A Class II malocclusion due to severe mandibular retrognathia often involves esthetic disfiguration that can be corrected only by surgical-orthodontic collaboration. In such a case, the mandibular incisors compensate for the sagittal discrepancy—whether spontaneously or after unsuccessful orthodontic treatment—through labioversion of their crowns. When surgical mandibular advancement is required, the treatment plan often calls for the orthodontist to increase the anterior overjet by distalizing the mandibular arch. Three different means of accomplishing this goal have traditionally been employed, each with obvious drawbacks:

- Use of intermaxillary Class III elastics, which demands constant cooperation from the patient and produces adverse forward movement of the maxillary arch.
- Extraction of two mandibular premolars to achieve a therapeutic Class III molar relationship, which is extremely difficult to balance. When mandibular-third-molar eruption is incomplete (as is often the case with mandibular retrognathia), the results are further compromised by the absence of antagonists to the maxillary second molars.
- The removal of four premolars, which solves the occlusal problem, but leads to undesirable distalization of the maxillary anterior sector, especially when the upper first premolars are extracted.

A more contemporary solution involves the use of skeletal anchorage. Although few authors have described this particular situation, Sugawara and colleagues did study the use of miniplates for mandibular distalization in 15 patients treated for anterior crossbite, anterior crowding, or dental-arch asymmetry. The average distal molar movement was 3.5mm for the crowns and 1.8mm for the roots, with an average .3mm relapse. Another group headed by Sugawara demonstrated the advantages of mandibular-incisor repositioning using miniplates in “surgery first” Class II treatment.

This article presents a rationale for mandibular distalization using retromolar miniscrew...
anchorage in presurgical treatment of retrognathic Class II cases.

**Case Selection and Preparation**

Indications include a skeletal Class II malocclusion with a retrognathic mandible, mild-to-moderate crowding, and mandibular alveolar protrusion. When any of these conditions are too severe, however, extraction treatment is preferable.

The lower third molars should be absent or extracted to ensure sufficient space for molar distalization. The bone located immediately distal to a terminal mandibular molar is inadequate for miniscrew placement (Fig. 1), but the bone in the retromolar triangle has a D1/D2-type density, which is considered satisfactory for miniscrew insertion and primary stability. The bone status distal to the terminal molars must be assessed by direct palpation before inserting miniscrews. Although the risk of damaging the mandibular nerve is low, it is important to identify the mandibular canal on the panoramic radiograph prior to insertion of a retromolar miniscrew. Padrilling of the cortical bone is mandatory to avoid screw breakage. Miniscrew length does not have a significant impact on stability, but the bone-embedded portion should be at least 5mm long. Considering the proximity of the lower alveolar nerve, a length of 7-9mm and a diameter of 2mm are usually appropriate.

To prevent miniscrew failure due to soft-tissue swelling around the screw head, we use a double loop of .018" stainless steel wire, made by winding the wire segment twice around the barrel of a Tweed loop-forming plier (Fig. 2A). Once the transmucosal loop is placed in the mouth, a hook is added at the opposite end of the wire for attachment of an elastic. This arrangement places the head of the miniscrew in more direct contact with the bone and also allows the use of less-expensive surgical miniplate screws, since the design of the screw head becomes unimportant.

Another advantage of using a transmucosal wire segment is that the miniscrew does not have to be inserted perpendicular to the elastics; instead, the screw’s long axis can approximate the direction of the traction force (Fig. 2B, C), preventing flexion moments that may contribute to miniscrew failure.

**Procedure**

After aseptic preparation and local anesthesia, a scalpel is used to cut a 3mm-diameter buttonhole in the mucosa, where the tissue is usually 4-5mm thick. The periosteum is removed with a narrow raspatory, and the insertion site is predrilled using a thin drill on a handpiece.

Each miniscrew is inserted through the transmucosal wire loop and screwed down by hand. No suturing is required. The elastics hook at the other end of the wire, formed with a Korean plier, should approximate the terminal mandibular molar.

