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Multidisciplinary approach to the treatment of double bilateral upper permanent incisors in a young boy

ABSTRACT

Background *A double tooth is a rare developmental anomaly referring to the fusion of two adjacent tooth buds or the gemination of a single bud.*

Case report *This case report describes the multidisciplinary approach to an 11-year-old patient with two double upper permanent incisors. The clinical intraoral examination showed a mixed dentition with bilateral double maxillary central incisors, molar Class I malocclusion and palatal ectopy of two lateral upper incisors. Computed tomography of the upper dental arch revealed the presence of double central incisors with two distinct roots. The clinical choice consisted of an innovative treatment including surgical, endodontic, orthodontic and restorative treatments. This management protocol produced good aesthetic, healthy and functional results that were stable also two years post-treatment.*

Keywords *Aesthetics, Conservative dentistry, Double teeth, Tooth movement, Tooth shape, Upper incisors.*

Introduction

Among dental anomalies of form there are twinning anomalies, such as fusion and gemination. Gemination occurs when two teeth develop from one tooth germ, resulting in a large tooth, so the number of teeth is normal. Usually, the division is incomplete and the tooth presents a single root and canal [Hattab, 2014].

Fusion generally occurs when a double tooth is counted as one unit, so the patient has a missing tooth. These teeth could arise through the union of two normally separated tooth germs that can be either complete or incomplete. Fusion can also be due to the union of a normal germ to that of a supernumerary tooth, so that the number of teeth is normal and it is difficult to differentiate the fusion from gemination. For this reason, the name "double tooth" is generally used [Hattab, 2014]. Fusion can be due to dental trauma during tooth development or the crowding of adjacent tooth germs. It is reported that the pressure or a physical force may produce close contact between two developing tooth buds. These developmental events appear to be influenced by hereditary and environmental factors [Benetti et al., 2004; Hattab, 2014]. Double teeth may also be part of systemic disorders such as chondroectodermal dysplasia, achondrodysplasia, focal dermal hypoplasia, otodental dysplasia, median cleft facial syndrome, oral-facial-digital syndrome, and Russel-Silver syndrome [Crawford et al., 2006].

The prevalence of double teeth in Caucasians is 0.1 to 0.9% in the primary dentition and 0.2 to 0.72% in the permanent dentition with no difference in sex [Hattab, 2014]. Gemination is more frequently found in the maxilla, while fusion is more frequent in the mandible [Schuurs and van Loveren, 2000]. As reported in the literature, fusion and gemination may require complex restorative, periodontal, surgical and orthodontic treatments, so a multidisciplinary approach is necessary to restore function and aesthetic appearance [Benetti et al., 2004; Le Gall et al., 2011].

The aim of this case report is to describe a combined treatment of double bilateral upper permanent incisors by means of an innovative approach including orthodontic, endodontic, restorative and oral surgery management protocol.

