

CASE REPORT

Interdisciplinary Treatment of a Severely Displaced Mandibular Canine: A Long-Term Follow-Up

MORTON S. WINTNER, DMD, MSD

Impacted canines are less prevalent in the mandible than in the maxilla,^{1,2} and impacted mandibular canines that have migrated to the opposite side of the midline (transmigration) are even more rare.³⁻⁷ Orthodontic cases such as these sometimes need significantly longer treatment time than usual, however, often requiring the advice and care of a specialist in periodontics. Because repositioning of impacted canines can involve periodontal complications and can pose a similar risk to adjacent teeth,⁸ these teeth may need to be monitored

periodontally for many years following orthodontic treatment.

With the refinement of techniques for surgical exposure and tissue augmentation and regeneration, the prognosis for these challenging conditions continues to improve. Proper diagnosis, surgical management, and application of orthodontic biomechanics are all critically important to ensure mucogingival health.

The following case study describes the treatment of a severely displaced and impacted mandibular right canine, with 18 years of follow-up observation.

Diagnosis and Treatment Plan

A 12-year-old female presented with a well-balanced Class I malocclusion and minimal dental crowding (Fig. 1A). All permanent teeth were fully erupted except for the third molars, the maxillary second premolars (which were soon to erupt), and the mandibular right canine. The deciduous canine was retained, and no mobility was evident. The

patient's general dentist had provided a full series of intraoral radiographs indicating that the mandibular right permanent canine was severely impacted, mesially inclined, and significantly displaced, with its crown apparently inferior to the mandibular central incisors.

The patient was referred to a periodontist, who uncovered the tooth just enough to place a bracket and to evaluate the tooth's proximity to the surrounding structures (Fig. 1B). This conservative approach was consistent with the recommendations of Kohavi and colleagues, who indicated that exposure of a buried tooth beyond its cemento-enamel junction may result in a loss of bony support.⁹ Minimal attached gingiva was present at the site, and the crown of the tooth was found to be mesially angulated and located in the labial vestibule at the level of the mucobuccal fold, inferior to the crowns of the mandibular central incisors and labial to their roots. As expected, the periodontist reported the loss of the labial cortical plate where



Dr. Wintner is in the private practice of orthodontics at 850 Beaver Grade Road, Moon Township, PA 15108; e-mail: drwintner@braces-pa.com.

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the displaced canine approximated the lower incisors. Although we presumed that there was bony support around the apical third of the canine, a labial bony fenestration seemed likely.

Repositioning the displaced canine was deemed preferable to extraction, which would have

posed risks to the overlapping incisors and could have caused bony trauma in the region. Furthermore, the longevity of the deciduous canine was questionable, since the root was already considerably resorbed. Therefore, if orthodontic treatment was not an option and the deciduous

canine eventually exfoliated, the space remaining would certainly be smaller than that of the contralateral permanent canine. Considering the circumstances of this case, it seemed reasonable to attempt to reposition the natural tooth with appropriate periodontal management in hopes that

