CASE REPORT

The Use of Segmental Corticotomy to Enhance Molar Distalization

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Efficient distalization of the maxillary molars requires a reduction of molar resistance to tooth movement, avoidance of distal crown tipping, good vertical control, and maintenance of anterior anchorage. Because molar distalization is a distolateral movement, however, it tends to dislodge the teeth from the alveolus. Corticotomy may be a useful adjunct procedure in such cases, since it has long been used to accelerate tooth movement and to minimize root resorption, loss of vitality, and relapse of orthodontic corrections.[1-7]

Suya suggested that most surgical and orthodontic procedures be performed in the first three to four months after corticotomy, before fusion of the tooth-bone units.[8] In a report of two cases of crowding, Wilcko and colleagues described the combination of corticotomy with the grafting of resorbable, alloplastic freeze-dried bone implants to increase the volume of alveolar bone, regenerate bone affected by dehiscence and fenestration, and avoid gingival recession resulting from expansion of the arches.[9] They argued that orthodontic movement results not from simple repositioning of single tooth-bone units, but from a cascade of physiological events leading to bone healing, which Frost has termed the "regional accelerated phenomenon".[10-13] An increase in bone metabolism in the periodontal tissues after surgical intervention has been demonstrated in beagle dogs[14] and in Wistar rats.[15,16] These phenomena are responsible for the rapid dental movement observed when orthodontic forces are introduced after corticotomy.

The present article describes the implantation of freeze-dried bovine bone in the buccal alveolus after selective buccal and palatal decortication of the maxillary molars. This approach has the following advantages:

- Corticotomy stimulates bleeding and capillary proliferation in the bone marrow, creating the perfect bed for a bone implant.
- Corticotomy allows the identification and resolution of any areas of transitory secondary osteoporosis.
- Dehiscence, fenestration, and

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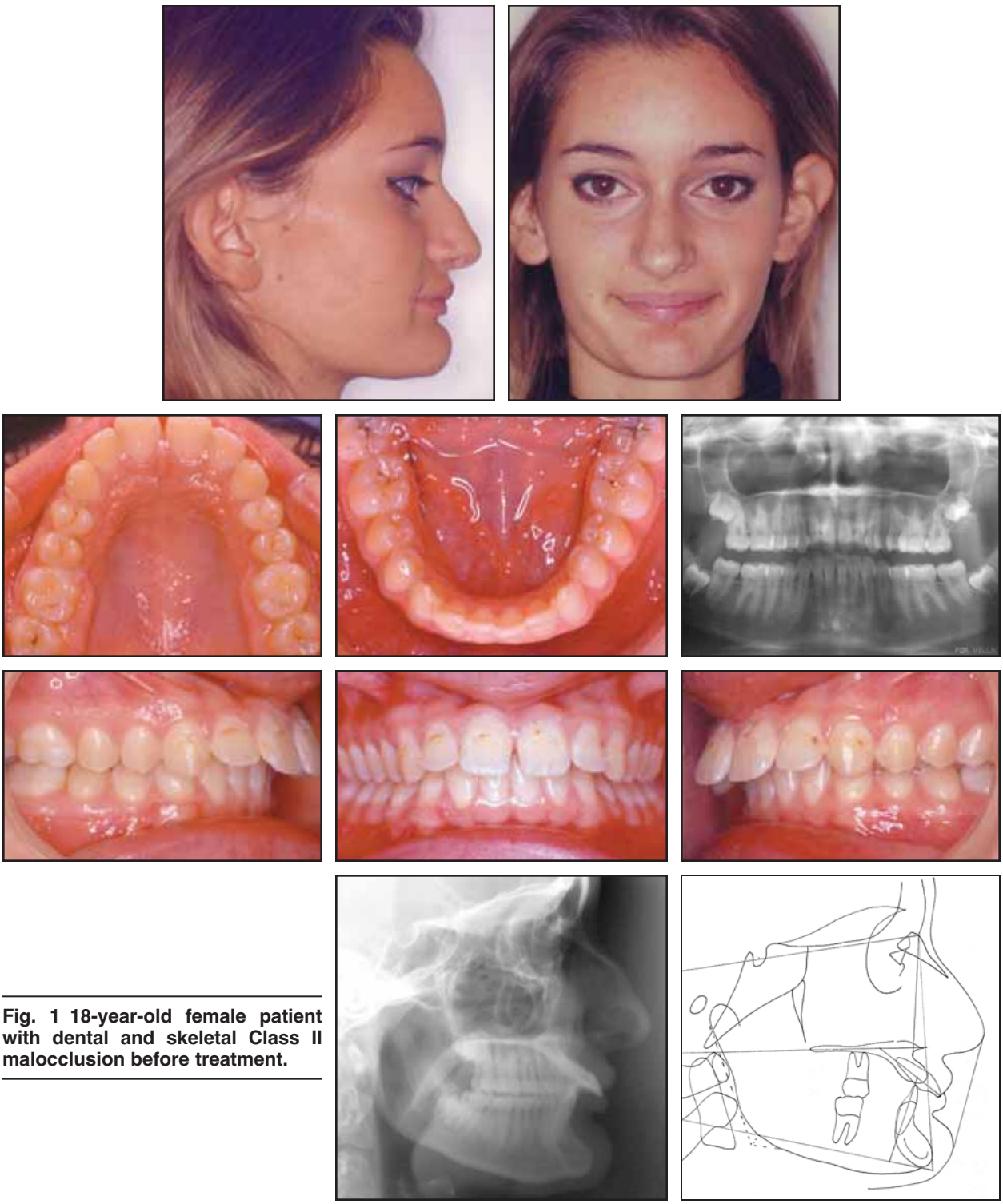