Case report

An 11-year-old Caucasian boy referred to the

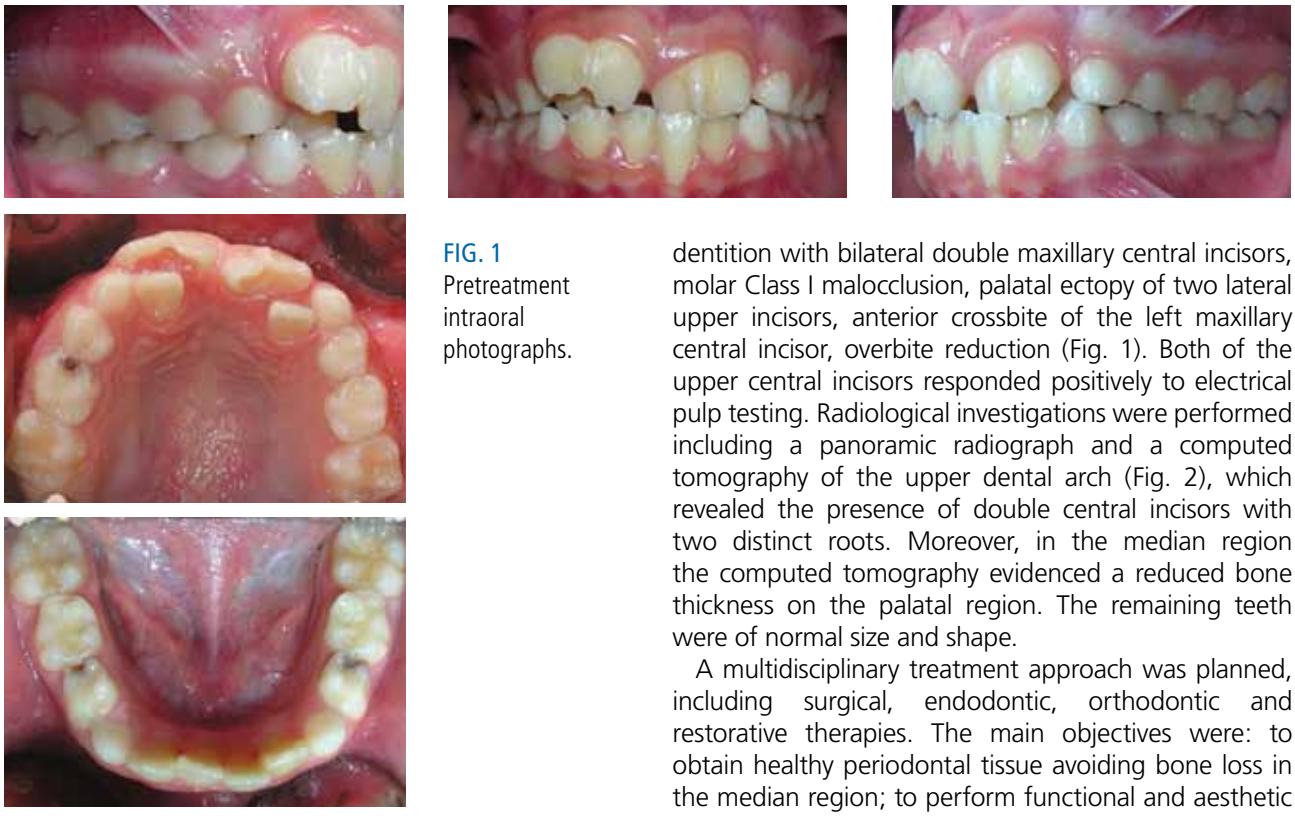

FIG. 1
Pretreatment intraoral photographs.

Department of Paediatric Dentistry and Orthodontics, University of Naples "Federico II" (Italy), with the chief complaint of the abnormal morphology of the two upper central incisors and of upper lateral incisors palatal position. The child appeared healthy, with no abnormal extra-oral findings and no history of orofacial trauma.

The clinical intraoral examination revealed a mixed dentition with bilateral double maxillary central incisors, molar Class I malocclusion, palatal ectopy of two lateral upper incisors, anterior crossbite of the left maxillary central incisor, overbite reduction (Fig. 1). Both of the upper central incisors responded positively to electrical pulp testing. Radiological investigations were performed including a panoramic radiograph and a computed tomography of the upper dental arch (Fig. 2), which revealed the presence of double central incisors with two distinct roots. Moreover, in the median region the computed tomography evidenced a reduced bone thickness on the palatal region. The remaining teeth were of normal size and shape.

A multidisciplinary treatment approach was planned, including surgical, endodontic, orthodontic and restorative therapies. The main objectives were: to obtain healthy periodontal tissue avoiding bone loss in the median region; to perform functional and aesthetic restorations. This approach consisted in: hemisection of the two upper incisors; extraction of the single mesial fragment of the left upper incisor; endodontic treatment of the mesial fragment of the right incisor; progressive extrusive and mesial orthodontic movement of this fragment by means of orthodontic therapy.

