



Repositioning an Inverted Maxillary Central Incisor Using a Combination of Replantation and Orthodontic Movement: a Clinical Case Report

Emilio M. Agrait, DMD Daniel Levy, DMD Mariane Gil, DMD G.D. Singh, DDS, PhD, BDS

Dr. Agrait is clinic director, Department of Pediatric Dentistry, Graduate Program, School of Dentistry, University of Puerto Rico, San Juan, Puerto Rico; Dr. Levy is a postdoctoral fellow and resident, and Dr. Gil was a postdoctoral resident, Pediatric Dentistry, School of Dentistry, University of Puerto Rico, San Juan, Puerto Rico; Dr. Singh is associate professor, School of Medicine, University of Puerto Rico, San Juan, Puerto Rico.

Correspond with Dr. Agrait at eagrait@prtc.net

Abstract

In some patients, the permanent central incisors fail to erupt and become impacted within the alveolus. In individuals with unfavorable impactions, surgical replantation may be considered to be a reasonable solution before orthodontic repositioning. In this clinical case report, a 9-year-old male patient presented with the permanent maxillary left central incisor in an inverted position high in the vestibule. He was treated with replantation and orthodontic repositioning with fixed appliances. Radiographic review 2 years post-treatment showed an intact lamina dura consistent with a healthy tooth. It is concluded that orthodontic repositioning in combination with surgical replantation can be an optimal treatment choice for impacted teeth, assuming the anatomic location of the tooth is favorable. (*Pediatr Dent.* 2003;25:157-160)

KEYWORDS: IMPACTED INCISOR TEETH,
SURGICAL REIMPLANTATION, ORTHODONTIC REPOSITIONING

Received July 6, 2002 Revision Accepted December 11, 2002

Various treatment modalities are available for the management of impacted maxillary central incisors. Orthodontic repositioning and surgical replantation are 2 alternatives. Several studies¹⁻³ have shown that impacted teeth can be properly positioned with orthodontic traction instead of using surgical repositioning. However, an impacted central incisor in an inverted position high in the vestibule poses a clinical problem because of its difficult location. The chances of failure with orthodontic repositioning alone are high^{4,5} due to root resorption, poor tissue response during the orthodontic force, nonesthetic gingivae of the exposed incisor, and the need for periodontal surgery.^{5,6} This case report demonstrates a successful treatment outcome, obtained using a combination of surgical replantation and orthodontic repositioning.

Case history

A healthy 9-year-old boy presented at the Pediatric Graduate Program Clinic, School of Dentistry, University of Puerto Rico, accompanied by his mother, whose chief complaint was the "missing central incisor of my son" (Figure 1). The patient had no history of dental

trauma and no supernumerary teeth nor mesiodens. Clinical examination showed that the patient was in the early mixed dentition, with a bilateral Class I molar relationship with normal overjet and overbite and a good lower-arch length. However, the permanent maxillary left lateral incisor was erupting into the space of the left permanent maxillary central incisor, and it was thought that the left maxillary permanent central incisor was impacted in a horizontal direction parallel to the occlusal plane. This pattern of eruption was accompanied by a retained primary left lateral incisor (Figure 2), indicating arch length discrepancy. Panoramic and periapical radiographs appeared to confirm that the impacted left central incisor was in a horizontal position relative to the occlusal plane (Figures 3a and 3b). Cephalometric evaluation revealed normal values for a Class I skeletal pattern with a balanced facial pattern.

Treatment

It was decided to extract the primary left lateral incisor, followed by an orthodontic 2x6 appliance, using the primary cuspids and first primary molars as anchorage. The



Figure 1. Frontal view showing the missing left permanent central incisor, with ectopic eruption of the left primary lateral incisor.



Figure 2. Occlusal view showing arch length discrepancy.

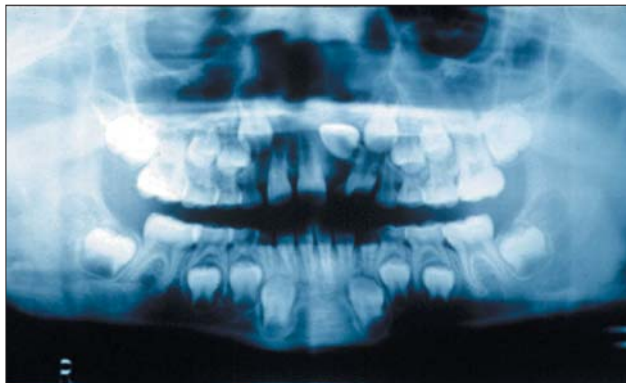


Figure 3a. Pretreatment panoramic radiograph. Notice the apparent horizontally positioned left central incisor relative to the occlusal plane.



Figure 3b. Pretreatment periapical radiograph of the impacted left central incisor.



Figure 4. Space was regained using a combination of titanium coil springs and elastomeric chains. Notice the bonding of primary cuspids and first molars as anchorage.