After the procedure, antibiotic and anti-inflammatory drugs are prescribed, along with mouthrinses. Traction is applied with elastics (or power chain) attached to the wire hook from two points—normally the first molar (1⁄8", 5oz) and the canine (3⁄16", 5oz)—exerting a total force of about 300g on the miniscrew (Fig. 3). A relatively high force can be applied because it is directed along the long axis of the miniscrew and because the bone in the retromolar triangle is highly cortical.
ized. The elastics should be changed daily by the patient.

Tooth movements must be kept within the alveolar processes, and, as always, sufficient space must be available for distalization. Horizontal computed tomography of the mandibular arch, performed parallel to the occlusal plane at the one-third level of the molar roots, can be used to determine whether the second-molar roots are in contact with the lingual alveolar plate, thus limiting distal movement (Fig. 4).

Fig. 2 A. Double-looped .018" stainless steel wire segment. B. Simulation of miniscrew insertion into retromolar area, with long axis of miniscrew oriented parallel to traction force. C. Panoramic radiograph after insertion of two retromolar miniscrews and transmucosal wires.

Fig. 3 A. Elastics attached from canine and first molar to mesial hook of transmucosal wire. B. Esthetic labial buttons used for attachment of elastics in lingual-orthodontic patient.

Fig. 4 Horizontal computed tomography of mandibular arch, parallel to occlusal plane at one-third level of molar roots, shows second-molar roots in contact with lingual alveolar plate, limiting distal movement.
Fig. 5 25-year-old female patient with Class II, division 1 malocclusion and retrognathic mandible before treatment.
The following case illustrates our technique, which we have successfully performed in more than a dozen patients.

**Case Report**

A 25-year-old female presented with a Class II, division 1 malocclusion, an associated skeletal Class II malocclusion, and a normodivergent facial pattern with lower-incisor compensation (Fig. 5, Table 1). Minor lower crowding was observed, and the third molars were absent. The patient had been treated as a teenager with orthodontic brackets and elastics, but the lower jaw remained retrognathic and the lower incisors proclined.

The use of Class III elastics was considered inadvisable because the patient’s upper incisors were not retroclined. Therefore, surgical treatment was planned, with presurgical mandibular distalization using retromolar miniscrew anchorage.

Harmony Lingual Appliance System* brackets were placed. Four months later, the traction system described above was installed, with elastics attached between the retromolar wire segments and the lower canines and first molars (Fig. 6A). The first-molar buttons were subsequently moved to the second premolars (Fig. 6B). Significant mandibular distalization was seen after 11 months of traction (Fig. 7). Surgery was performed, and treatment was completed after another three months of orthodontic finishing (Fig. 8).

**Discussion**

The success of surgical mandibular advancement depends a great deal upon proper orthodontic preparation. More complete uprighting and retroclination of the lower incisors allows greater mandibular advancement—and thus a better correction of retrognathia—reducing the need for genioplasty as well as the likelihood of a poor esthetic result and future relapse.

Backward movement of the mandibular arch using miniscrew anchorage allows stable repositioning of the mandibular incisors, even if most of the distal movement is achieved through tipping rather than bodily distalization. Such movement cannot relapse, because the anterior overjet is corrected surgically.

Although retromolar-anchored distalizing forces can be exerted only on the buccal side of the arch, lingual orthodontic appliances can be successfully used as long as the appliance system maintains control of the archform.

We attribute our retromolar-miniscrew re-

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**Table 1**

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tention rate (100% in more than 10 cases) to our miniscrew orientation, with the traction force applied parallel to the screw’s long axis. This method of mandibular distalization has proved comfortable for our patients, causing minimal soft-tissue irritation, and the patients are happy to avoid extractions and interproximal stripping. Results to date have been both esthetic and stable.

Fig. 6 A. After four months of leveling and alignment with lingual appliances, miniscrews inserted in retromolar triangles and elastics attached between bonded buccal buttons and transmucosal wires. B. First-molar buttons moved to lower second premolars.

Fig. 7 Patient ready for surgery after 11 months of mandibular distalization.
Fig. 8 A. Patient after 18 months of surgical-orthodontic treatment. B. Regional superimposition of pretreatment (black) and presurgery (blue) cephalometric tracings, showing effects of leveling and mandibular distalization. C. Superimposition of pretreatment (black), presurgery (blue), and post-treatment (red) cephalometric tracings.
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