The treatment plan was explained to the patient and his parents. The surgical procedure was performed under general anaesthesia. The double upper maxillary incisors were marked (Fig. 3a) and full-thickness buccal flap was raised (Fig. 3b). Both teeth were sectioned with a diamond bur (Fig. 3b-c) and, the mesial part of the maxillary left incisor was extracted (Fig. 3d). During the sectioning procedure, the pulp of the remaining tooth was exposed at the middle third of the root and a direct pulp capping was performed using mineral trioxide aggregate (MTA) (Fig. 3e). The extraction socket was filled with deproteinised bovine bone mineral (Bio-Oss, Geistlich Pharma North America Inc.) (Fig. 3f) and covered with

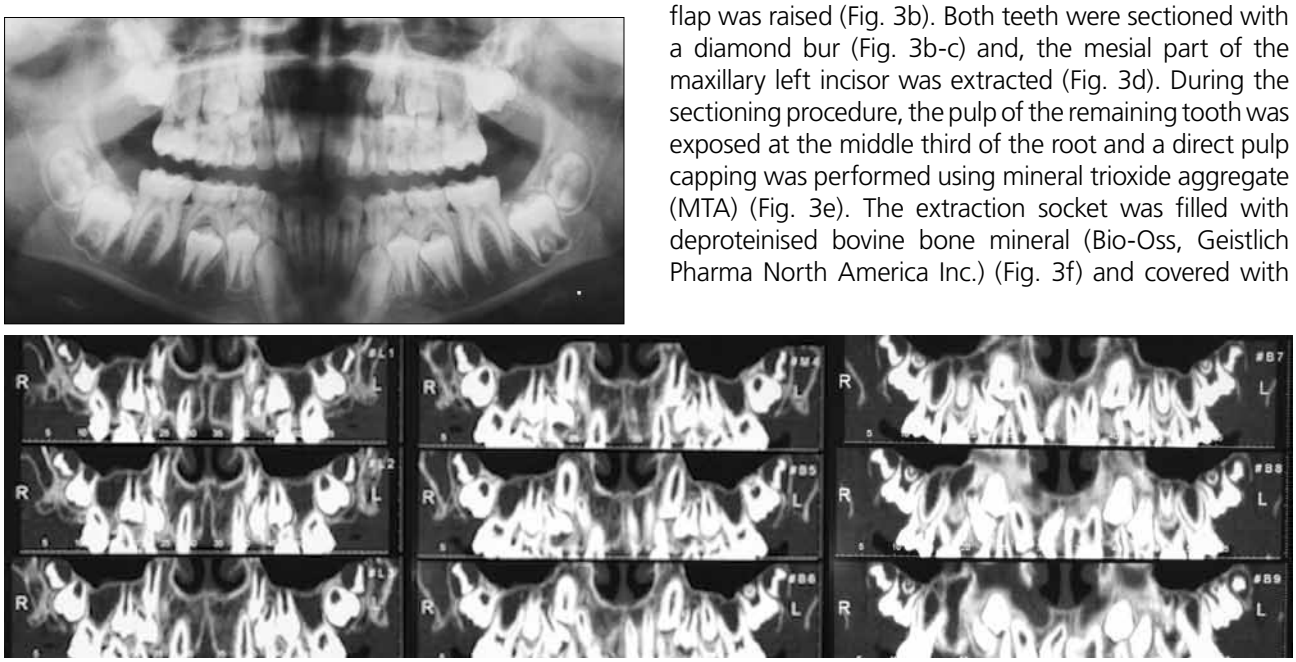

FIG. 2 Preoperative panoramic radiograph and preoperative computed tomography images.