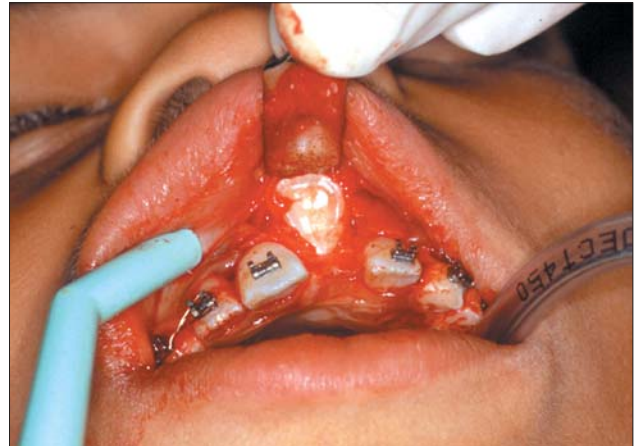


Figure 5. Surgical exposure of the impacted left central incisor using a mucoperiosteal flap. Note the inverted position of the incisor rather than a true horizontal impaction.

initial leveling was performed with a 0.195-inch coaxial wire, followed by 0.16-inch stainless steel wire with a titanium coil spring to create adequate space and to eventually carry the horizontal left central incisor to its normal position after reimplantation (Figure 4).

Surgical exposure of the left central incisor was achieved using strict subperiosteal elevation of a mucoperiosteal flap, and careful removal of the buccal cortical bone was achieved using a diamond bur (Figure 5). The impacted tooth was found to be in an inverted position rather than horizon-

tally oriented as originally diagnosed. After careful luxation, replantation of the inverted tooth in an upright position was undertaken (Figures 6 and 7). After exposing the buccal surface of the central incisor, an orthodontic bracket was placed. The mucoperiosteal flap was repositioned and sutured. A 0.020-inch stainless steel wire was left lying passively against the brackets of the appliance for 2 weeks to permit postoperative stabilization (Figures 8 and 9).

The patient returned 2 weeks later and orthodontic traction of the replanted left central incisor was initiated. An



Figure 6. Luxation of the inverted central incisor being performed.

elastomeric power chain between the helix of a 0.016×0.016-inch stainless steel wire was used to apply a light force of 30 to 40 g.

After 6 months of stabilization with a 0.19×0.25-inch stainless steel wire, the treatment was completed; the bands and brackets were removed and replaced with a maxillary bonded lingual wire retainer extending across the right and left permanent lateral incisors (Figure 10).

The inverted left maxillary central incisor had been successfully positioned into proper alignment, using a combination of replantation and orthodontic traction. Upon completion of treatment, the exposed incisor showed an acceptable gingival contour and attached gingivae (Figure 11). Radiographically, the repositioned incisor showed that its root was completed, although it did not reach the same length as the contralateral central incisor. Clinically, however, the tooth had normal color, was asymptomatic, and vitality-testing responses were normal. The total treatment time was 15 months with a 2-year follow-up.

Discussion

Orthodontic extrusion may be preferable to surgical repositioning in cases of impacted central incisors that lie in a favorable position. This case report shows that replantation can be considered to be an alternative to extraction or prosthodontic treatment. Nevertheless, in such cases it is important to properly inform the patient and parents of the possibility of failure before extensive measures are used to save an impacted tooth.

The most decisive factor for periodontal healing after surgical replantation is the presence and viability of the periodontal ligament of the tooth.⁵ Thus, the clinician should concentrate on preserving a vital periodontal ligament on the root surface of the surgically manipulated tooth. In this particular case, the inverted tooth was handled only by its crown and was maintained in its alveolar socket at all times in an effort to maintain the viability of the cells of the periodontium.

In this case, a closed-eruption surgical flap was used, which returns the flap to its original location after placement of the orthodontic bracket on the inverted tooth. This technique is thought to be associated with more beneficial esthetic effects than the apically repositioned flap.⁷ Indeed, this particular case showed an acceptable gingival contour and attached gingivae at the 2-year follow-up evaluation (Figure 12).

Root growth seems to be highly related to the stage of root development at the time of replantation.⁸ The subsequent reduction in root length seen in this case was probably due to the distortion of Hertwig's epithelial root sheath, presumably caused by compression of the dental follicle. Indeed, the function of the Hertwig's epithelial root sheath is considered as an explanatory factor for variation in root growth.⁹ However, no radiographic or clinical changes were seen in the follow-up after 2 years, and as the tooth was vital, the treatment was considered to be successful. It is concluded that the results obtained in this particular case indicate that incisor teeth with unfavorable impactions can be replanted, when the surgical procedure is performed under favorable conditions. Nevertheless, longer follow-up periods are recommended to determine the advantages of this combined technique of tooth repositioning.