Fig. 1 18-year-old female patient with dental and skeletal Class II malocclusion before treatment.

gingival recession, which are commonly observed in the molar regions, can be improved by a graft with good osteoconductive properties.

Diagnosis and Presurgical Treatment

An 18-year-old female in the permanent dentition presented with a dental and skeletal Class II malocclusion (Fig. 1). Cephalometric analysis (Table 1) revealed significant forward rotation of the mandible (SN-GoGn = 22°) and vertical collapse of the lower third of the face (ANS/PNS-GoGn = 12°). The maxillary incisors were extremely proclined (U1-ANS/PNS = 140°), and the overjet was pronounced (9mm).

The initial phase of treatment consisted of leveling and alignment of both arches, using .022" brackets on an .018" □ .025" preformed stainless steel archwire (Fig. 2). This was followed by bilateral buccal and palatal corticotomies.

Surgical Procedure

One hour before surgery, the patient was administered amoxicillin, 2g. Thirty minutes before surgery, she was given Nimesulide,* 100mg, which she was instructed to take every eight hours during the first day after surgery. A .12% chlorhexidine rinse was performed immediately before the procedure, and Lidocaine 2% with epinephrine 1:100,000 was infiltrated at the surgical sites.

Buccal and palatal sulcular incisions were made, with mesial and distal vertical releases one tooth away from each area to be decorticated. Full-thickness flaps were reflected, but the buccal flaps were reflected palatally beyond the apices of the teeth, since a natural curve of palatal reflection was not possible. Any remaining interproximal papillary tissue was

*Helsinn Healthcare S.A., Lugano, Switzerland; www.helsinn.com.

TABLE 1
CEPHALOMETRIC DATA

	Pretreatment	Post-Treatment
SNA	80°	80°
SN-Po	86°	85°
AN-Po	–6°	–5°
SN-ANS/PNS	10°	10°
SN-GoGn	22°	25°
ANS/PNS-GoGn	12°	15°
U1-ANS/PNS	140°	119°
L1-GoGn	99°	100°
L1-APo	–1.0mm	0.0mm
Overjet	9.0mm	2.5mm
Overbite	5.0mm	2.5mm
Interincisal angle	111°	123°

Fig. 2 Upper and lower .018" □ .025" stainless steel archwires used in presurgical phase.

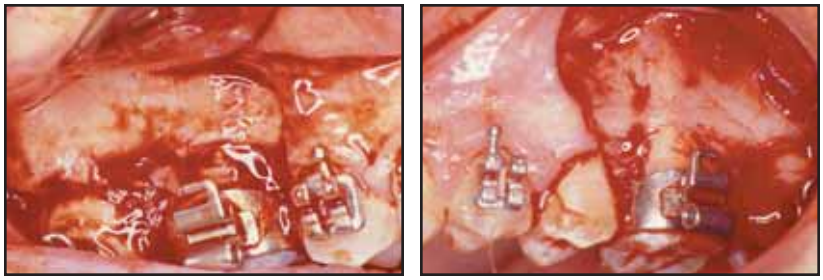

Fig. 3 Exposure of surgical sites, revealing fenestration on mesial roots of left first molar and right second molar.