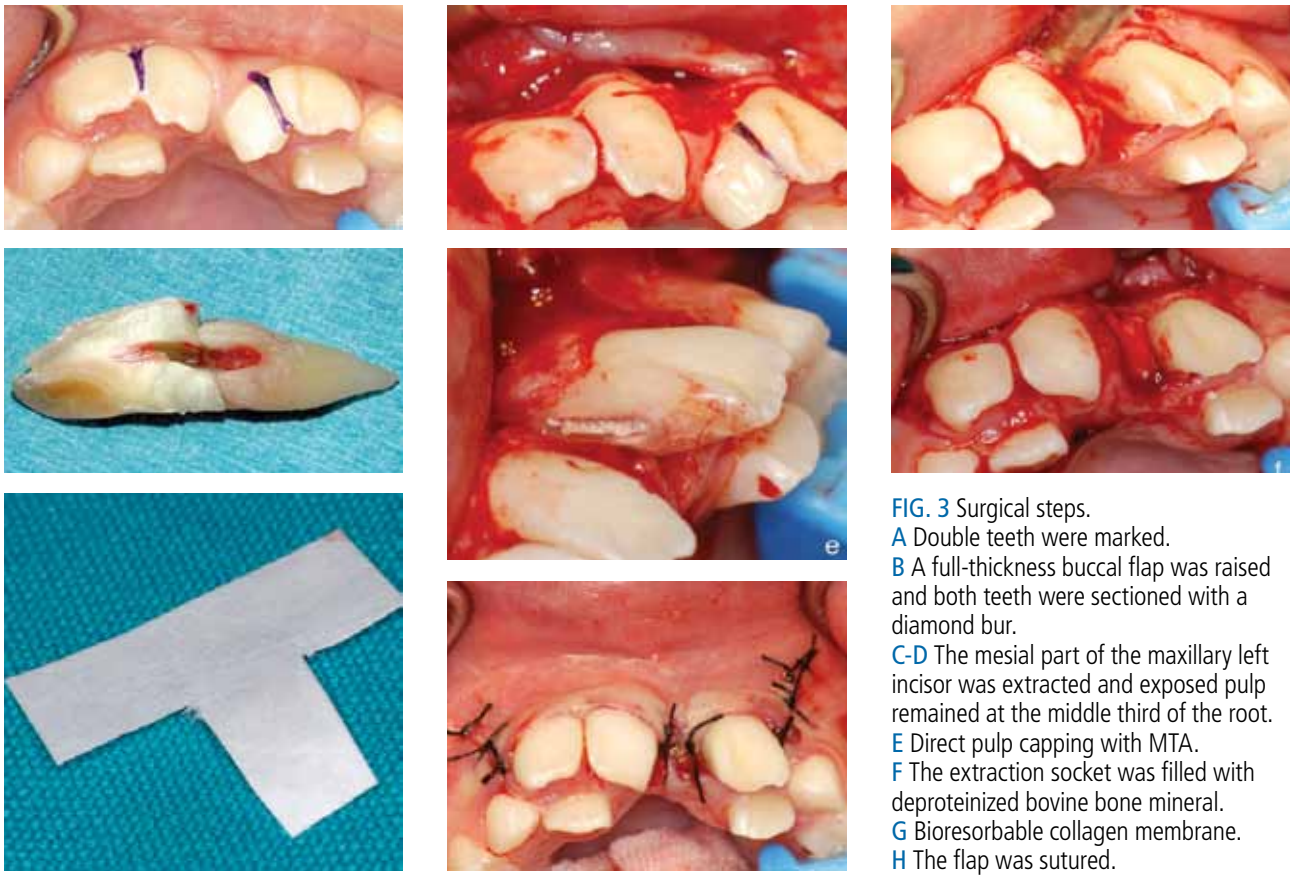

FIG. 3 Surgical steps.
A Double teeth were marked.
B A full-thickness buccal flap was raised and both teeth were sectioned with a diamond bur.
C-D The mesial part of the maxillary left incisor was extracted and exposed pulp remained at the middle third of the root.
E Direct pulp capping with MTA.
F The extraction socket was filled with deproteinized bovine bone mineral.
G Bioresorbable collagen membrane.
H The flap was sutured.