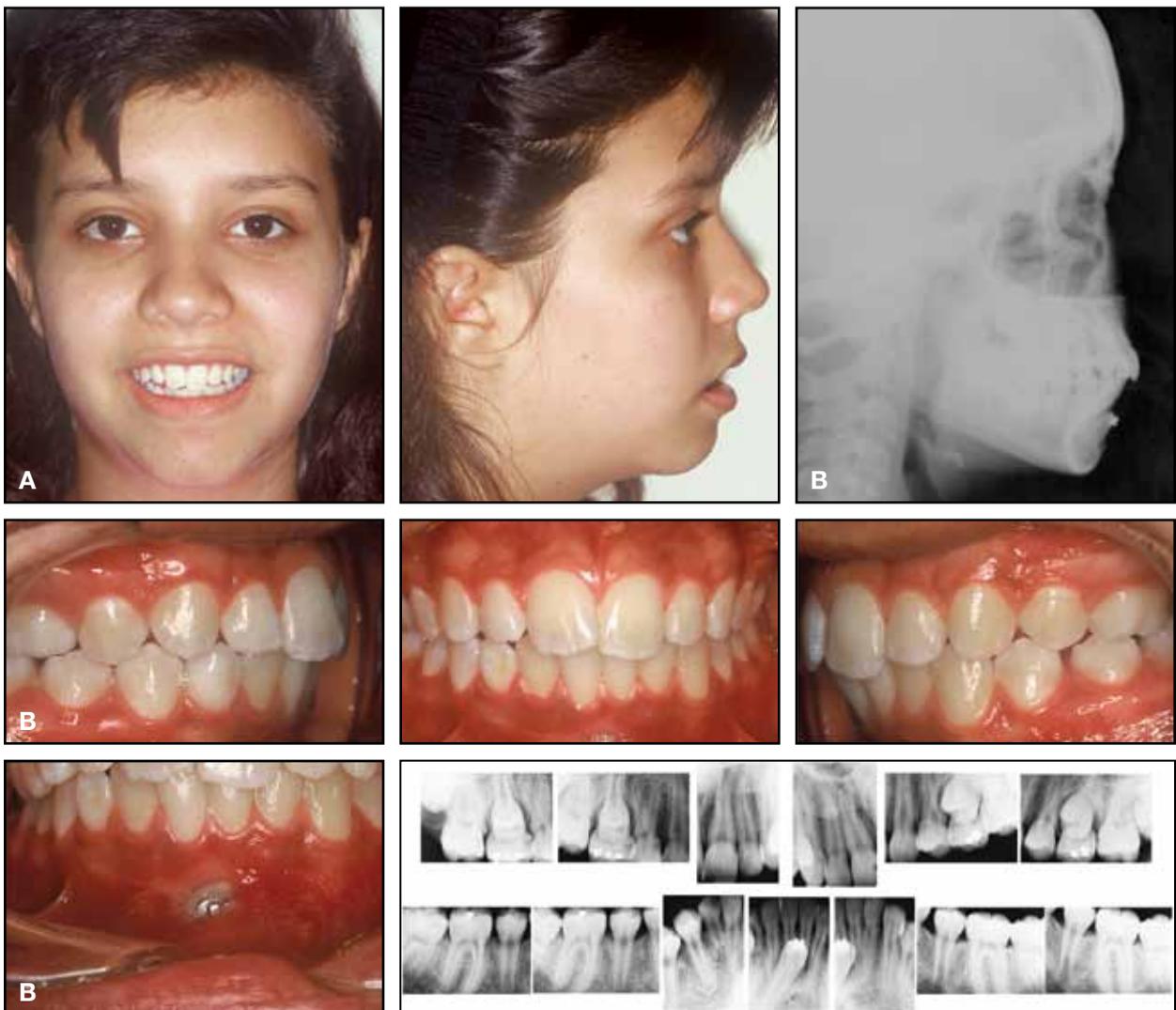


Fig. 1 A. 12-year-old female patient with Class I occlusion, minor crowding, and impacted lower right permanent canine before treatment. B. After surgical exposure of impacted canine and placement of eyelet bracket.

the tooth could be maintained indefinitely.

We expected that the soft-tissue coverage over the lower incisors could be improved while acceptable bony support was maintained. It was clear that once orthodontic treatment was initiated, protection of the canine would require periodontal therapy including free gingival grafts. Furthermore, it would be critical to minimize lower-incisor flaring, considering the thin labial cortical bone in this region.

Treatment Progress

Full fixed appliances were placed about two months after the initial periodontal surgery, and the upper and lower arches were leveled and aligned over the ensu-

ing eight months. The exposed permanent canine remained in its original position, while the deciduous canine was bypassed by the initial series of archwires.

A mandibular lingual arch was placed to preserve arch integrity prior to movement of the displaced canine. A lower .016" × .022" archwire was fabricated to incorporate a modified Bull loop, with an anteriorly angled bend at the inferior end serving as anchorage for traction of the displaced canine. This loop design provided a less severe force vector than would have resulted from tying the exposed tooth directly to the arch. The canine was gently tied to the Bull loop with .030" power tube (Fig. 2A) and retied at three-week intervals.

As the displaced canine

approached its proper position, active movement was temporarily halted to allow healing of a free gingival graft. During this period, the canine was lightly tied to the looped archwire to hold its current position and prevent any regression (Fig. 2B). After another seven months of canine traction, the deciduous canine was removed, and a new bracket was bonded to the permanent canine in a more ideal position (Fig. 2C).

As tooth movement progressed, additional recession was noted. Consequently, a second free gingival graft was performed with the aim of creating a wider zone of attached gingiva. Once the canine had been moved enough to be incorporated into the main archwire, adjustments were made to achieve the most