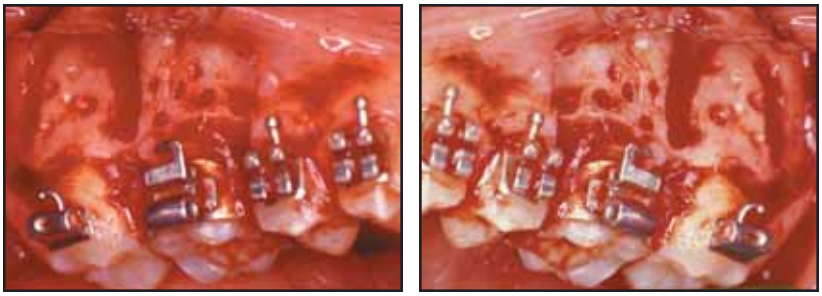

Fig. 4 Holes and grooves drilled on buccal side of alveolar site in preparation for grafting.

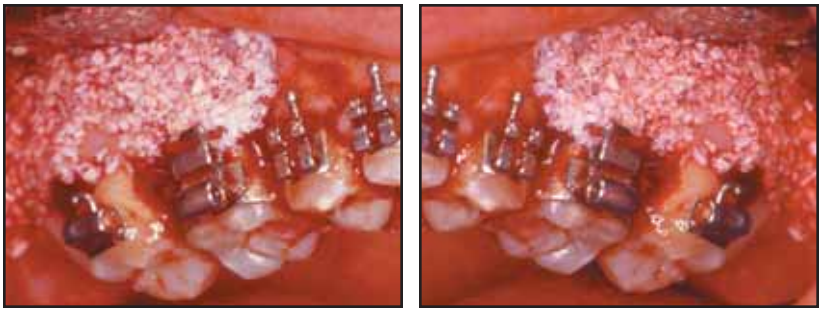

Fig. 5 Bio-Oss freeze-dried bovine bone implant material grafted buccally over decorticated areas.

Fig. 6 One week after corticotomies, molar distalization initiated with nickel titanium coil springs between second premolars and first molars.

Fig. 7 Four weeks after corticotomies.

left in place. Exposure of the surgical sites revealed fenestration on the buccal cortices (Fig. 3).

Decortication was then performed with a round bur on a high-speed handpiece (20,000 rpm) under normal saline irrigation. Vertical incisions were made between the roots of the first and second molars and connected by horizontal cuts beyond the apices, ending 1-2mm below the alveolar crests. Several holes were then drilled, both buccally and palatally, to create a bleeding bed for the graft (Fig. 4). Each cortex was penetrated on the buccal side of the alveolar site, taking care to avoid damage to the roots. Bio-Oss** freeze-dried bovine bone implant material was placed buccally to cover the decorticated areas (Fig. 5). The flaps were closed with silk 4-0 sutures.

Molar Distalization

One week after surgery, the sutures were removed. Molar distalization was initiated by placing 200g nickel titanium coil springs*** on the maxillary archwire between the second premolars and first molars (Fig. 6). The patient was seen every four weeks (Fig. 7) until distalization of the

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†G&H Wire Company, P.O. Box 248, Greenwood, IN 46142; www.ghwire.com.

molars was complete, about eight weeks after the corticotomies (Fig. 8). No anterior anchorage devices were needed.

The second premolars, which showed the greatest movement, were rotated mesially by the force of the compressed springs, despite being blocked by metal ligatures. The distal movement of the two molars was radicular, with minimal distal crown tipping. During distalization, the teeth showed no increase in mobility, and the patient did not report any pain or sensitivity.

Intrusion of the upper anterior segment and closure of the spaces between the second premolars and first molars were accomplished in another four weeks, using Class II elastics to an .018" Australian Special Plus wire† with coil springs between the lateral incisors and canines (Fig. 9). Treatment was completed in 11 months (Fig. 10).