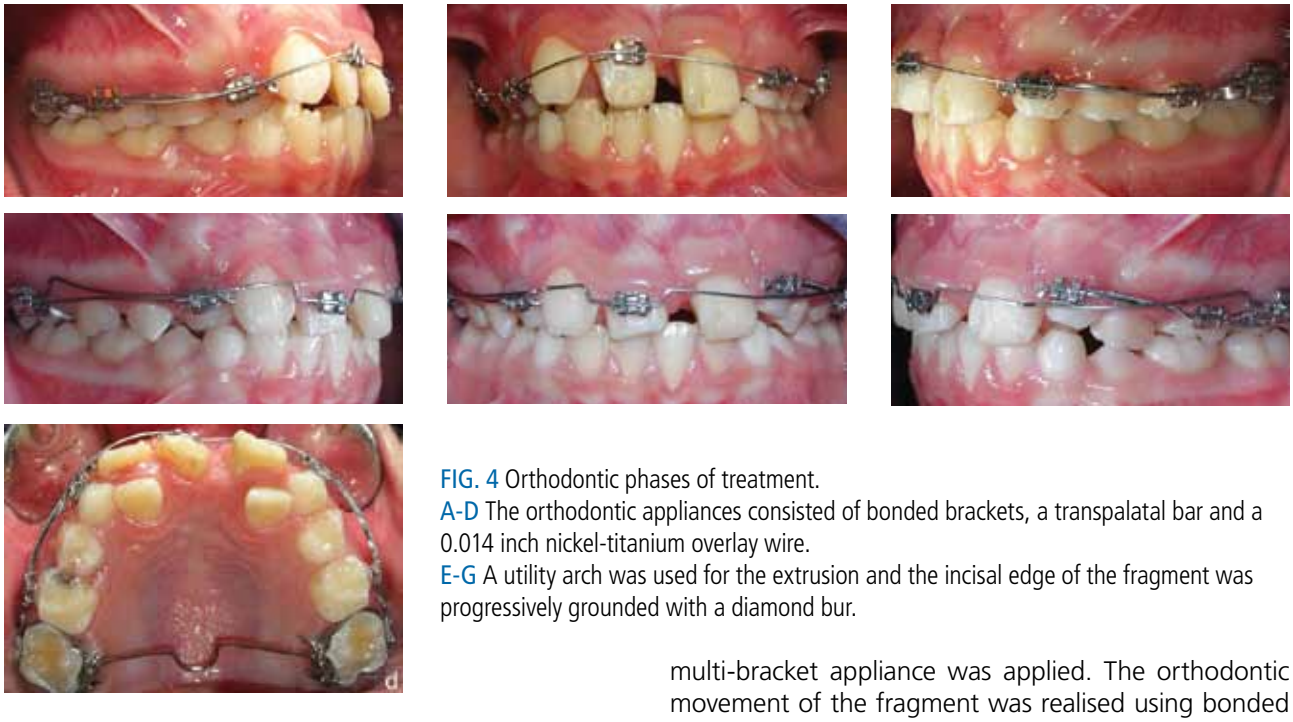

FIG. 4 Orthodontic phases of treatment.
A-D The orthodontic appliances consisted of bonded brackets, a transpalatal bar and a 0.014 inch nickel-titanium overlay wire.
E-G A utility arch was used for the extrusion and the incisal edge of the fragment was progressively grounded with a diamond bur.

a bioresorbable collagen membrane (Bio-Gide, Geistlich Pharma North America Inc., USA) (Fig. 3g).

The mesial fragment of the right upper incisor was left in place and the flap was sutured (Fig. 3h).

After two weeks, the mesial fragment underwent a root canal treatment, and after six weeks a partial multi-bracket appliance was applied. The orthodontic movement of the fragment was realised using bonded brackets, a trans-palatal bar and a 0.014 inches nickel-titanium overlay to apply a light, constant, extrusive force (15-20 g) on the fragment (Fig. 4 a-d) in order to create an additional alveolar bone level in the median region. The electrical pulp testing to teeth 1.1 and 2.1 was performed at each appointment. Then, an utility arch was used to extrude the fragment whose

