Endodontic Management of a Maxillary Lateral Incisor fused with Supernumerary Tooth using Spiral Computed Tomography as Diagnostic Aid

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ABSTRACT

Fusion is a developmental anomaly in tooth morphology, which may be due to either union of two separate tooth buds or partial splitting of a single tooth bud. A thorough understanding of root canal anatomy is an essential prerequisite for a successful endodontic treatment. This case report describes successful endodontic management of a maxillary left lateral incisor fused with a supernumerary tooth using spiral computed tomography (SCT) as a diagnostic aid. A patient reported with a painless swelling in the maxillary anterior region associated with a fused maxillary lateral incisor. Spiral CT was performed to better understand the complex root canal anatomy. Endodontic treatment was done using methyl trioxide aggregate (MTA) as apical plug and obturation by thermoplasticized gutta-percha. The tooth was completely asymptomatic at 1-year follow-up showing signs of healing. The present case report emphasizes on the importance of three-dimensional (3D) imaging techniques, such as SCT in cases of developmental anomalies having complicated root canal morphology for successful endodontic therapy.

Keywords: Fusion, Mineral trioxide aggregate, Spiral computed tomography, Supernumerary tooth.

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INTRODUCTION

Development of an ideal dentition depends on many factors. Disorders of development of teeth can be classified according to the abnormalities in shape, such as dens invaginatus, talon cusp, dens evaginatus, gemination, fusion, or abnormalities in number, such as supernumerary teeth. Double tooth presents as one of the rare anomalies affecting the shape of the tooth, which denotes embryological conditions like gemination and fusion. Although the cause is unknown, but trauma has been suggested as a possible cause; genetic factors may also be involved. The incidence of double tooth ranges from 0.14 to 5.0% in worldwide population, with no sex predilection. Unilateral presentation is more common than the bilateral. Pindborg defined fusion as the union between dentin and/or enamel of two or more separate developing teeth. Depending on the stage at which the tooth germs join together, the fusion may be complete or incomplete. If the contact occurs early, at least before calcification begins, complete fusion occurs, forming a single large tooth. If the tooth germs come into contact when a portion of tooth crown has completed its formation, then incomplete fusion occurs. Such teeth may have either two pulp chambers with their respective root canals or a single root canal system. If fusion occurs between a normal and a supernumerary tooth, it becomes difficult to differentiate it from gemination. Pindborg described gemination as the malformation of a single tooth bud, resulting in an anomalous tooth within the normal complement of teeth. Gemination occurs when a single tooth germ attempts to divide, resulting in a large single tooth with a bifid crown and a common root canal.

Endodontic treatment of double teeth has been a constant challenge for the practitioners because of variations in root canal anatomy. Intraoral periapical (IOPA) radiographs provide only the two-dimensional (2D) image of root canal which may not be sufficient enough for understanding the complex morphology of pulp canal space in anomalous dentition, such as fused teeth. Newer diagnostic techniques, such as spiral computed tomography (SCT) or volume acquisition CT, which provide three-dimensional (3D) images, should be used in such cases for better evaluation of the root canal anatomy and hence a successful endodontic therapy.

The present case report describes successful endodontic management of a maxillary left lateral incisor fused with a supernumerary tooth with the aid of SCT.

CASE REPORT

A 28-year-old female patient reported to the Department of Conservative Dentistry and Endodontics with the
complaint of painless swelling in left maxillary anterior region since 1 year. The medical and family histories were noncontributory. All vital signs were within normal limits. Clinical examination revealed a diffuse palatal swelling extending from the distal aspect of left central incisor to the distal of first premolar; the swelling was fluctuant on palpation. Hard tissue examination revealed a temporary restoration on palatal surface of maxillary left central incisor and abnormal crown morphology of maxillary left lateral incisor (Fig. 1A). There was an increased mesiodistal diameter with a supernumerary tooth attached palatal and mesial to the maxillary left lateral incisor (Fig. 1B). The labial and palatal surfaces of both lateral incisor and the supernumerary tooth were found to be caries free. No discomfort was present on vertical and horizontal percussion or palpation of tooth. The tooth exhibited no mobility. Thermal and electric pulp testing showed negative response in relation to the left central incisor, left lateral incisor, and the supernumerary tooth.

The preoperative periapical radiograph revealed a well-defined periapical radiolucency approximately 4 cm in diameter involving the lateral incisor and the supernumerary tooth which were fused along the entire root length (Fig. 1C). The pulp canal space exhibited a complex structure but the exact anatomy could not be understood from a 2D radiograph. All IOPA radiographs were depicting a radiopaque foreign body which was the permanent jewelry worn by the patient in the nose. Hence, care was taken to avoid its interference over the area of concern.

