Primary triple teeth: histological and CT morphological study of two case reports

L. Aguilo* / M. Catala** / A. Peydro***

The macromorphology and micromorphology of two specimens of primary triple teeth using histological and CT analysis approach is analyzed. A single morphological pattern of triple teeth has been found and described: three nearly separate crowns with three separate pulp chambers, and three joined roots with three connected root canals. The characteristic triple teeth appearance occurred because a labial supernumerary tooth is the junction element between two teeth of normal series: the central incisor on the mesial side and the lateral incisor on the distal side. Primary triple teeth suggest an idiophatic abnormality in the distribution of the dental material originated very soon in the dental development. They can be considered as an early double fusion between three tooth germs, initially separate but in close proximity and developing synchronically.
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INTRODUCTION

The term triple tooth is used to describe a rare dental abnormality in which three primary teeth appear to be joined. They are usually unilateral and located in the incisor region. Associated dental anomalies and hereditary nature of them had been reported.[1-4]

This condition is often related to the double teeth, which have been considered the result of fusion or gemination of teeth[5-12] or recently a manifestation of a primary abnormality in the distribution of the dental material.[13]

Fusion and gemination of teeth have also been involved in triple teeth cases, if a permanent incisor was missing it is suggested that triple tooth may have been a fusion of primary central and lateral incisors with a permanent tooth. If there were no missing tooth the case would suggest either fusion involving two primary teeth and a supernumerary tooth or a combination of fusion and gemination between primary teeth of normal series[1-3,12]

In pediatric dentistry, knowledge of internal dental anatomy is a requisite for correct treatment planning. However, there is limited information about the morphology and relationship of roots and root canals of triple teeth. Only clinical and radiological appearances were considered in previous reports.

The superimposition of the attached teeth complicate the detailed radiographic view of the structure of a triple tooth. Methods as histology and Computed tomography (CT) have been used widely to examine the dental tissues and the internal dental anatomy.[14-16]

This retrospective study aims to show the macro- and micromorphology of two triple teeth using histological and CT analysis. The dental anomalies in both cases, and in those of siblings, have also been analyzed. Possible etiopathogenic situations are discussed.

CLINICAL CASES

Case no. 1.

A three-year-old girl was found on a routine dental visit to have a triple tooth located in the left maxillary anterior region.

Five months later, the girl was seen in an emergency as a result of trauma, which fractured subgingivally the mesial crown of the triple tooth. Due to the rare condition of the tooth affected a decision was made to extract it under sedation.

* L. Aguilo,. MD, PhD, DDS.
** M. Catala, MD, PhD, DDS.
*** A. Peydro, MD, PhD, DDS.

Address all correspondence to Dra. Luz Aguilo, Ave. M. Cristinano 12-2, 46001 Valencia, Spain.

Telephone: +34-96-39239 19
Fax: +34-96-3921918

Figure 1. Clinical labial view of the left maxillary triple tooth of case no. 1.

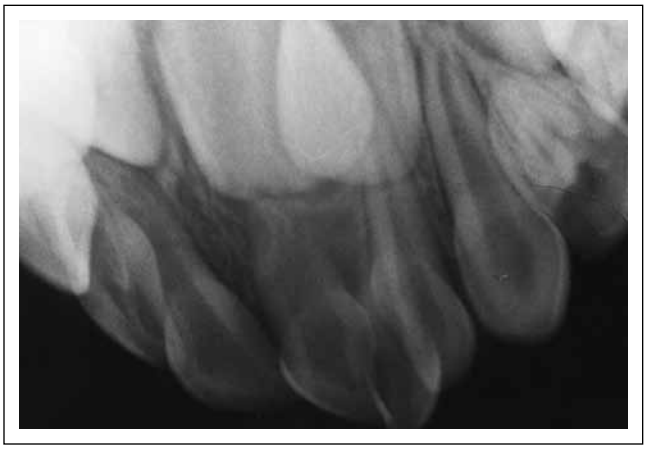

Figure 2. Occlusal radiograph of the triple tooth of case no. 1 showing three differentiated pulpal chambers. Only two root canals can be guessed.

