dentsply-DeTrey, Konstanz, Germany) (Fig 1d). Subsequently, the access cavity was sealed with a universal composite resin restoration (Filtek Z250; 3M ESPE AG, Seefeld, Germany). The patient remained asymptomatic during the follow-up period.

CASE REPORT (2)

A 28-year-old male patient reported to the department of conservative dentistry and endodontics with a chief complaint of pain in the upper left back region of the oral cavity for the past 1 week with no relevant medical history. The patient had undergone oral prophylaxis 3 days before.

Pre-operative radiograph revealed no carious lesion (#15) (Fig 3a).

Fig 3. Case 2.
a. Preoperative photograph of tooth #15 and the fused supemumerary
b. Working length radiograph
c. Access opening showing the four root canal orifices in #15 and a separate orifice in the fused supernumerary
d. Postobturation radiograph of tooth #15 in eccentric angulation

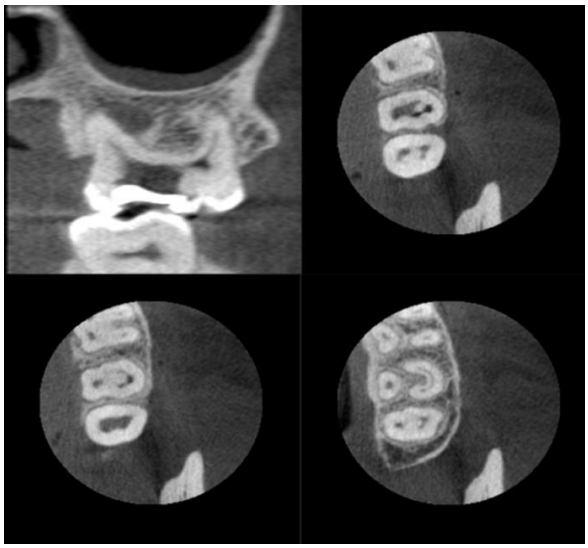

Fig 4. a. CBCT image showing pulpal communication between the supernumerary tooth and tooth #15
b. CBCT image showing union between the MB1 and distal canal at the apical third. (b-d) Enlarged axial section CBCT images of tooth #15 at the (4b) cervical (4c) middle and (4d) apical level showing fusion between the root canals

On clinical examination, the left maxillary second molar was tender on percussion and it showed unusual crown morphology with a paramolar tubercle fused between the mesiobuccal and distobuccal cusp. Cold test and EPT testing revealed a negative response. Based on clinical and radiographic evaluation, diagnosis of pulpal necrosis with apical periodontitis was made.

A local anesthetic agent (Xylocaine; Astra-Zenca pharma Ind Ltd, Bangalore, India) was administered for the patient. Under rubber dam isolation, conventional endodontic access cavity was prepared using Endo access bur #2 (Dentsply Maillefer, Ballaigues, Switzerland) in tooth #15 and its fused counterpart.

After access preparation, three canals were located with #10 size k file; namely, the mesiobuccal (MB), distobuccal (DB), and palatal canal (P) in #15 and a separate canal in the fused paramolar tubercle (Fig 3c). To know whether the communication existed between the canals, a CBCT analysis was performed with the patient's consent.

Axial images revealed fusion between the canal of paramolar tubercle, mesiobuccal canal and distobuccal canal at the middle third level with a single portal of exit (Fig 4a-d).

The working length was determined using an apex locator and later confirmed radiographically (Fig 3b). Cleaning and shaping was performed using protaper NiTi instruments in a crown down manner. Irrigation was done with normal saline, 5ml of 2.5% of sodium hypocholorite and 17% EDTA. Further debridement of the communication between the root canals was similarly performed as in case report 1.

Canals were dried with paper points and obturation was performed using F2 gutta percha points and AH plus sealer, (AH Plus; Dentsply-DeTrey, Konstanz, Germany) and the cold lateral compaction technique (Fig 3d). Access cavity was restored with light cure composite (Filtek Z250; 3M ESPE AG, Seefeld, Germany). The patient was recalled after one week for evaluation and the patient was asymptomatic.

