Intrusion of Overerupted Maxillary Molars with Miniscrew Anchorage

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The intrusion of overerupted maxillary molars in adult patients is a difficult challenge for orthodontists. Use of conventional fixed or removable appliances may result in unwanted side effects, and their success depends on patient compliance, the adequacy of the anchor units, and the periodontal health of the supporting structures.[1-5] Alveolar corticotomy is another alternative, but it involves patient discomfort and the risks of surgery.[6,7]

Various methods of using skeletal anchorage for the correction of overerupted maxillary molars have recently been proposed,[8] including buccal miniplates[9] or miniscrews[10] with transpalatal bars; buccal and palatal miniscrews with extension wires[11]; and a combination of buccal miniplates and

Fig. 1 Case 1. 26-year-old female patient with maxillary left second molar overerupting into space of missing mandibular left second molar.

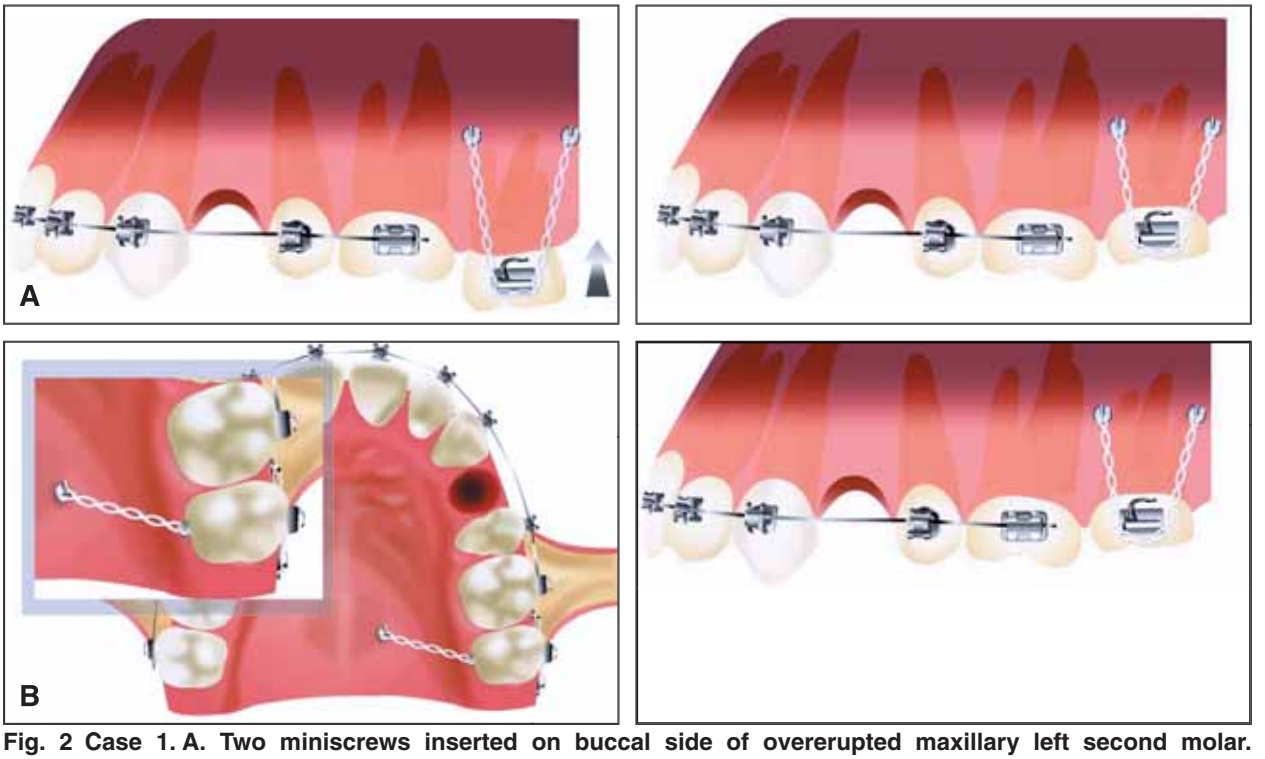

Fig. 2 Case 1. A. Two miniscrews inserted on buccal side of overerupted maxillary left second molar. B. Palatal anchorage from miniscrew in paramedian area.