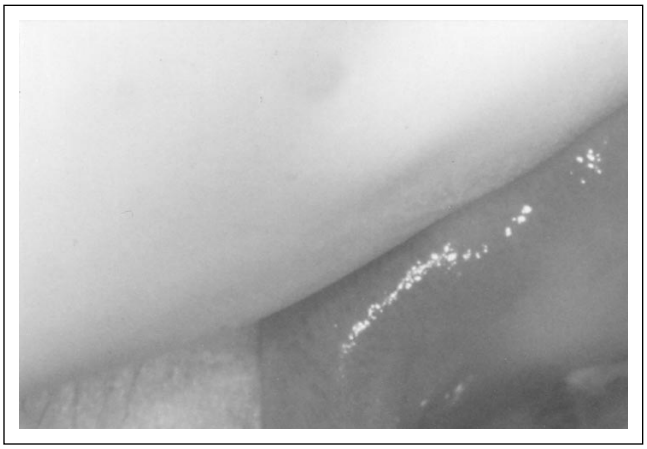

Figure 3. Labial view of the triple tooth of case no. 2, involving the right maxillary central and lateral incisors.

Figure 4. Periapical radiograph of the triple tooth of case no. 2, showing unclear roots and root canals.

Case no. 2.

A two-year-old boy was seen for evaluation of two abscesses in the labial gingiva above a right maxillary triple tooth.

The first treatment considered was a triple pulpectomy. However, this option was not done because of the difficulty of adequately filling the less known root canals, and the uncertain subsequent prognosis. The tooth was removed under general anaesthetic. Special care was taken to remove the whole tooth. Unfortunately, longitudinal fracture of the tooth occurred during extraction. The clearly visible course of this slanting longitudinal fracture did not hinder analysis of the tooth morphology.

In both cases, clinical examination showed that each triple tooth had three joined together crowns, of different shape and size. Even though these three crowns could be distinguished, separated by two visible grooves, dental floss could not be passed between them.

Radiographic examination showed that all the succedaneous permanent incisors were present in case no. 1. In case no. 2 a successor lateral incisor was missing (Figure 14). No other dental anomalies were found, even in the panoramic radiograph of the cases taken some years later.

The patients were Caucasian and in good health. In neither case did the parents know of any similar case in

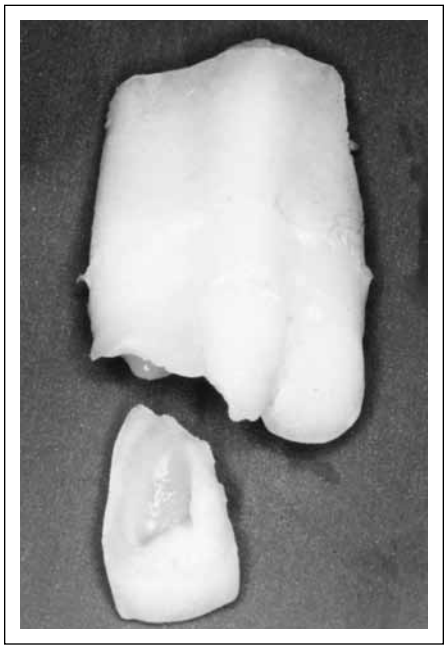

Figure 5. Macroscopic view of the extracted triple tooth of case no. 1. Note the fractured mesial crown.

Figure 6. Radiograph of the specimen of case no. 1, showing three differentiated pulpal chambers, but only two clearly ascertainable root canals.

Figure 7. Labial view of the specimen of case no. 2.

Figure 8. Radiograph of the specimen showing three crowns and three roots and root canals.

the family. No evidence of dental anomalies were found in the 5-year-old brother of case no. 1, or in the later born sister of case no. 2.

Because the extractions of triple teeth had been made at a very young age, an analysis of the whole specimens, from the tip of the crown to the apex of the root, could be obtained.

Both triple teeth were clinical and radiographically examined from several positions immediately after extraction. Later, the triple tooth of case no. 1 was histologically studied, and a x-ray CT study made of that of case no.2.

