

CASE REPORT

Extraction of a Geminated Central Incisor

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Abnormalities in tooth size, shape, and structure generally occur during the morpho-differentiation stage of development, although tooth buds can fuse during the histological phase.¹⁻⁴ Congenital tooth anomalies involving tooth shape can be divided into three types: fusion, concrescence, and gemination.⁵⁻⁸

Fusion is defined as a complete or partial union between the dentin of two or more teeth at the crown level, forming a single tooth with an enlarged crown; in this case, the pulp chamber is separated at the dentin level. Concrescence refers to the union

of two separate teeth through a deposit of cementum after crown formation. Gemination occurs when a tooth germ begins to divide, resulting in two crowns or one large crown with a common pulp chamber.^{1-4,8,9} The incidence of geminated teeth (.19-.22%) is only about half that of fused teeth (.42%), with no significant difference between males and females. Maxillary central incisors are most commonly affected by gemination (3.6%), followed by mandibular third molars (.9%).^{5,10}

The union of a supernumerary tooth and a normal tooth, most often the maxillary central

incisor, is referred to as “diphyodontic gemination”.¹ This article describes multidisciplinary treatment of a patient diagnosed with diphyodontic gemination of the upper left central incisor and a supernumerary tooth.

Diagnosis and Treatment Plan

A 13-year-old male was referred by his family dentist to the Orthodontic Department of the Fatebenefratelli Hospital, Isola Tiberina, Rome, due to an anomalous maxillary left central incisor (Fig. 1). Clinical examina-



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Fig. 1 13-year-old male patient with anomalous maxillary left central incisor, excessive overbite and overjet, and crowding in both arches before treatment.



Fig. 2 After five months of upper molar distalization with Pendulum* appliance.

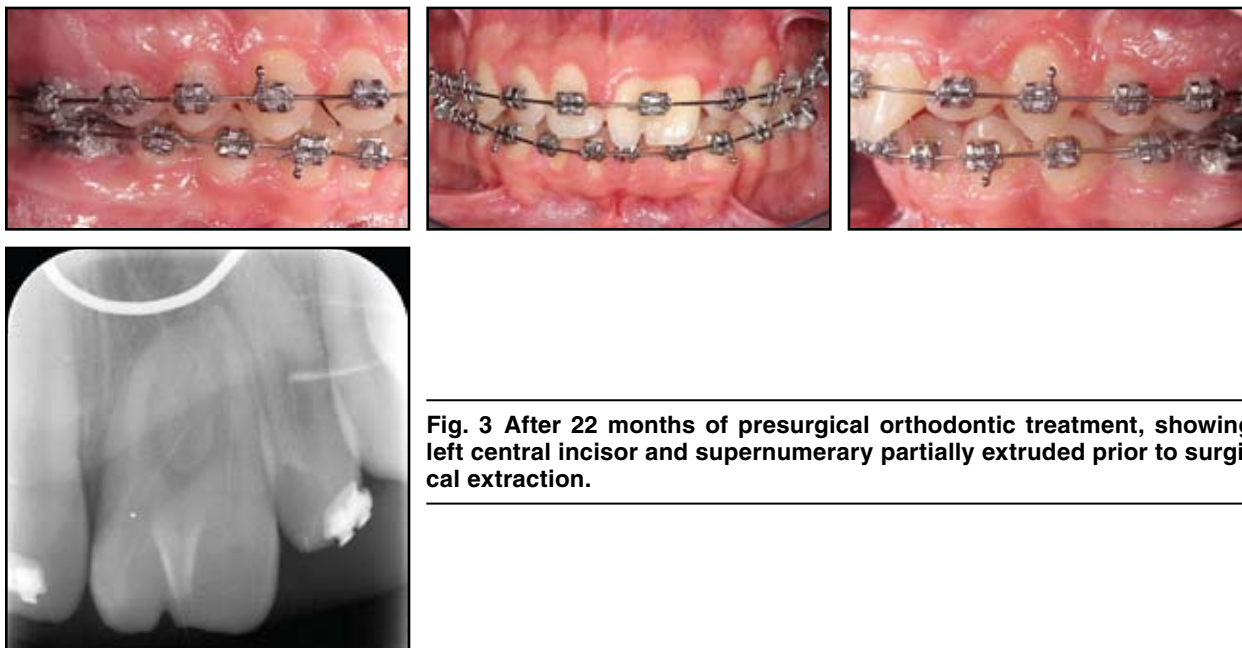


Fig. 3 After 22 months of presurgical orthodontic treatment, showing left central incisor and supernumerary partially extruded prior to surgical extraction.

tion indicated a Class I malocclusion with excessive overbite and overjet (4mm each). Severe crowding had forced the upper left canine completely out of the arch; crowding in the lower arch was moderate. Radiographic examination showed that the anomalous maxillary left central incisor had a single pulp. No periapical issues were observed.