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palatal miniscrews.[12-14] The last technique is relatively convenient and effective, but requires a more complex and invasive surgical procedure for insertion of the miniplates.

This article describes a simpler method of intruding overerupted maxillary molars, using the Lin/Liou Orthodontic Mini Anchor System (LOMAS*) for direct skeletal anchorage.

Case 1

A 26-year-old female presented with a maxillary left second molar that had overerupted into the space of the missing mandibular left second molar (Figs. 1,4A). The upper second molar had erupted beyond the adjacent first molar by about 5mm at the buccal cusp, 5mm at the palatal cusp, and 3mm at the marginal ridge. The periodontal condition of the overerupted molar was normal.

Our treatment goal was to intrude the maxillary left second molar with miniscrew anchorage, thus providing adequate space for prosthetic replacement of the mandibular second molar.

Two LOMAS miniscrews (1.5mm in diameter, 9mm long) were inserted into the maxillary left buccal alveolar bone, one in the tuberosity and the other between the roots of the first and second molars (Fig. 2A). Palatal anchorage was supplied by another LOMAS miniscrew (2mm in diameter, 7mm long) in the left paramedian area of the palate (Fig. 2B). A permanent implant (11mm long) was placed in the mandibular left second molar area so that complete osseointegration would be achieved before the implant was needed as anchorage for correction of the mandibular arch (Fig. 4B).

Immediately after screw placement, about

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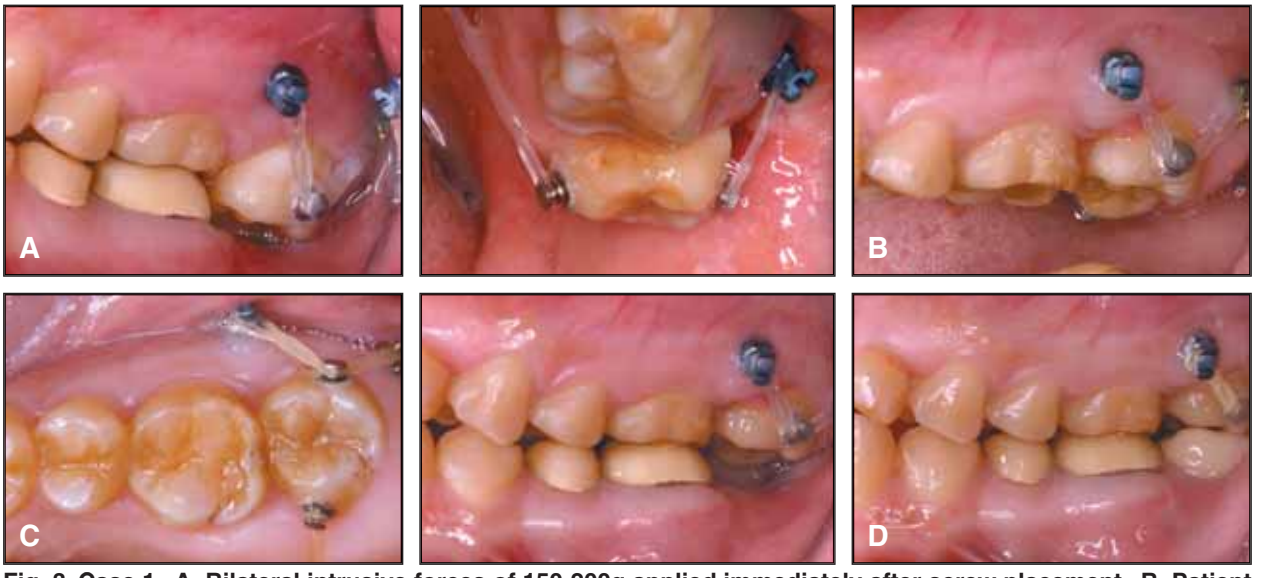

Fig. 3 Case 1. A. Bilateral intrusive forces of 150-200g applied immediately after screw placement. B. Patient after three months of intrusion. C. Patient after five months of intrusion D. Mandibular prosthesis in place.

Fig. 4 Case 1. A. Before intrusion of maxillary left second molar. B. Immediately after placement of three maxillary miniscrews and permanent mandibular implant. C. Temporary mandibular molar crown placed after five months of maxillary molar intrusion.