DISCUSSION

Variation in the anatomy of the canal of the maxillary second molar has been reported earlier. variations include taurodontism [9], a single rooted maxillary second molar with a single canal [10] and three rooted maxillary second molar with six canals (three palatal, two mesiobuccal and one distobuccal) [11]. Using CBCT, Kottoor et al. reported a case of five rooted maxillary second molar with five root canals (MBl, MB2, DB, MP, and DP) [8]. Fusion of the molar with the paramolar tubercle is particularly rare and there are only very few case reports on the successful endodontic management of such cases [7, 12]. Presence of a deep groove between the supernumerary and its permanent counterpart is highly susceptible to caries and can also sometimes extend subgingivally leading to periodontal breakdown. Moreover, fused teeth might contain either separate root canals or share a common root canal, which makes treatment planning complicated [13].

Gurudutt Nayak et al. recently reported that the canal morphology in maxillary molars fused with a paramolar tubercle is highly variable [14]. To understand the morphology, both cases were analysed using CBCT. Axial CBCT slices of 200 μm thickness were obtained at different levels to determine the internal canal anatomy that was not clearly evident with periapical radiographs.

Previous studies by Kottoor et al. [8] used CBCT in the endodontic management of a maxillary second molar with five roots and five canals, maxillary first molar with seven root canals [15], and maxillary first molar with eight root canal systems [16].

A major advantage of CBCT provides three dimensional accuracy and elimination of superimposition of anatomical structures when compared to conventional radiographs [17].

Song et al. [13] have reported nonsurgical endodontic retreatment in the supernumerary tooth fused to maxillary molar using CBCT. In that particular report, there was no pulpal communication present between the fused tooth and the maxillary molar.

However, in both cases, true pulpal communication was present between the paramolar tubercle and the mesiobuccal canal of tooth #15, which was later confirmed using CBCT.

Cleaning and shaping was done using Protaper NiTi rotary system. In case 1, the MBl, DB and the paramolar tubercle canals fused at the apical third and had a single portal of exit. Of the three canals, the paramolar tubercle canal had a straight course. It was first prepared to the working length following which the MBI and DB canals were cleaned and shaped till the point of communication with the supernumerary root canal. The palatal and the MB2 canals remained separate and were prepared to the full working length.

In the second case report, the root canal of the paramolar tubercle was fused with the MB and DB at the middle third below the cementoenamel junction (CEJ) and they had a single portal of exit.

Gurudutt Nayak et al. [14] reported the anatomical and morphological characteristics of a rare case of paramolar tubercle using spiral computed tomography. The root of the paramolar tubercle was fused to the MB and DB, but the canal remained independent from the main root canals. Contrary to this, in the present cases, the paramolar tubercle was fused with MB and DB and the canal had a single exit.

Additional disinfection of the root canal system was performed using passive ultrasonic irrigation (PUI) and Endovac. Endovac irrigation system was performed employing the micro-irrigation technique according to the manufacturer's recommendations. EndoVac is a true apical negative pressure system that draws fluid apically by evacuation [18]. Recent studies have shown the superior canal and isthumus debridement efficacy of EndoVac [19, 20]. ln the present case, due to the presence of communication between the root canals, a modified technique for the use of Endo-

Vac was followed, wherein the irrigant was delivered using a conventional needle through the paramolar tubercle canal and it was evacuated using the micro-cannula placed in the MBl canal. Irrigation was performed with 3 ml of 2.5% NaOCl followed by 3 ml of 17% EDTA. The same was repeated in the second cycle by placing the micro-cannula in the paramolar tubercle root canal and the irrigant was delivered through the MBl canal. This ensured the complete debridement of the communication between the canals.

CONCLUSION

Use of CBCT provided valuable information about the root/root canal anatomy and the EndoVac irrigation system was useful in cleaning the communications that aided in the successful endodontic management of the maxillary second molars fused with the paramolar tubercle.

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