The diagnosis was a diphodontic geminated tooth caused by the union of the left central incisor and a supernumerary tooth. The multidisciplinary treatment plan for this patient involved upper molar distalization to relieve the crowding, followed by orthodontic extrusion of the geminated tooth, a surgical procedure to remove the tooth, and prosthetic rehabilitation.

Orthodontic Phase

A Pendulum* appliance was used to distalize the upper molars

and stabilize the Class I molar relationship without the need for patient compliance. After five months of treatment, the molar relationship had been overcorrected, and enough space had been gained to eliminate anterior crowding (Fig. 2).

Next, we employed a full fixed Bidimensional appliance¹¹ in both arches. Posterior vertical control was provided by a high-pull headgear worn at night. Leveling and alignment were carried out with a sequence of .014" Sentalloy** and .018" × .018" BioForce** archwires. Because the treatment plan called for extrusion of the geminated tooth and its supporting alveolar bone and attached gingiva, an .016" × .022" wire was placed with a step-down bend corresponding to the geminated tooth. An .018" × .022" stainless steel wire was then placed in each arch, with vertical intermaxillary elastics prescribed to finish the occlusion (Fig. 3).

Presurgical orthodontic treatment lasted 22 months.

Surgical Procedure

Although various surgical procedures can be performed on a geminated tooth,^{2-4,6,7,12} it is impossible to separate the supernumerary tooth from the normal tooth due to their shared endodontic system.^{8,13} The most common procedure is therefore a one-step surgical technique in which a mucoperiosteal flap is raised and the geminated tooth is extracted. Because the flap repositioning can create a three-walled bony defect, however, this procedure often results in significant periodontal pocketing and long epithelial attachments.^{5,14,15} To minimize periodontal complica-

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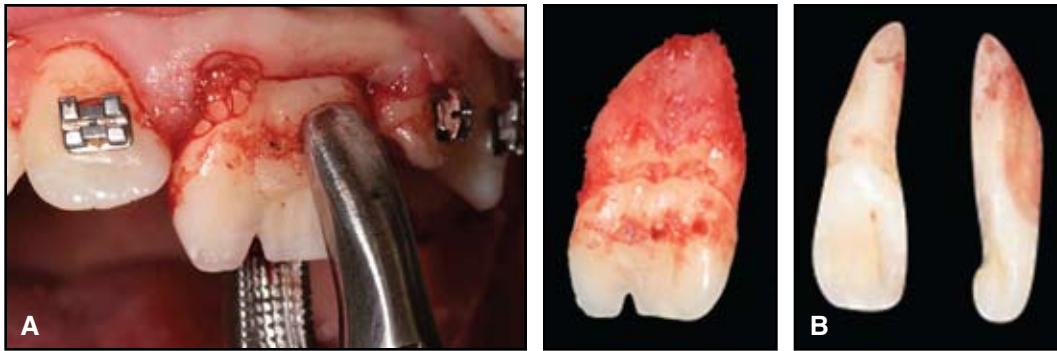


Fig. 4 A. Extraction of geminated left central incisor. **B.** Separation of incisor from supernumerary.

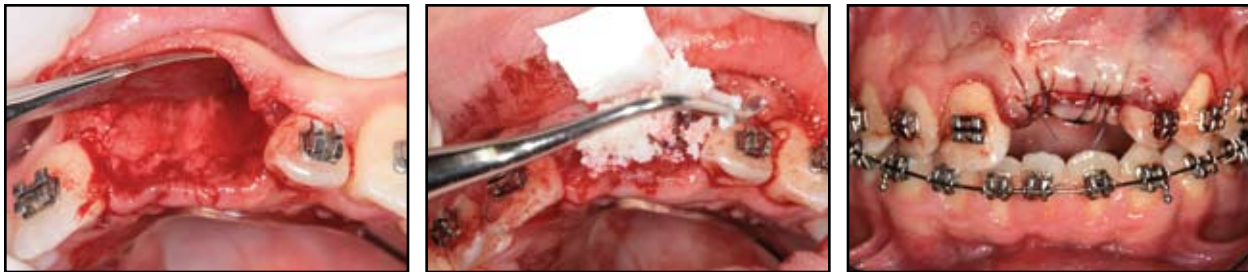


Fig. 5 Guided tissue regeneration with application of Bio-Oss^{***} de-proteinized bovine bone mineral graft and Bio-Gide^{***} resorbable collagen membrane.