Macroscopically, specimens were about 2 cm in length. They showed an appearance resulting from the junction of three no aligned teeth: a central tooth being labially located and joined to adjacent teeth. The labial tooth was a peg-shaped and small tooth seeming a supernumerary tooth. The mesial and the distal teeth

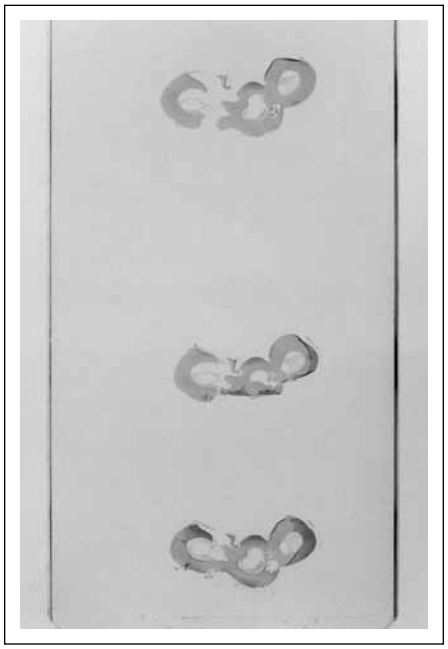

Figure 9. Histological view of coronal sections of case no 1. A continuous dentin layer that delimits three isolated pulp chambers with pulp can be seen. The external dentin layer appears mostly covered by cement, which continues with collagen bundles. In such areas where a cementum covering is not present, a typical festooned surface of the DIEd can be detected.

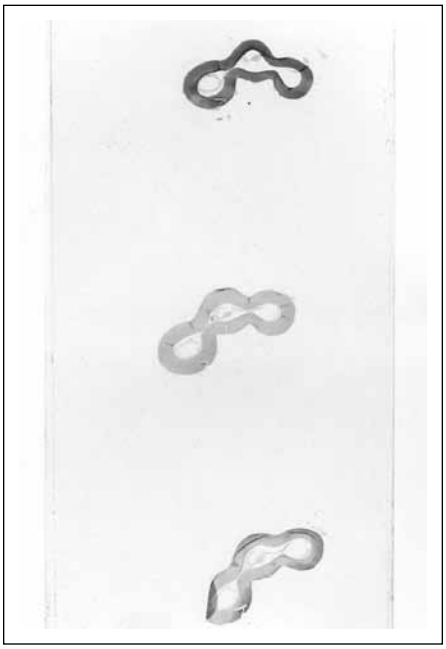

Figure 10. Histological view of middle-root sections of case no. 1. A single pulpal canal formed by three joined dilations of the root canal surrounded by dentin can be distinguished. Pulpal remnants are also present in the dilations. A continuous cementum layer with periodontal ligament remnants covers the external wall.

Figure 11. Histological view of apical root sections of case no. 1. The root canals are united forming a single apical canal. The thickness of the dentin wall is almost half a part of that in the DIES and root sections. The cementum covering is also thinner and interrupted.

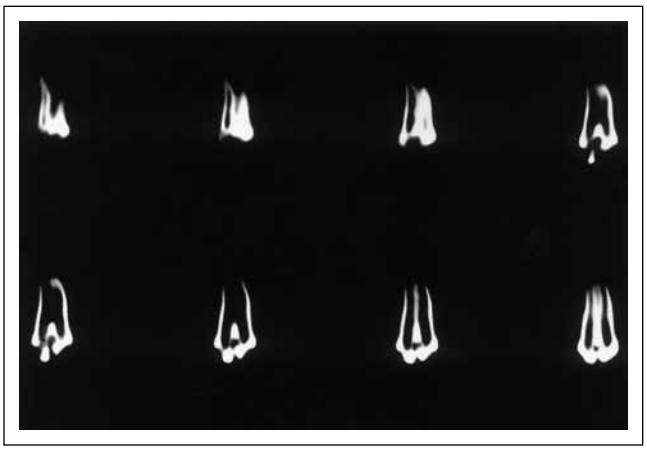

Figure 12. Longitudinal axial CT images. Internally, is evident an almost total joining of the root canals at the mid-level of the root like a large tooth structure with a large root canal.

seem teeth of normal series, the central and lateral incisors.

