

Clinical management of fused and infected mandible canine and incisor

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ABSTRACT

Introduction: Dental fusion is a developmental anomaly in which two teeth buds join each other at different levels. **Objective:** To report a case of a lower canine and a lower lateral incisor with separate crowns and root fusion, with root canals connected and apical periodontitis. **Methods:** One year earlier, the patient had received root canal treatment in the canine; however, there was no remission of symptoms. Endodontic treatment was performed with reinstrumentation, passive ultrasonic irrigation with sodium hypochlorite, smear layer

removal and intracanal medication with calcium hydroxide. A week later, the symptoms had disappeared and the canals were filled with gutta-percha and Sealapex by means of the Tagger hybrid technique. **Results:** After two years and two months, the patient exhibited periapical tissues healing. **Conclusion:** The detection and proper management of developmental tooth anomaly cases is mandatory for treatment success.

Keywords: Root canal therapy. Dental pulp cavity. Anatomy. Periapical diseases.

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Introduction

The clinical and radiographic characteristics of dental developmental anomalies such as fusion, germination, concrescence or twinning have been well described in the literature,¹ while the cause of these malformations is considered multifactorial. They present an incidence that can range from 0.1 to 1% in both dentitions, while deciduous teeth have greater prevalence.^{2,3} A slightly higher proportion in Asian and Native American populations³ has been reported. These dental anomalies, of shape and number, frequently present pulp and periodontal diseases due to variations in their anatomy, such as grooves, fissures and depressions from where it is difficult to remove dental biofilm, which can lead to decay or periodontal disease.

Dental fusion occurs when two separate tooth buds are joined, and can occur at any tooth level.⁴⁻⁶ However, there may be so many variables that sometimes it is difficult for the clinician to diagnose the specific pathology, as well as the type of treatment that can be performed. When a fused tooth requires root canal therapy, the complex internal and external anatomy represents a challenge for the clinician, since fused pulp cavities present complications in terms of removal of debris, disinfection and proper sealing.^{3,6-9}

The present report discusses the clinical management and outcomes of a lower canine and a lower lateral incisor that exhibited their clinical crowns separated, but fused at the root level. Additionally, the teeth shared the radicular pulp cavity with apical periodontitis.

CLINICAL CASE

A 55-year-old mestizo female patient exhibiting pain in the chin and lymphadenopathy in the area of the right side of the neck was referred for treatment. The oral clinical examination revealed slight edema in the buccal surface of the lower right canine, with erythematous gingiva in the same area. It was observed that the lateral incisor was very close to the canine and both were sensitive to percussion. The patient had mobility and buccal gingival erythema in the aforementioned teeth. Both teeth had resin restoration at lingual and proximal surfaces. The patient reported that root canal treatment had been performed in the canine a year before due to spontaneous pain.

The lateral incisor presented a darker tone in comparison to adjacent teeth. Both teeth were negative to

pulp vitality cold tests. Periapical radiography revealed that the canine had previous root canal treatment with filling starting from the middle third with a single cone. At the apical level, a small periapical lesion was observed. The resin restoration involved part of the root cervical third.

The most interesting fact was how the root of the lateral incisor overlapped or fused the middle third of the canine (Fig 1A). From different radiographic angles, both roots showed a single periodontal ligament space in the middle and apical thirds, thereby suggesting that they were fused.

The previously treated root canal was diagnosed with symptomatic apical periodontitis and root fusion of both teeth. Root canal retreatment was indicated. Amoxicillin (750 mgs) every 12 hours and Nimesulide (100 mgs) every 8 hours, for 8 days, were prescribed.

At the second appointment, the patient was asymptomatic. Anesthesia was given with 2% mepivacaine in the right mental foramen. Absolute isolation was placed and the resin that sealed the canine access was removed with a high-speed round bur #2. In the lateral incisor, conventional access was performed. The root canal filling of the canine was removed with a Gates-Glidden bur #2 and GPX instrument #5 (Brasseler, USA) at 800 rpm. Throughout the procedure, 2.5% sodium hypochlorite (NaOCl) was used as irrigant. Lateral incisor root canal was located with a #15 K-file. During this procedure, necrotic tissue was found. Crown-down debridement was performed, starting with #40 K-Flexofile (Maillefer-Dentsply, Baillegues, Switzerland) in the cervical third.

Once the middle third was reached, the #25 file found an obstruction. Root length (Fig 1B) was established, with the instrument in the lateral incisor joining the canine canal in the middle third. Both canals were enlarged by means of hand instrumentation and the balanced forces technique, using a set of files for each canal. NaOCl (3 mL) and a 27-gauge needle (Endodontic, Monoject, USA) were used for irrigation at each change of instruments. Canine was apically enlarged up to #60 file, and laterally enlarged up to #45 file. Patency of shared foramina was maintained during preparation with #20 Flexofile.