However, for better understanding of the root canal anatomy, a 3D dental imaging was planned for the tooth. Informed consent was obtained from the patient and a multislice SCT of maxilla was performed using Dentascan software (GE HealthCare, Milwaukee, WI, USA). The involved tooth was focused and the morphology was obtained in axial, transverse, and sagittal sections of 0.5 mm thickness along with 3D reconstructed images. Images revealed that the lateral incisor and the supernumerary tooth had two separate pulp chambers, but the pulp canal space shifted majorly into the supernumerary tooth as it progressed from coronal to apical section of the roots to join into a common large apical foramen in the supernumerary tooth corresponding to Weine’s type II configuration (Figs 2A to D).

The treatment plan included root canal therapy with respect to the central incisor, lateral incisor, and the supernumerary tooth. Surgical management of the cyst was planned which included enucleation.

Local anesthesia was administered and rubber dam was applied. Endodontic access cavity was made on the
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Management of a malformed tooth, such as fusion is often a challenge to the dentist. Fusion is often confused with the process of gemination, especially when a supernumerary tooth fuses with a permanent tooth. These two can be differentiated by the following parameters:

- **Morphology**: Gemination results in mirror images of the coronal halves, whereas fusion takes place at an angle.
- **Anatomy**: Fused teeth would mostly have separate pulp chamber and root canals while geminated teeth usually have one large pulp canal.
- **Location**: Fusion is common in mandible but fusion between a supernumerary and a normal tooth is more common in maxilla. Gemination is, however, more commonly seen in maxilla.
- **Number of teeth**: According to Mader, the “two tooth rule” may be helpful in differentiating fusion from gemination. If fused teeth are counted as one and the number of teeth in the dental arch is less, then it may be considered as fusion. However, when the anomalous tooth is counted as one and the number of teeth in dental arch is normal, then it can be either gemination or fusion between normal and a supernumerary tooth. In the present case, according to the “two tooth rule” and the SCT findings, diagnosis of fusion between maxillary lateral incisor and a supernumerary tooth was made. Fused teeth are generally asymptomatic and sometimes patient might retain the anomalous structure also without any problem. However, such double teeth may not only compromise the function and esthetics but can also be associated with various problems, such as carious lesions along the line of fusion or periodontal-endodontic involvement. Endodontic treatment in such teeth presents a great challenge to the dentist due to unpredictable root canal anatomy.

Radiographs are an indispensable diagnostic aid in endodontics. However, in such cases, conventional radiographs have limitations primarily because of the inherent projection of a 3D anatomy into a 2D image, which leads to superimposition, geometric distortion of the image, and hence misinterpretation and/or misdiagnosis. Tachibana and Matsumoto found that CT allowed multidirectional observation of the morphology of roots, root canals, and the tooth. The newer 3D diagnostic technology of SCT allows to obtain a large volume of data in seconds and offers more rapid examination time with the effective dose in the range of 1 to 30 mSv, which is much less than conventional CT. In the present case, guidelines proposed by Diederichs et al were used that decreased the radiation dosage to 0.56 ± 0.06 mGy, which is equivalent to a single panoramic radiograph.
The SCT simultaneously involves the patient translation through the X-ray source and the continuous rotation of the source detector assembly. Thus, the raw projection data acquired by the SCT can be viewed as multiplanar or 3D reconstructions. It also allows for reconstruction of overlapping structures which, thereby, enhances resolution of small objects.

Mineral trioxide aggregate apical plug of 4 mm was placed in the fused lateral incisor since it has shown to have a superior sealing ability, good marginal adaptation, high degree of biocompatibility, and a reasonable setting time. Moreover, MTA can be used in cases where there is exudate since it can set in the presence of moisture in the root canal. This property is important in teeth with necrotic pulps and periapical lesions. However, in the present case, calcium hydroxide intracanal medicament was placed to limit bacterial contamination. The middle and cervical part of canals were obturated with injection fill thermoplasticized gutta-percha and a resin sealer to ensure a 3D obturation.

In the present case, the SCT allowed for complete understanding of the root canal morphology. This enabled us to perform a successful cleaning and shaping and obturation of the complex root canal space. The SCT has been successfully used in clinical dentistry for confirmatory diagnosis of morphoanatomic aberrations in root canals. In recent years, cone beam CT has emerged as an innovation in the field of dentistry imaging, allowing for various 3D reconstructions. The new generation equipments permit the visualization of soft and hard tissues, surpassing conventional images in relation to the linear measurements of maxillaries, location and extension of dental resorptions, radicular position, presence of radicular fractures, and diagnosis of bone lesions.

CONCLUSION

Endodontic management of fused teeth may pose a constant challenge for the practitioners because of variations in root canal anatomy. Newer diagnostic techniques, such as SCT which provide 3D images should be used in such cases for better evaluation of the root canal anatomy and hence a successful endodontic therapy.

REFERENCES