Radiographically, it was showed that each of the teeth appeared to have its own pulp chamber and root canal (Figures 5-9).

The histological and CT approaches provide accurate details of the specimens with no distortion or superimposition. The size, location and extent of the different dental tissues as well as the morphology and relationship of the root canals were analyzed. The different sections of each triple tooth, from the abovementioned methods of analysis, were evaluated and showed in the Figures 10 to 15. In both cases, three nearly separate crowns with three separate pulp chambers, and three joined roots with three connected root canals were seen.

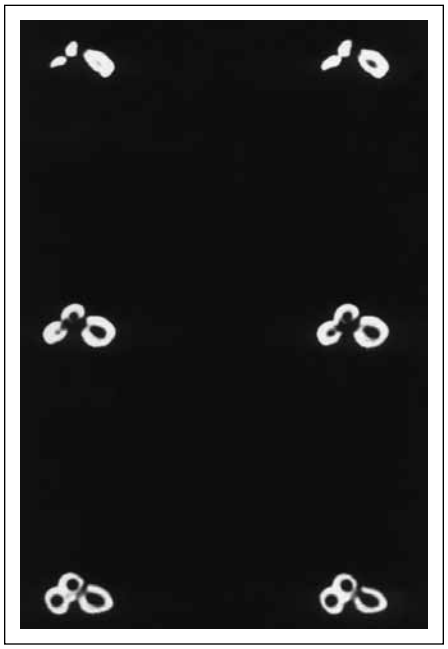

Figure 13. Series of CT images shows horizontal tomographic sections of the triple tooth crown of case no. 2. At the occlusal level three separate crowns are seen. At the mid-crown level the distal and labial crowns have become joined. The three separate pulpal chambers are not joined anywhere in the coronal portion. At the CLI level the three crowns have become joined.

The teeth of the specimen of case no. 1 appeared more joined than those of case no. 2, macro or microscopically. In both cases, the involved teeth appeared more joined in the radicular than in the coronal portion. The supernumerary tooth was more joined to the lateral incisor than to the central incisor. The central and lateral incisors are more closely connected to the supernumerary tooth than to each other.

DISCUSSION

Clinically, the two triple teeth presented here, and those in previous reports[1-3,12] share a single clinical appearance: a labial supernumerary tooth doubly joined to two teeth of normal series, the central incisor on the mesial side and the lateral incisor on the distal side. The central and lateral incisors are the teeth always and only involved. This contrasts with the variety of appearances and involved teeth in double teeth cases.[13,17]

The histological and CT studies of the presented cases clarify previous clinical and radiographic conjectures about the internal macro and micro-morphology of triple teeth. The results of both these methods were similar and showed a single morphological type of triple tooth: three nearly separate crowns with three separate pulp chambers. Three joined roots with three connected root canals from the first third of the root, where these canals become progressively joined.

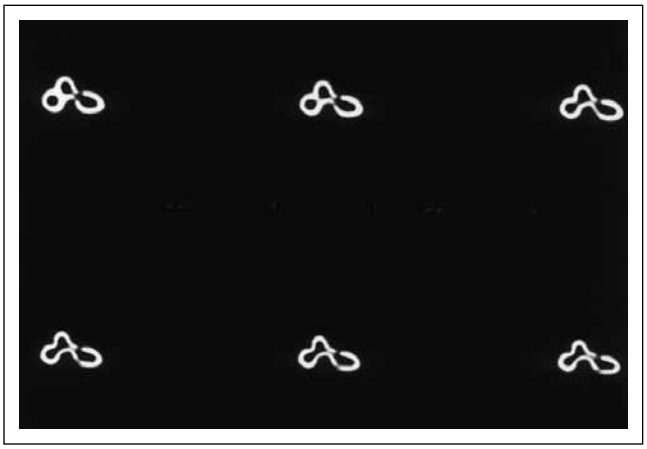

Figure 14. CT images of the root of case no. 2. At the mid-root level a total joining of the root canals of distal and labial teeth can progressively seen. A tri-lobulated single root and tri-lobulated single root canal can be seen.