After orthodontic treatment, the periodontal health of the upper premolar and molar regions had improved, and the initial gingival recession and apical root resorption of the orthodontically repo-

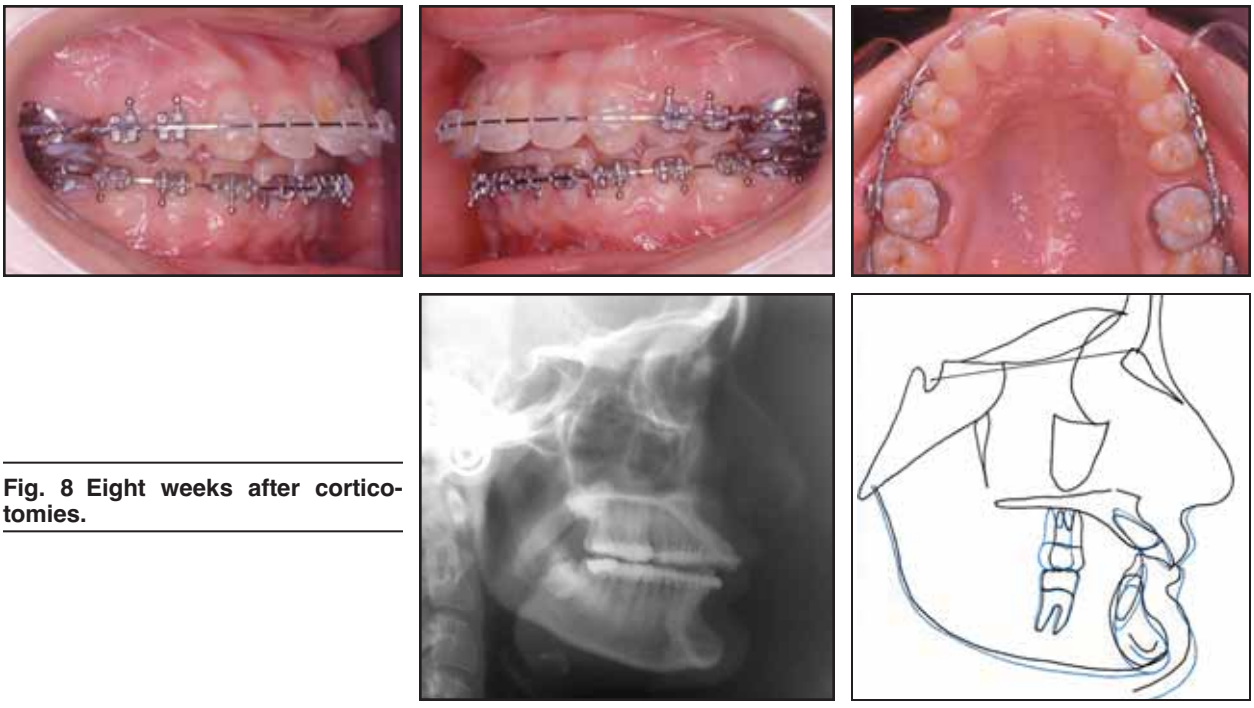

Fig. 8 Eight weeks after corticotomies.

Fig. 9 Intrusion of upper anterior segment with .018" Australian Special Plus wire and coil springs between lateral incisors and canines.