150-200g of bilateral intrusive forces were delivered with power chain from the miniscrew heads on both sides to bonded buttons on the overerupted second molar (Fig. 3A). The power chain was replaced monthly (Fig. 3B).

After five months of intrusion, the maxillary left second molar was in the desired position (Fig. 3C). A temporary crown was fabricated for the mandibular second molar to help maintain the correction (Figs. 3D,4C). No sign of root resorption was observed.

Fig. 5 Case 2. 28-year-old female patient with overerupted maxillary right first and second molars.

Case 2

A 28-year-old female presented with overerupted maxillary right first and second molars due to the early loss of the mandibular antagonists (Figs. 5,9A). The upper right first molar had erupted beyond the adjacent second premolar by about 5mm at the buccal cusp, 5mm at the palatal cusp, and 3mm at the marginal ridge. The second molar had erupted past the first molar by about 2mm at the buccal cusp, 2mm at the lingual cusp, and 1mm at the marginal ridge, and was nearly in contact with the edentulous mandibular soft tissue. Both overerupted molars were in good periodontal condition.

To create enough space for prosthetic replacement of the mandibular molars, the treatment plan involved extraction of the maxillary right third

Fig. 6 Case 2. A. Miniscrew inserted into right infrazygomatic crest. B. Miniscrew in paramedian area of palate. C. Bilateral intrusive forces delivered to overerupted molars after two weeks of surgical healing.

molar, followed by intrusion of the overerupted maxillary right first and second molars using miniscrew anchorage.

Two months after the third molar extraction, LOMAS miniscrews were placed in the right infrazygomatic crest and the right paramedian area of the palate (Fig. 6). A permanent mandibular implant was also inserted to allow osseointegration (Fig. 9A). After two weeks of healing, bilateral intrusive forces were applied from the miniscrews to bonded attachments on the overerupted molars.

Five months later, the maxillary right first molar had been intruded to the marginal ridge level of the adjacent second premolar, but the second molar was still not in its planned position (Fig. 7A). Because the buccal miniscrew head was completely embedded in the soft tissue, new LOMAS miniscrews were inserted into the tuberosity and between the roots of the second premolar and first molar (Figs. 7A,8,9B). Bilateral intrusive

Fig. 7 Case 2. A. Incomplete intrusion of maxillary right second molar after five months of treatment. With infrazygomatic miniscrew embedded in soft tissue (circle), new miniscrews were placed in tuberosity and between roots of maxillary second premolar and first molar to continue intrusion. B. Maxillary right second molar in desired position after another three months of treatment.

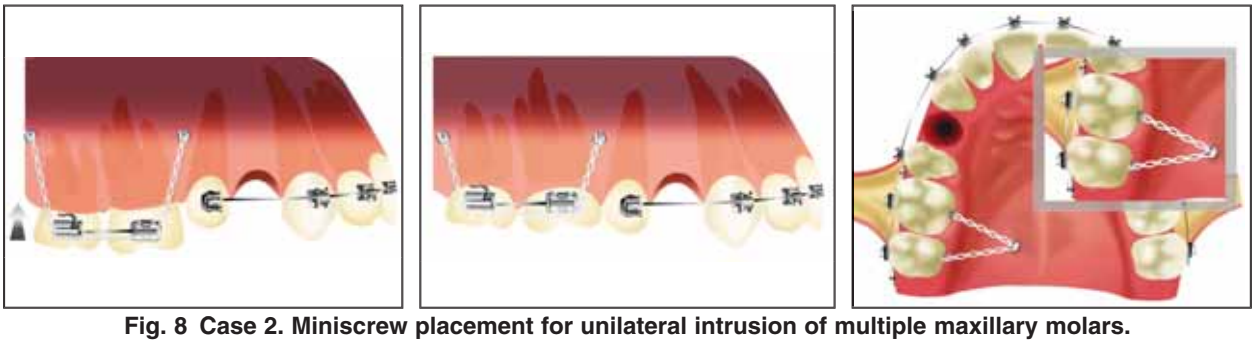

Fig. 8 Case 2. Miniscrew placement for unilateral intrusion of multiple maxillary molars.