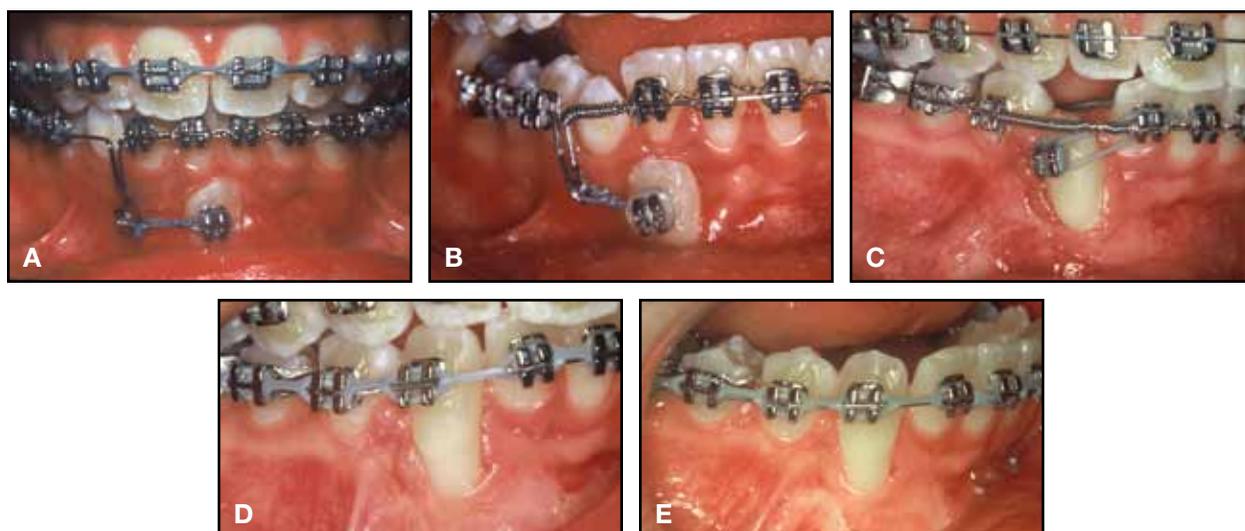


Fig. 2 Progress of canine traction. **A.** Nine months after original exposure, Bull loop in lower archwire tied to canine bracket with elastic tubing; space opened for permanent canine with open-coil spring. **B.** Six months later, active movement of ectopic canine temporarily halted to allow healing of free gingival graft. **C.** With permanent canine nearing proper mesiodistal location after additional seven months, retained deciduous canine was extracted. **D.** Another six months later, canine incorporated into main archwire. **E.** Final detailing of axial inclination and buccal crown torque two months later.

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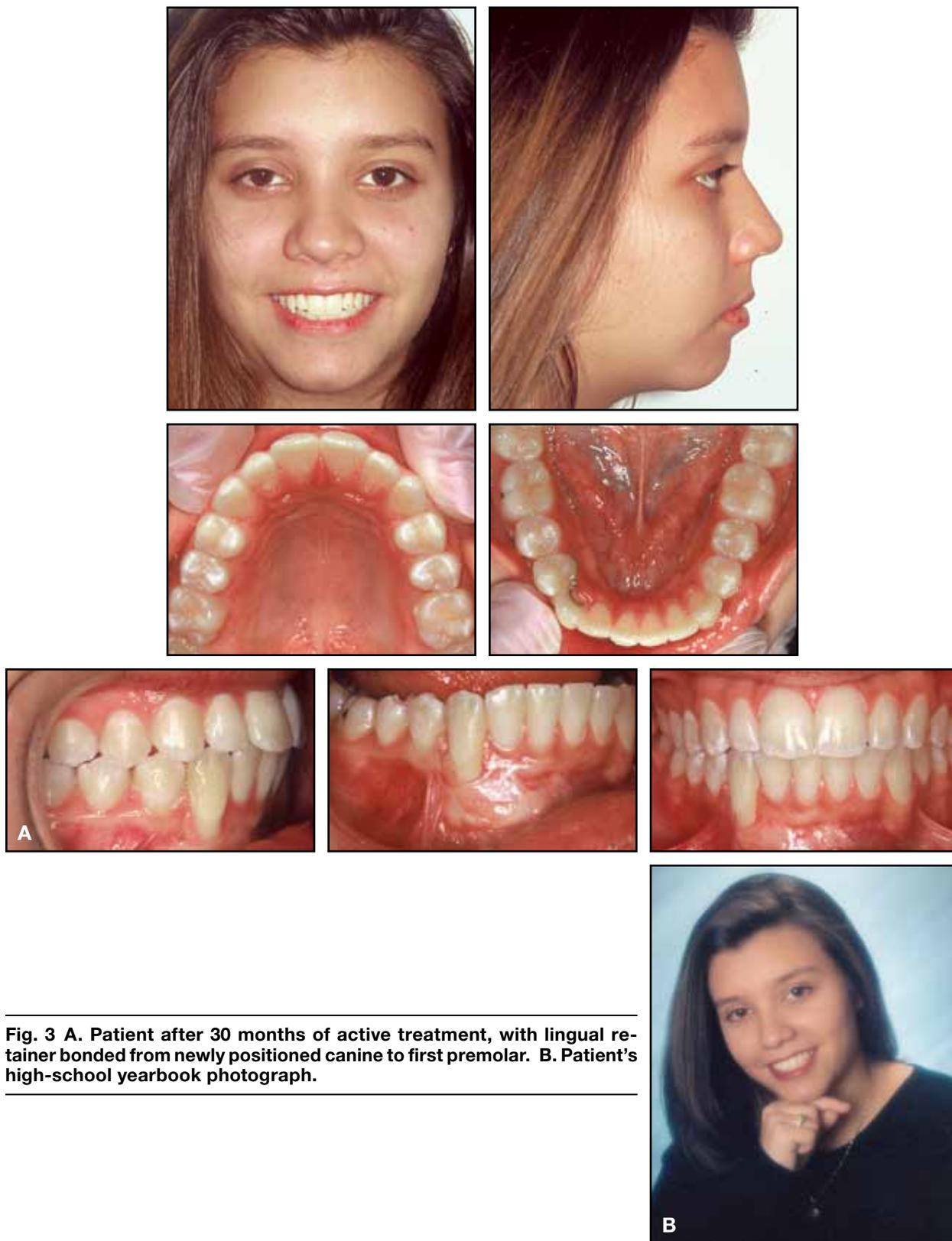