Passive ultrasonic irrigation (Analytic, SybronEndo, Glendora, USA) was performed with a #15 file and NaOCl in three series of 20 seconds in each canal. The canals were flooded for five minutes with EDTA

(REDTA, Roth Int, Chicago, USA), pumping it with a sterile #40 gutta-percha cone. Final irrigation was performed with 3 mL of NaOCl and canals were dried with sterile paper cones (Pearson, California, USA). Both canals were filled with calcium hydroxide (Sultan, Englewood, USA) mixed with double-distilled water, so as to form a thick paste inserted into the canal by a lentulo spiral #40 at 20.000 rpm. Excess paste was removed and the coronal access sealed with Cavit R (3M Espe, Seefeld, Germany). Ibuprofen (400 mgs) was prescribed in the event of postoperative discomfort. The following appointment was scheduled 8 days later.

In the following appointment, the patient reported no symptoms. He was then anesthetized and isolated, and coronary seal was removed by means of a high-speed bur #2. Calcium hydroxide paste was removed by means of irrigation with 20 mL NaOCl and master files. Ultrasonic irrigation was performed, the canals were flooded with EDTA for 5 minutes, dried with sterile paper points and filled with gutta-percha points and Sealapex (SybronEndo, USA) by means of the hybrid Tagger condensation technique with a gutta condenser size 45 (Maillefer-Dentsply) at 20,000 rpm. Excess gutta-percha was removed, vertical condensation was performed and the pulp chambers were cleaned with sterile alcohol swab. Cavit R was used to seal the coronary access. The final radiograph revealed how the lateral incisor canal was fused to the canal of the canine in the middle third, and how endodontic filling material penetrated the anastomosis between the two canals (Fig 1C). Restoration of both teeth was recommended to be performed as soon as possible.

The patient returned for control two years and two months later. The gingiva presented within normal parameters, and both teeth were in masticatory function, with resin-based restorations. Radiographic examination revealed healing and normal thickness of the periodontal ligament. The right central incisor had undergone root canal treatment (Fig 1D).

Discussion

Defining anatomical anomalies is paramount.

Tooth gemination occurs when a single tooth bud undergoes partial division, leading to the formation of a dental structure with varying degrees of separation of the clinical crown, usually with a single root and a canal with varying anatomy. In these cases, it is possible to

observe an extra tooth crown in one's dentition.¹⁰

Conversely, fusion is described as the union of two tooth buds, which can happen at any stage of their formation and may involve different degrees of coalescence of the enamel, dentin and pulp of both teeth.¹ When this fusion occurs in the initial stage of development, it may leave both clinical crowns joined; when it occurs in a later stage, the two clinical crowns are very close together, but separate; when fusion occurs at any level of the root, it presents variable joining degrees of pulpal cavities,³ as in this case. Fusion can occur between two regular teeth of the dentition, between a regular and a supernumerary tooth or even between two supernumerary teeth.⁶

In the case reported herein, despite absence of posterior teeth due to previous extractions, it was determined that fusion occurred between the lower canine and the lateral incisor with two pulp chambers separated and fusion of the two canals in the middle third, sharing a single apical canal. This fusion at the root level might occur as a result of formation and maturation of these two buds at different times.

Due to sharing their internal anatomy, irritation of one pulp would eventually lead to damage of the other. Given the proximity of both clinical crowns and the limited interproximal space between them, the cause of irritation seemed to be the decay that occurred between the two crowns. This occurred as a result of the difficulty in maintaining this narrow gap clean of biofilm, and the fact that the patient was unaware of this anatomic anomaly. The condition affected the canine pulp cavity which had undergone root canal treatment ignoring the root fusion it had with the adjacent tooth. Because dental fusion was not identified and treated according to its anatomical complexity, previous treatment resulted in failure.

To diagnose teeth with these conditions, the clinician must carefully assess the coronary anatomy and the bulge in the buccal gingiva corresponding to the roots. Periodontal probing and periapical radiographs are also used.^{3,6} Cone-beam computed tomography is very useful and effective in identifying periapical lesions and dental structures details,¹¹ and has been used to diagnose cases similar to that reported herein.¹² Nevertheless, care must be taken in order to avoid overexposure to radiation. The American Dental Association¹³ states that this technique should be used