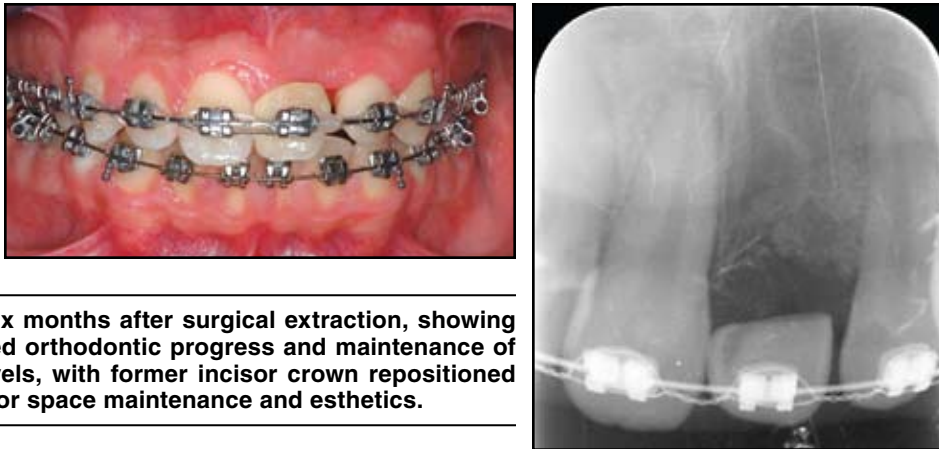


Fig. 6 Six months after surgical extraction, showing continued orthodontic progress and maintenance of bone levels, with former incisor crown repositioned in arch for space maintenance and esthetics.

tions, we instead chose the guided bone regeneration technique.

First, the left central incisor and supernumerary were extracted and the incisor crown was separated from the supernumerary and its root (Fig. 4). The bone margins were refined with a manual bone curette, and the area was irrigated with sterile saline solution. A de-proteinized bovine bone mineral graft (Bio-Oss^{***})

was applied to the bone defect and covered with a resorbable collagen membrane (Bio-Gide^{***}), following the technique recommended by Olsen and colleagues¹⁶ (Fig. 5). This procedure is designed to prevent migration of gingival epithelial cells and thus allow periodontal cell colonization to create a new periodontal attachment.¹² A periapical x-ray was taken to check the bone lev-

els. One week later, sutures were removed, and tissue healing was confirmed.

A bracket was bonded to the extracted incisor crown, which was repositioned in the arch to act as an esthetic space maintainer during the remainder of treatment. Six months later, radio-