Fig. 9 Case 2. A. Permanent mandibular implant placed before maxillary molar intrusion to allow osseointegration. B. Two miniscrews added after five months of treatment due to incomplete intrusion of maxillary right second molar. C. Patient after eight months of intrusion.

forces were applied immediately after screw placement.

Another three months later, the maxillary right second molar was finally in the desired position, and adequate space for the mandibular prosthesis had been obtained (Figs. 7B,9C). A temporary crown was fabricated for the mandibular implant to prevent any relapse of the maxillary molar intrusion. During the eight months of intrusion, we observed no excessive crown tipping or significant root resorption. The periodontal status of the maxillary molars remained healthy.

Discussion

These cases demonstrate that significant amounts of maxillary molar intrusion can be achieved within a few months using direct anchorage from only a few miniscrews. The technique can also be used for bilateral intrusion of maxillary molars in an open-bite patient who needs extra vertical control or a patient with a retrusive chin requiring upward rotation of the mandible (Fig. 10).

Selection of the miniscrew insertion site should be based on the biomechanics to be used, the bone density and quantity, and the restrictions of adjacent anatomic structures. We used bilateral intrusive forces to avoid buccal or palatal tipping of the molars. The paramedian area of the palate has been previously recommended for miniscrew insertion in adult patients due to its thin keratinized soft tissue, compact bone, and distance from the palatine artery.[11-13] The maxillary tuberosity and interdental areas are convenient and easily accessible buccal insertion sites. Although the tuberosity is primarily composed of porous cortical and fine trabecular bone, it can be successfully used for miniscrew placement as long as the "Bone Density Guided Insertion Technique" is followed.[15] When a screw is inserted in the buccal interdental area, a distance of at least 2mm should be maintained between the miniscrew and the adjacent root to avoid root damage.[16]

A relapse rate of about 21% in cases involving intrusion of maxillary molars with skeletal anchorage has been reported by Daimaruya.[17] Therefore, the clinician must consider whether overcorrection is required when using the method described above.

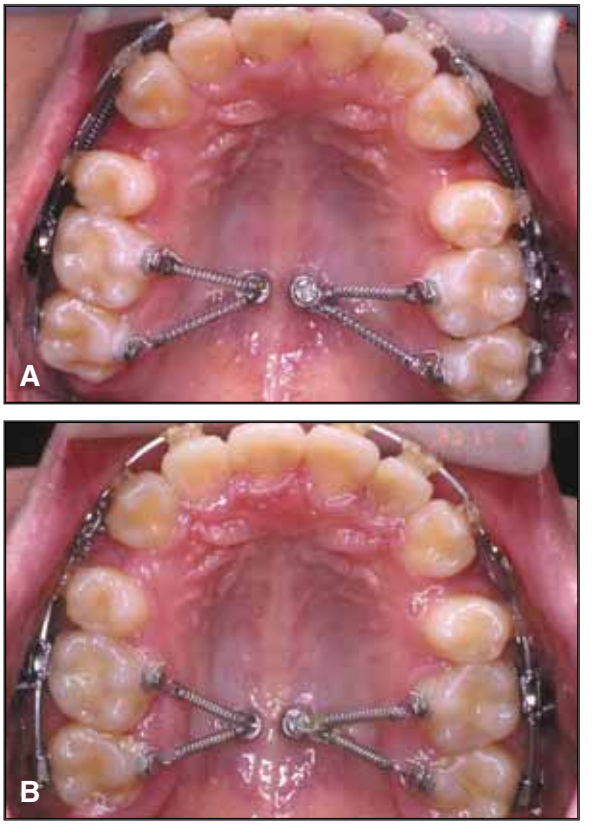

Fig. 10 Bilateral maxillary molar intrusion using miniscrews for direct anchorage. A. Patient before intrusion. B. After intrusion, showing impacted distal marginal ridges of both maxillary second molars.

Conclusion

Advantages of this skeletal anchorage technique for intruding overerupted maxillary molars include:

- Relatively simple and non-invasive surgical procedure.
- Direct skeletal anchorage, with no need for extra laboratory work or chairtime to fabricate or adjust a transpalatal bar.
- Easy screw removal without additional surgery.
- Applicability in either uni- or bilateral intrusion of single or multiple maxillary molars.

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