Fig. 3 A. Patient after 30 months of active treatment, with lingual retainer bonded from newly positioned canine to first premolar. **B.** Patient's high-school yearbook photograph.

ideal axial inclination and sufficient buccal crown torque (Fig. 2D,E). Light Class II elastics were also employed for a brief interval.

Six weeks prior to removal of the fixed appliances, a guided soft-tissue-regeneration procedure was performed to improve coronal attachment. After a full-thickness flap was raised, the root surface was cleaned and debrided, and a resorbable membrane was placed.

Treatment Results

Total active treatment time was about 30 months, including pauses following the three perio-

dontal procedures and some delays due to the patient's schedule (Fig. 3A). At the conclusion of treatment, approximately 4mm of gingival recession was evident, as measured from the cemento-enamel junction of the repositioned permanent canine.

A twisted lingual retainer wire* was bonded from the newly positioned canine to the lower right first premolar. A maxillary wraparound retainer and a standard mandibular Hawley retainer were also provided.

The patient was followed for 18 years after the completion of active treatment (Fig. 4). During this period, the dentition and

periodontium remained stable; the gingival recession associated with the displaced canine showed no appreciable increase, and bony support was well maintained.

The prognosis for a stable result seems quite good. The patient reports the tooth to be comfortable, with minimal sensitivity to mechanical and thermal stimulation. The minor sensitivity associated with the slight recession has diminished over the years, and as root-desensitizing materials and procedures continue to improve, there is reason to be optimistic. The patient re-

*3M Unitek, Monrovia, CA; www.3MUnitek.com.



Fig. 4 A. Three years after treatment. B. 10 years after treatment. C. 12 years after treatment. D. 18 years after treatment.

mains pleased with the overall outcome and appreciates having retained her natural tooth. Cosmetically, the gingival defect is hidden inferiorly to the smile line and to the lip line at rest. In fact, the patient was voted “Best Smile”, along with a high-school classmate, in her senior year (Fig. 3B).

Discussion

Despite the success of extraction and implant replacement, a combined orthodontic and periodontal approach that attempts to preserve the natural tooth has many technical advantages as well as intangible value to the patient. In the case presented here, the 18-year stability of the repositioned tooth indicates that an effective treatment plan was employed, especially considering the risks associated with extraction of the impacted tooth, the possible complications of a subsequent implant or bridge, and the potential cost of replacing prosthetic restorations to adjust shading as the patient aged.

Had the impacted canine been left untreated, it might eventually have erupted and required removal—a procedure involving

some risk to the adjacent teeth, particularly as the alveolar bone becomes more dense with age. Leaving the deciduous canine in place would also have been risky, since it could have exfoliated before the patient reached the maturity needed for placement of an implant—at least 16 years of age for a female. Exfoliation would therefore have necessitated a temporary bonded bridge, which is challenging to place in this region and would surely have required multiple recementations. If the space proved insufficient for an implant, the patient would have needed a fixed bridge, with its attendant lifelong issues. Even if the resorbed canine had been retained for an extended time, its eventual loss would have required immediate orthodontic intervention to prevent migration of the adjacent teeth and avoid both functional and esthetic repercussions.

Conclusion

This 18-year case study demonstrates the importance of appropriate periodontal therapy in conjunction with orthodontic treatment of severely displaced canines.

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