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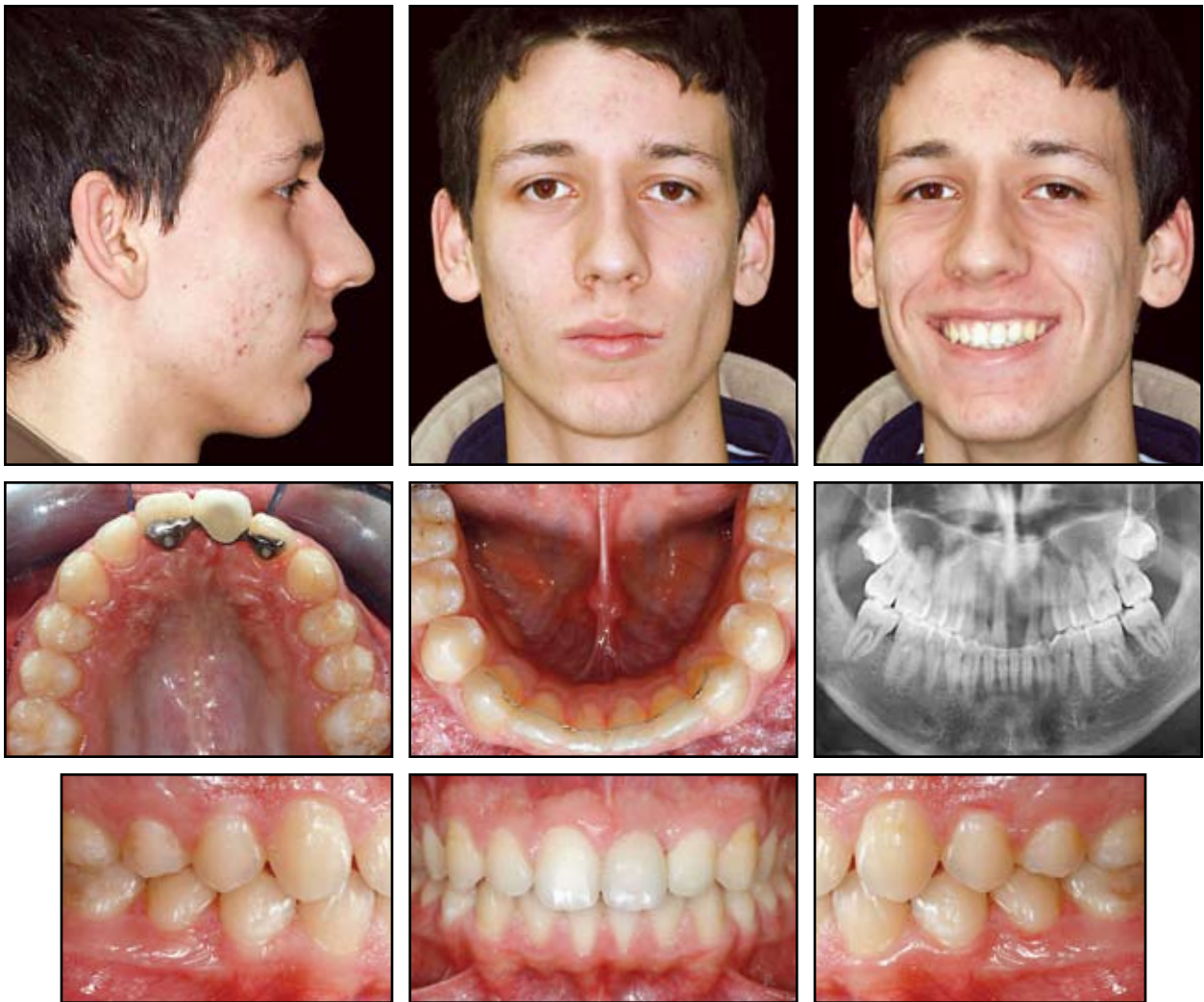


Fig. 7 Placement of Maryland bridge after 28 months of treatment.

graphs showed positive bone healing with normal marginal bone levels (Fig. 6).

Restorative Treatment

Before debonding, a Maryland bridge was fabricated to function as a temporary prosthetic until a dental implant could be placed in adulthood. Total treatment time was 28 months (Fig. 7). One year after the end of treatment, the patient's soft tissues and bone levels remained healthy (Fig. 8).

Discussion

Gemination and fusion are difficult to distinguish clinically; in fact, this is generally done simply by counting the number of teeth in the area.^{1,5,17} Radiographic evaluation is required, however, to determine the root structure of the involved teeth.^{1,13} Although a double tooth with separate root systems can be treated in several ways, including intra- or extraoral surgical division,^{9,12,15,17-19} a geminated tooth with a single endodontic system must usually be

extracted.

Multidisciplinary treatment is needed to prevent a collapse of periodontal tissues subsequent to the extraction and to achieve the best possible esthetic and functional outcome.^{12,17} Presurgical orthodontic treatment will not only help achieve an ideal occlusion, but will also enhance the bony and periodontal tissues through extrusion of the geminated tooth, thus improving the vertical bone level.^{12,18} A filler such as Bio-Oss is recommended to promote bone healing and to



Fig. 8 Follow-up records taken one year after end of treatment.

reduce the risk of periodontal pocketing. De-proteinized bovine bone is widely used in dentistry because of its similarity to human bone; studies suggest that such grafting material is stable, reliable, and non-resorbable.²⁰⁻²²

In our adolescent patient, the extracted incisor crown, separated from its supernumerary and ligated to the archwire, served as an ideal temporary pontic until the patient was ready for a Maryland bridge. Placement of a permanent dental implant will be delayed until at least five years after the end of treatment.^{12,17,18}

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