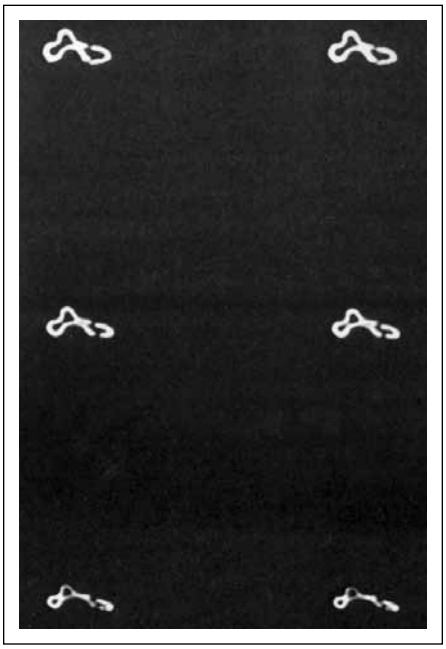

Figure 15. At the apical portion of root, the three roots are joined, but the root canals become progressively separated until its total separation at the apex of the tooth. Note the open apex of the three root canals.

In both cases, at the mid-root level, a single tri-lobule-shaped root canal is visible. At the apex of the root in case no. 1 a large root canal can be seen, but in the corresponding portion in case no. 2 there are three separate root canals. This difference may be related to the physiological apical resorption of case no. 1, which had already started, due to the age of the patient. Or because there was a higher degree of fusion between the teeth in case no. 1 than in case no. 2 as mentioned in the results of histology and CT study.

This difference and other small differences in the degree of fusion between the involved teeth of each

triple tooth may possibly due to the more or less synchronic or close development, or to the more or less early beginning of the fusion process.

A combination of fusion and gemination or fusion of the primary incisors with a permanent tooth have been considered possible etiopathogenic situations in triple teeth cases previously reported.[1-3] However, as showed in the figures, in the initial coronal segments of the specimens it can be clearly seen that there are not two, but three separate teeth. In neither case are the pulp chambers connected as occurred in the typical morphology of gemination,[13] Furthermore, the clinical and radiographic characteristics of the involved teeth, even of the supernumerary tooth, correspond to those of the primary dentition. These findings contrast with the above-mentioned stated etiopathogenic considerations.

Triple teeth must be considered a fusion between two primary teeth and a supernumerary tooth[1-3] either if a permanent incisor is missing or even if there is no missing tooth. Triple tooth occurs when a supernumerary tooth is doubly joined to two adjacent teeth and being the junction element between them.

If there were no missing teeth as in case no. 1, the case would suggest a hyperactivity of the dental lamina developing a supernumerary tooth. This tooth fails to develop as a separate tooth and remains, joined to the central and lateral incisors.

If there were a missing tooth as in case no. 2 it would be considered an abnormality in the apportioning of the dental material of the dental lamina causing a case of coincidental hyperdontia-hypodontia.[18]

In both presented cases, there were no other anomalies in the primary dentition and few in the permanent dentition. With regard to the siblings, no dental anomalies were found. These facts and in addition the constant incisor location of the triple teeth suggested that the abnormality would be single and located in the anterior segment of the dental lamina.

If a conservative treatment of a triple tooth had to be considered the present contribution about the internal morphology should be taken into account.

CONCLUSION

Specifically, the junction element is the supernumerary tooth. This supernumerary tooth is labially located and joined to two teeth of normal series (the central incisor on the mesial side and the lateral incisor on the distal side) causing the characteristic triple teeth clinical appearance.

A similar internal morphological pattern of crowns and roots in triple teeth is seen: three nearly separate crowns with three separate pulp chambers, and three joined roots with three connected root canals.

Triple teeth can be considered as an early double fusion between three tooth germs, initially separate, but in close proximity and developing synchronically.

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