

CBCT in endodontic treatment of fused second and third mandibular molars

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Abstract

The aim of this article is to report a rare anatomic case and the contribution of new technologies in best resolving it. Fusion is defined as the union of two separate tooth germs at any stage of tooth development. Planning treatment for this condition can be difficult and requires all diagnostic means available. A 45-year-old female patient presenting with a fused second and third molar underwent endodontic treatment and direct restoration after CBCT imaging revealed a direct relationship between the two germs. The treatment was successful once the correct diagnosis had been made.

Introduction

Fusion is defined as the union of two separate tooth germs at any stage of tooth development. Fused elements may be attached at the dentine or enamel. This process involves the epithelial and mesenchymal germ layers, and results in irregular tooth morphology.¹ Depending on the stage of development in which the fusion occurs, pulp chambers and canals may be linked or separated.

The reason for this phenomenon is unknown, but genetic factors, physical forces, pressure, and trauma may be influencing factors.² The prevalence of dental fusion is higher in primary dentition (0.5–2.5%) than in permanent dentition (0.1%); in both cases, the anterior region has the highest prevalence.³ The incidence is the same between males and females.

Cases of affected posterior teeth are rare in the literature. Most posterior teeth are fused with fourth molars (supernumerary). Fusion between premolars and molars or second and third molars has also been reported, but is less common. In some reported cases, teeth are bilaterally fused with supernumerary molars.^{4–9} In these cases, the number of teeth in the dental arch is also normal and differentiation from gemination is clinically difficult or impossible. A diagnostic consideration, but not a set rule, is that supernumerary teeth are often slightly aberrant and have a cone-shaped clinical appearance. Thus, fusion between a supernumerary and a normal tooth will generally involve differences in the two halves of the joined crown. However, in gemination cases, the two halves of the joined crown are commonly mirror images.⁹

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Figure 1. Initial clinical situation. Observe the plaque in the lingual side in the fusion area and discoloration due to caries.



Figure 2. Initial X-ray situation.

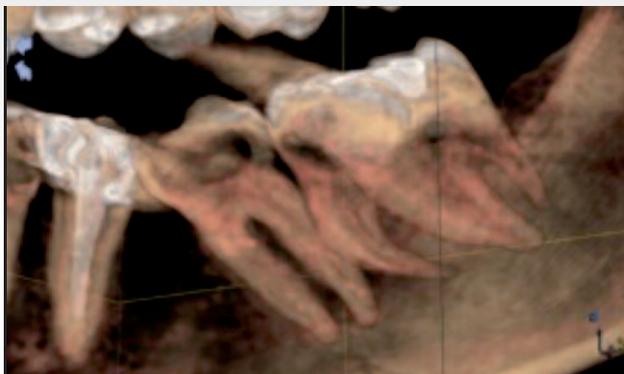


Figure 3. Reconstruction

Periodontic problems occur as a part of the pathology in these cases.⁵⁻⁸ A high prevalence of caries also occurs due to anatomically abnormal plaque retention. In the anterior region, an anti-aesthetic effect occurs owing to the abnormal anatomy. In contrast, crowding and occlusal dysfunction may occur in the posterior region, especially in cases with supernumerary teeth, which often leads to tooth extraction.^{5,10,11}

Fused teeth are usually asymptomatic. The collaboration of practitioners with expertise in multiple areas of dentistry is important to create or achieve functional and aesthetic success in these cases. Several treatment methods have been described in the literature with respect to the different types and morphological variations of fused teeth, including endodontic, restorative, surgical, periodontal, and orthodontic treatment.^{3-6,10-12}

In cases in which endodontic therapy is indicated, clinicians must be very careful during access because anatomy is not predetermined and canals may be displaced from their normal position, depending on the position of the two germs and whether the teeth involved are part of the normal dentition or supernumerary. For this reason, clinicians should examine the element meticulously, both clinically and radiographically.