References

1. Prabhu N, Munshi AK. Surgical management of a labially placed permanent maxillary central incisor after supernumerary tooth extraction: report a case. *J Clin Pediatr Dent.* 1997;21:201-203.
2. Yng-Tzer JL. Treatment of an impacted dilacerated maxillary central incisor. *Am J Orthod Dentofacial Orthop.* 1999;115:406-409.
3. Crawford LB. Impacted maxillary central incisor in mixed dentition treatment. *Am J Orthod Dentofacial Orthop.* 1997;112:1-7.
4. Andreasen JO. Periodontal healing after replantation and autotransplantation of incisor in monkeys. *Int J Oral Surg.* 1981;10:54-61.
5. Machtei EE, Zyskind K, Ben-Yehouda A. Periodontal considerations in the treatment of dilacerated maxillary incisors. *Quintessence Int.* 1990;21:357-360.
6. Kayalibay H, Uzamis M, Akalin A. The treatment of a fusion between the maxillary central incisor and supernumerary tooth: report of a case. *J Clin Pediatr Dent.* 1996;20:237-240.
7. Vernet ME, Kokich VG, Kennedy DB. Uncovering labially impacted teeth: apically positioned flap and closed-eruption techniques. *Angle Orthod.* 1995;65:23-32.
8. Schatz JP, Joho JP. Long-term clinical and radiologic evaluation of autotransplanted teeth. *Int J Oral Maxillofac Surg.*
9. Engel M, Katsaros C. Replantation of an inverted lower second premolar germ. *J Orofac Orthop/Fortschr Kieferorthop.* 1997;58:282-285.

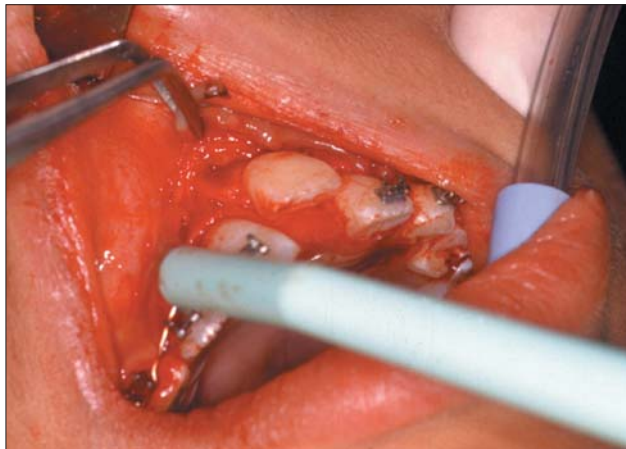


Figure 7. Careful repositioning of the left central incisor being undertaken. The tooth was handled only by its crown and maintained in its alveolar socket at all times.

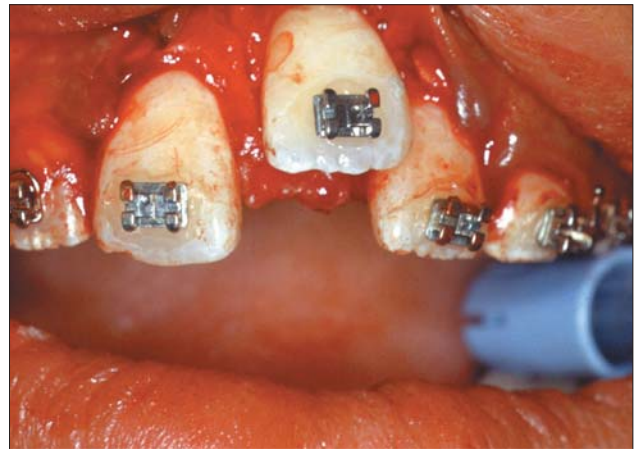


Figure 8. After the replantation, brackets were placed to aid in the orthodontic traction.

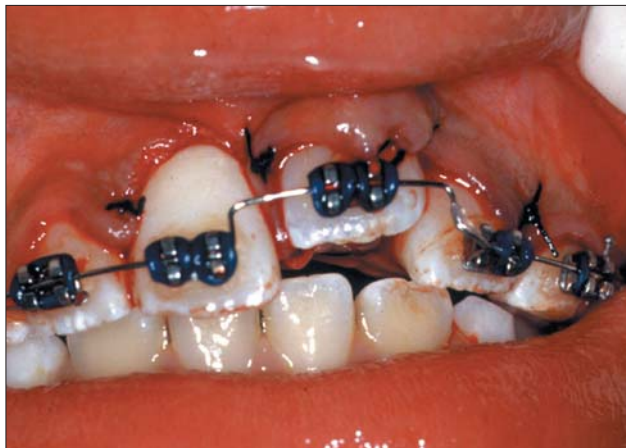


Figure 9. Postsurgical stabilization using a passive 0.20-in stainless steel wire.



Figure 10. Maxillary bonded fixed retainer extending across the left to right lateral incisors and bonded to all 4 incisors for better stabilization.



Figure 11. One year postsurgery, observe the acceptable gingival contour. Marginal gingiva envelops the central incisors in a collar-like fashion with a good outline on the buccal surface.



Figure 12. Two years postsurgery, the attached gingivae are demarcated from the adjacent alveolar mucosa on the buccal surface by a well-defined mucogingival line. The color, size, and shape are acceptable. The left central incisor was vital with no change in color noticed. Vitality tests were normal.