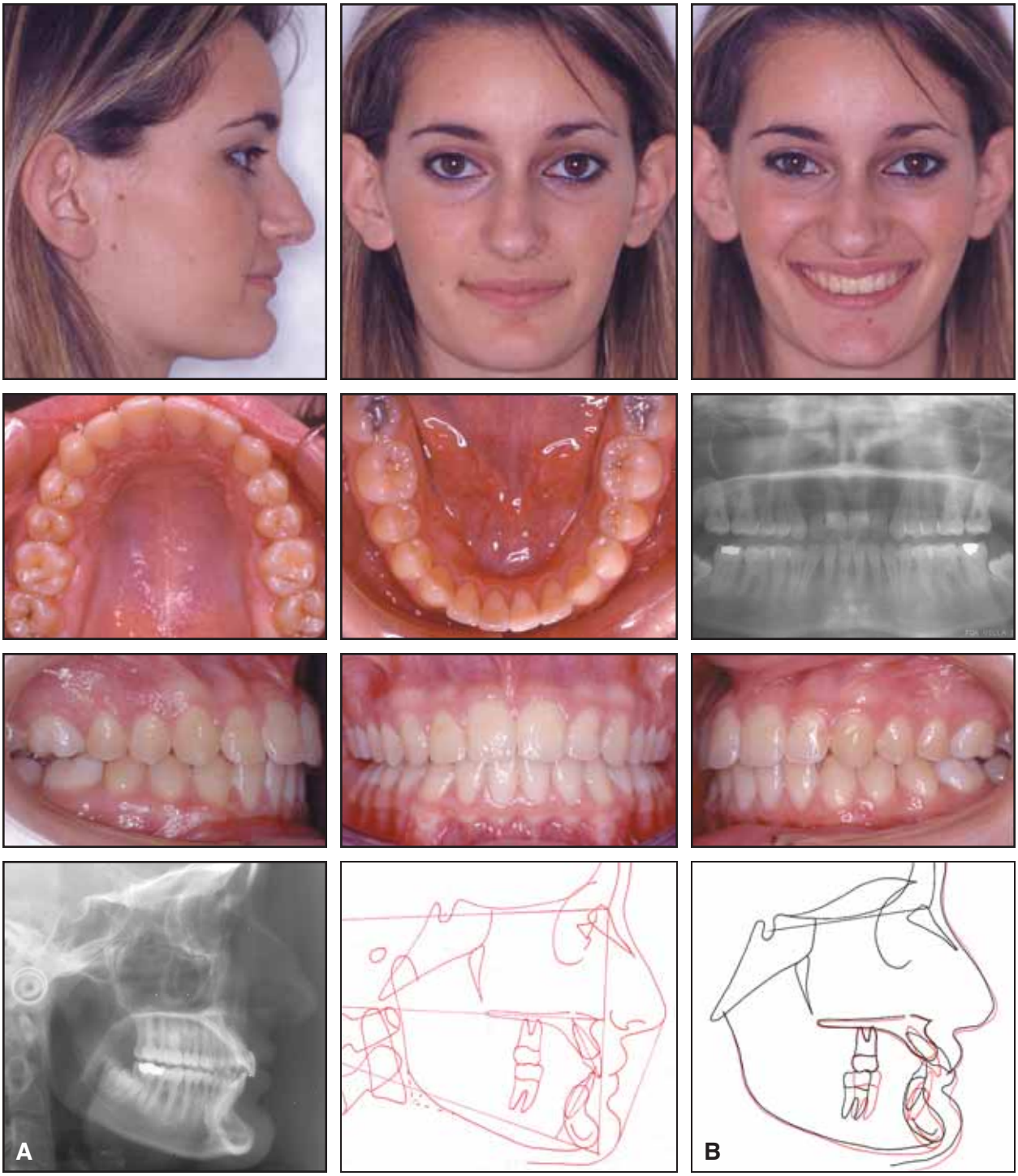

Fig. 10 A. Patient after 11 months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

sitioned teeth had diminished. The upper third molars were extracted before appliance removal, allowing clinical confirmation of the graft attachment and the absence of fenestration (Fig. 11).

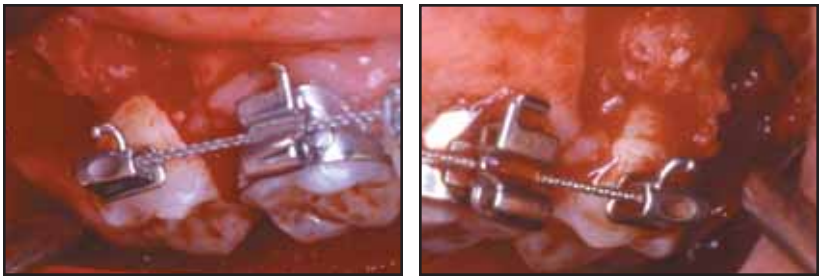

Fig. 11 Increased buccal alveolar bone and healing of right second molar fenestration after extraction of upper third molars, immediately before appliance removal.

Discussion

This case demonstrates that segmental corticotomy and maxillary molar distalization can be an effective combination in correcting Class II molar relationships. The corticotomies reduced molar resistance to distal movement and eliminated the need for anterior anchorage. Optimal leveling and alignment of both arches was required before surgery to minimize the friction generated by the sliding mechanics and avoid occlusal interference from the mandibular molars.

In cases where the arches cannot be fully leveled and aligned before molar distalization, segmental corticotomy may be combined with other procedures or appliances to reduce molar resistance. The presence of the third molars seems to have no effect on distal movement; in the present case, where the maxillary third molars were extracted at the end of treatment, distalization of the first and second molars occurred without distal crown tipping or significant loss of anchorage.

Grafting of the Bio-Oss material in the buccal area increased the volume of alveolar bone and improved the condition of the periodontal tissues around the distalized molars. The time required for distalization and for the entire treatment was significantly less than would have been needed for conventional orthodontics.

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