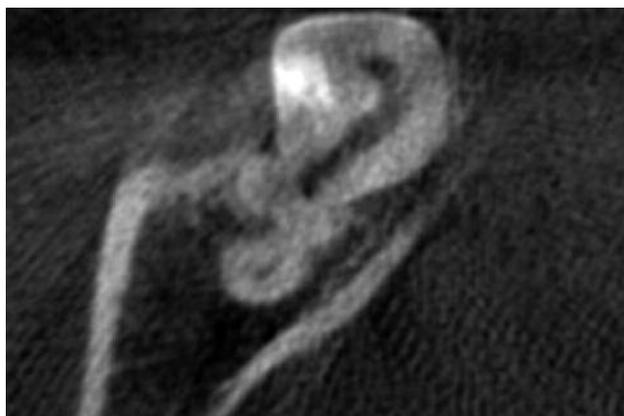


Figure 4. Axial images where fusion is obvious.

This case report demonstrates the usefulness of a CBCT scan in addition to conventional intra-oral X-rays from different projections in diagnosing and designing appropriate treatment for this rare case.^{13,14}

Case presentation

A 45-year-old woman was referred by an oral surgeon who had proposed an extraction of the last mandibular molar because of pain and abnormal anatomy. The patient complained of pulsing pain in the right side of the oral cavity, which extended to the ear region and worsened at night.

After a comprehensive extra-oral and intra-oral examination, the pain was found to be localised to the region of teeth 47 and 48 (Fig. 1). Both cold and hot stimuli consistently caused pain in those teeth. An obvious anatomic abnormality noted during the clinical examination was confirmed with intra-oral X-rays using a parallel-cone technique and various projections. The X-ray (Fig. 2) also revealed a deep amalgam restoration extending into the pulp chamber, which had been infiltrated, and distal caries in the fused tooth. A deep carious lesion was also observed on tooth 46, but a simple filling was scheduled because the tooth responded normally to cold and hot stimuli.

In this case, the treatment plan was determined to be root-canal therapy for the pulpitis in the fused tooth and a direct restoration for the same tooth. In addition, dental hygiene sessions were scheduled for the patient because of generalised plaque and to avoid worsening of periodontal conditions in the area of the fused tooth. Direct restorations were also arranged with the general practitioner to avoid any other pulp implications in other teeth with marked infiltrated restorations.

Initially, the treatment plan was targeted at the root-canal therapy of the fused tooth, which was urgent. In order to clarify the anatomy of this element, a CBCT examination was also performed; it revealed two independent mesial roots



Figure 5. Access cavity. Non-conventional shape due to abnormal anatomy.

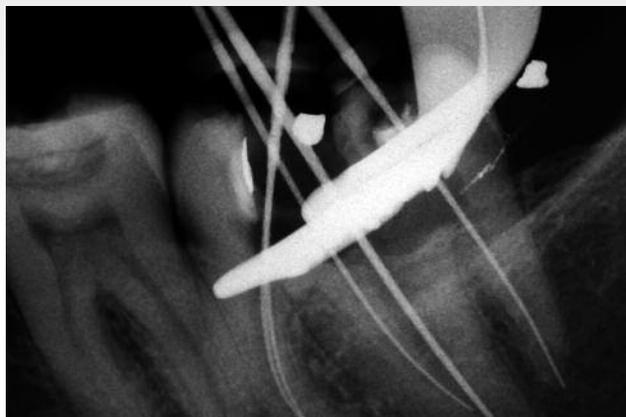


Figure 6: Working length X-ray.

(lingual and buccal) and a single distal root. The fused root in the middle involved two independent canals ending in the same area (Figs. 3 & 4).

After anaesthetic with 1:100,000 lidocaine had been administered, the tooth was isolated with a rubber dam (KKD, Sympatic Dam). Because of the abnormal anatomy, the use of a liquid photopolymerising dam (DAM COOL, Danville Materials) was necessary to seal gaps completely and to avoid leakage of saliva into the treated tooth and sodium hypochlorite into the patient's mouth. An extended access cavity using a 1.2mm cylindrical bur and a #2 Start-X ultrasonic tip (DENTSPLY Maillefer) was created to visualise all five orifices (Fig. 5).