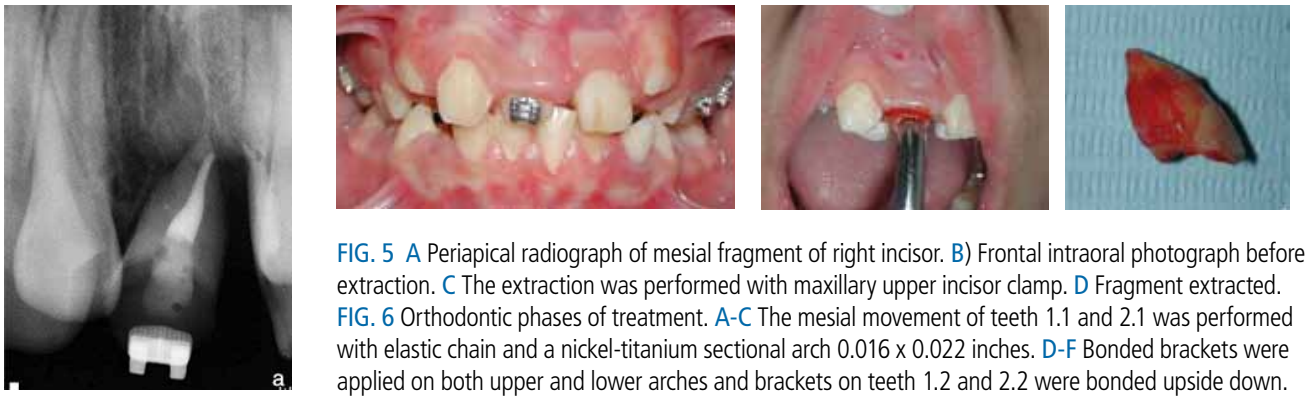

FIG. 5 A Periapical radiograph of mesial fragment of right incisor. B) Frontal intraoral photograph before extraction. C The extraction was performed with maxillary upper incisor clamp. D Fragment extracted.
FIG. 6 Orthodontic phases of treatment. A-C The mesial movement of teeth 1.1 and 2.1 was performed with elastic chain and a nickel-titanium sectional arch 0.016 x 0.022 inches. D-F Bonded brackets were applied on both upper and lower arches and brackets on teeth 1.2 and 2.2 were bonded upside down.

incisal edge was progressively slightly grounded with a diamond bur to avoid occlusal interferences (Fig. 4 e-g). After 15 months, a periapical radiograph was performed to evaluate the bone morphology (Fig. 5a), and the remaining portion of the central right incisor mesial fragment was removed under local anaesthesia (Fig. 5 b-d).

Then, the electrical pulp testing to tooth 2.1 evidenced a negative response, so a root canal treatment was necessary. The mesial movement of teeth 1.1 and 2.1 was performed with elastic chain and a nickel-titanium sectional arch 0.016 x 0.022 inches (Fig. 6 a-c). A V-bend was applied in the center of the sectional arch for a bodily movement of the teeth. When the full permanent dentition was completed, a fixed comprehensive orthodontic treatment was performed. The use of an extra-oral traction increased the anchorage in order to distalise teeth 1.3 and 2.3, which erupted in Class II occlusion (Fig. 6 a-c). Brackets for teeth 1.2 and 2.2 were bonded upside down in order to provide a buccal root torque (-8°) (Fig. 6 d-f). During the orthodontic therapy, the upper central incisors underwent restorative treatment to create their normal shape and size.

The post-treatment photographs showed good smile aesthetics, good periodontal health with interdental papilla between teeth 1.1 and 2.1, a Class I intercuspation, a normal overjet and overbite and good alignment of both arches (Fig. 7). The gingival tissue appeared clinically healthy. The probing depth showed good periodontal status and a good alveolar bone level between teeth 1.1 and 2.1. Upper and lower arch retention was managed with bonded retainers and a two-year follow-up showed that occlusion, aesthetics and periodontal health of the teeth were stable (Fig. 8).

Discussion

Double teeth cause both an unpleasant aesthetic appearance, due to their enlarged mesiodistal dimensions, and space problems, making normal teeth alignment impossible.

In this case, the aesthetic and functional rehabilitation is the most important requirement. A comprehensive multidisciplinary approach allowed to achieve a successful outcome overcoming numerous clinical problems [Ferrazzano et al., 2014].

First, the use of MTA permitted to seal the communication between the root canal system and the external surface of the separated teeth, thus promoting the healing process [Parirokh and Torabinejad, 2010].

Furthermore, the appropriate use of composite resin for aesthetic restoration of the teeth gave the patient a pleasant smile and correct occlusal parameters through a noninvasive highly conservative approach. However, the limits of composite resin use in restorative therapy

FIG. 7 Post-treatment intraoral photographs.

FIG. 8 Two-year post-treatment intraoral photographs.

are related to the instability of colour that is usually associated with the absorptive capacity of long-term material [Yong-Keun and Powers, 2007].

Finally, the real novelty of this case was the orthodontic movement of the fragment that should be eliminated to promote bone apposition, avoiding the risk for a large bone loss, which could most likely happen in the median region after extraction of contiguous teeth [Korayem et al., 2008].

Conclusion

The multidisciplinary approach to treat the problems related to two double upper permanent incisors allowed to reach a pleasing aesthetic and functional result. Proper clinical and radiographic multidisciplinary examinations, a correct diagnosis, and treatment planning were the key features for a successful treatment.

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