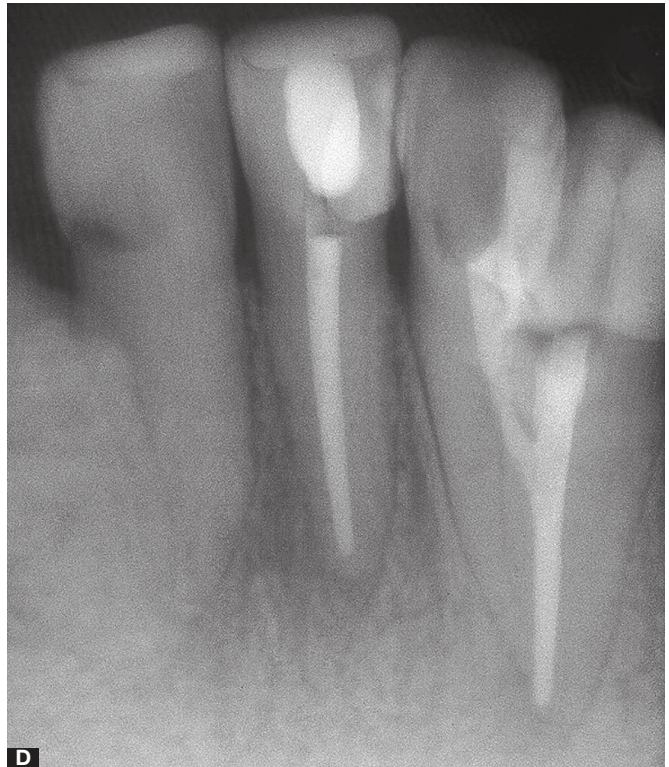
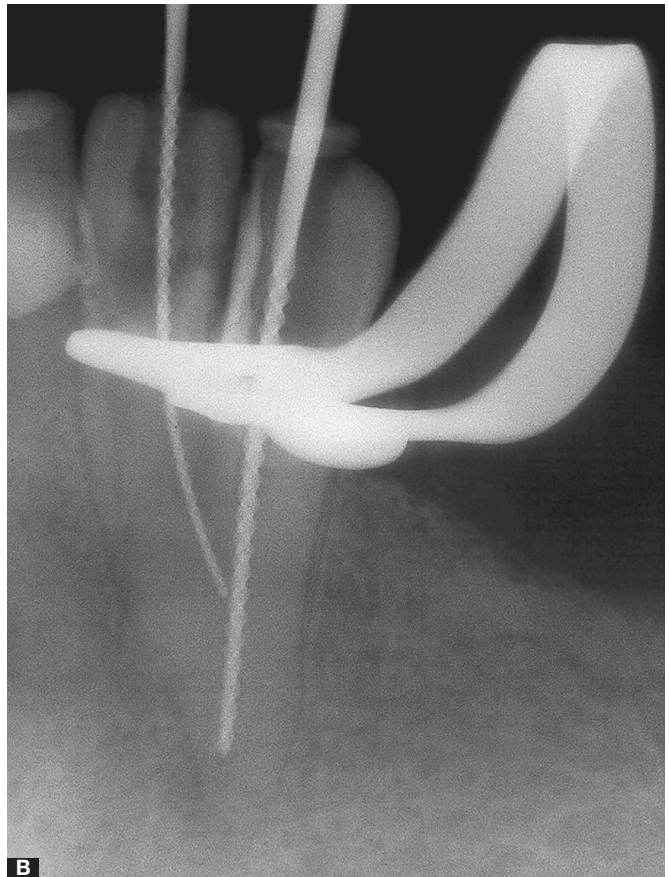


Figure 1. **A)** Diagnostic radiography revealing previous root canal treatment in the canine, periapical lesion and fusion of the two teeth in the root middle third. The clinical crowns appear to be separate. **B)** Odontometry radiograph reveals how the canal of lateral incisor fuses in the middle third of the canine. **C)** Final radiograph reveals the filling material that penetrated into the isthmus in the cervical third of both canals. **D)** Control radiograph at 24 months. The previous periapical lesion healed. The central incisor received root canal treatment.

only when it is essential for the diagnosis or may significantly improve clinical outcomes, in order to minimize patient's exposure to radiation.

Root canal retreatment of the crown and cervical third of fused teeth was performed separately. In contrast, treatment of the fused teeth middle third was performed in conjunction, taking care so as not to push necrotic tissue or debris from one canal to another. Due to being a case of complex anatomy with periapical lesion and biofilm inside pulp cavities, it was decided to place intracanal medication for a week in order to decrease the bacterial load¹⁴ and improve prognosis.¹⁵

Final radiograph revealed that although the two main canals joined in the middle third, as seen in the odontometry radiograph, the fusion of the two pulp cavities occurred from the cervical third on, with endodontic material penetrating an apparent isthmus connecting both canals. In cases in which the presence of these isthmuses is suspected, it is important to try to clean these narrow cavities, which might contain tissue and biofilm, the best as possible, and use a filling technique that not only plasticizes gutta-percha, but also

generates pressure on the filling material causing it to enter into these ramifications.^{16,17}

The diagnosis of fused teeth allows planning a specific therapeutic approach for these cases. This includes debridement and irrigation with sodium hypochlorite and the use of ultrasound to allow the penetration of NaOCl into isthmuses communicating canals. It also includes the use of intracanal medication with calcium hydroxide to reduce the microbial load to a minimum, in addition to thermoplastic filling with a view to filling these irregularities.

Conclusion

Dental fusion is a dental developmental anomaly in which two dental buds fuse their structures (crowns, roots and pulp) at any level. The clinician must recognize this alteration, since treatment success relies on knowledge, diagnosis and careful management of these anatomical variations. The case reported herein presented periapical lesion with secondary infection. Dental fusion was identified, root canals were retreated and two-year and two months radiographic and clinical control showed apparent healing of periapical tissues.

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