Once the surface was clean and canals were visible, negotiation with hand files (K-files) and PathFiles (DENTSPLY Maillefer) was performed to ensure patency of the canals. First #10 and #08 K-files (if needed) were alternated along the canals with copious irrigation with sodium hypochlorite and using 17% EDTA gel (B&L Biotech) until the #10 file was at the apex. Working length was measured with an apex locator (Root ZX, Morita). Afterwards #1–3 PathFiles



Figure 7: Finished case.

were used until the #3 file reached working length in all five canals. Once patency had been confirmed, working length was also confirmed radiographically (Fig. 6).

The next step was to shape the canals using reciprocating files (WaveOne, DENTSPLY Tulsa Dental Specialties) with a single-file reciprocating technique. Since the anatomy was slightly different, the shaping technique was changed. After the primary file (25.08, red code), apical gauging was performed with manual NiTi K-files (ISO) to measure the apical restriction diameter. For the distal canal, the large file was also needed. Throughout the procedure, irrigation with preheated 5.25% sodium hypochlorite was performed with 30g irrigating needles (NaviTip, Ultradent) and the irrigant was activated with IrriSafe files (ACTEON).^{15–17} Once the shaping had been completed, apical diameter was confirmed through apical gauging, and cones were fitted. Irrigation with preheated and activated 17% EDTA solution (Vista Dental Products) was used to remove inorganic debris from the canals. Canals were then dried with paper cones and the roots were sealed with vertical condensation of hot gutta-percha (Endo-a2 B&L Biotech) with standardised gutta-percha



Figure 8: X-rays of the finished case.

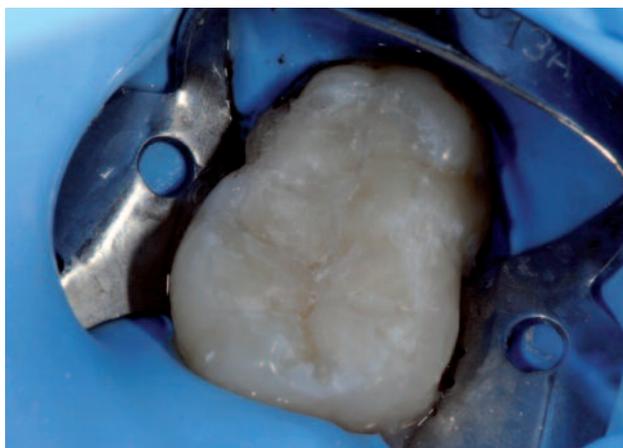


Figure 9: After restoration.



Figure 10: After restoration.

cones and Pulp Canal Sealer. Back-filling was performed with warm liquid gutta-percha (SuperEndo-b B&L Biotech; Figs. 7 & 8). The treatment was completed with a direct composite restoration (Figs. 9 & 10). All treatment was performed under clinical microscope (OMNI pico, Zeiss)

The patient kept to her treatment plan and attended several recall appointments after the root-canal therapy. She also attended six-monthly oral hygiene appointments with the dental hygienist (Figs. 11–13).

Discussion

Treatment planning for rare conditions such as fused teeth is fundamental to the success of each case. For this reason, clinicians must consider every parameter before starting treatment. In this case, a tooth extraction would have been the likely outcome without a CBCT examination. Because the fused teeth complex did not involve any occlusal or periodontal problems, the extraction would have caused significant biological damage and held significant financial implications.

Once a treatment plan was in place, a CBCT scan was very helpful in determining the exact position of the canals and in



Figure 12: One-year recall.



Figure 11: One-year recall X-ray.

designing the access cavity according to the exact anatomy, which was different from that of a normal single tooth. The single-file reciprocating technique chosen for this case was adapted to the need of the tooth. Since the anatomy was complex, the direct use of a large file in the distal root might have failed. Had different diameters been established during apical gauging, the shaping technique would have been changed and more files would have been introduced. For this reason the shaping technique was modified using more files for this particular root.

Conclusion

In conclusion, this case demonstrates the importance of treatment planning. In designing a treatment plan, all diagnostic methods should be considered. In this case, a CBCT examination resulted in a successful and predictable treatment.

Editorial note: A complete list of references is available from the publisher.

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Figure 13: Four-year recall.