Microscrew Anchorage for Molar Intrusion

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Molar extrusion is a common problem in adults, caused by the loss or infraocclusion of the opposing teeth. The simplest way to correct an extruded molar is to reduce its crown, but this may require endodontic treatment, periodontal surgery, and a fixed prosthesis.[1,2]

Although orthodontic intrusion is a more conservative approach, it is difficult to accomplish without unwanted side effects. When an intrusive force is placed on a molar, the reactive force of extrusion, which occurs predominantly on the premolars, can virtually cancel out the molar intrusion. Several authors have proposed removable[3] or fixed appliances[4-6] to overcome this problem, but the devices are so complex that they require multiple teeth to be used for anchorage, increasing patient discomfort and producing unpredictable results.

Skeletal anchorage has been suggested as an ideal force system for molar intrusion without side effects.[7-10] Among the various types of implants, orthodontic microscrews are widely used because of their ease of placement and relatively comfortable surgical procedure.[11,12] This article reports two cases of molar intrusion using skeletal anchorage from microscrews.

Case 1

A 30-year-old female presented to the prosthodontic department with the chief complaints of difficulty chewing and sensitivity to cold in the mandibular left molar area. The missing mandibular left second molar had been replaced by a cantilever bridge from the mandibular left first molar, but had overerupted due to the infraocclusion of the opposing pontic (Fig. 1A). Ill-fitting crown margins were observed on the mandibular left second premolar and first molar.

The poor prosthetic restoration was removed, and an implant fixture, 11.5mm in length, was placed in the mandibular left second molar area. After the osseointegration period, the maxillary left second molar displayed even more extrusion because of the lack of occlusal contact (Fig. 1B). The molar had overerupted beyond the marginal ridge of the adjacent first molar by about 5mm on the palatal cusp and 1.5mm on the buccal cusp (Fig. 1C).

Microscrew-aided orthodontic intrusion of the maxillary second molar was planned to regain enough vertical space for the implant-supported fixed prosthesis. The axes of the roots were evaluated on the periapical and panoramic x-rays to determine the ideal sites for screw

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placement. Two microscrews* were implanted on the buccal side, one between the maxillary left canine and first premolar and the other between the first and second premolars. For palatal anchorage, two more microscrews were placed in the midpalatal suture area.

Connecting bars of .032" × .032" TMA** wire were bonded to the mesial screws on both

*Part No. 1D16109, 1.6mm × 8mm OSAS self-drilling screw, EPOCH Medical, Seoul, Korea. www.osas.co.kr.

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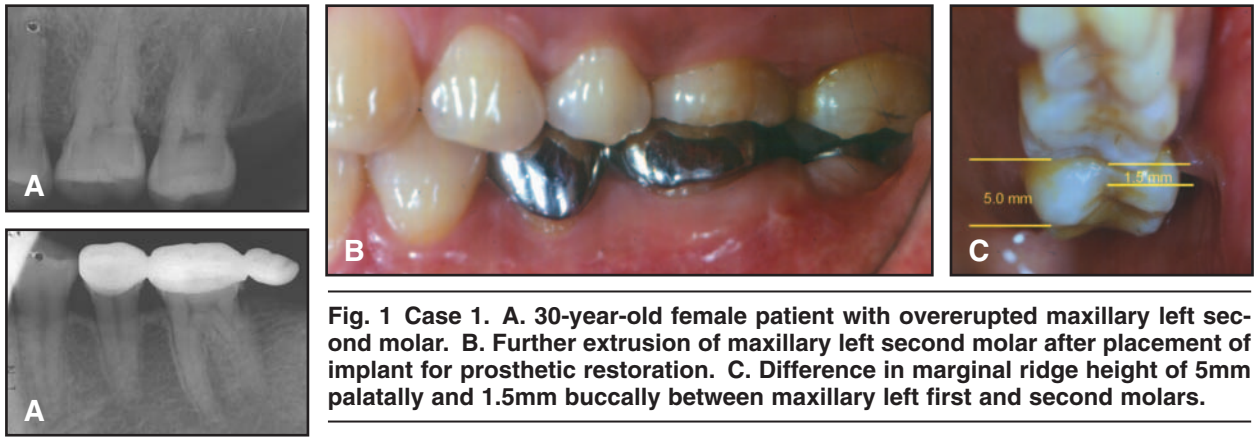

Fig. 1 Case 1. A. 30-year-old female patient with overerupted maxillary left second molar. B. Further extrusion of maxillary left second molar after placement of implant for prosthetic restoration. C. Difference in marginal ridge height of 5mm palatally and 1.5mm buccally between maxillary left first and second molars.

Fig. 2 Case 1. Placement of two buccal and two palatal microscrews for attachment of connecting bars; intrusive force applied with power chain on both sides of maxillary second molar.

Fig. 3 Case 1. A. After loosening of one palatal microscrew, buccal connecting bar attached to button on second premolar. B. Buccal elastic force applied to second molar. C. Lingual .016" × .022" nickel titanium sectional archwire engaged in brackets on maxillary left second premolar and first and second molars.

the buccal and palatal sides, wrapped around the distal screws for stability, and extended to the apical areas on both sides of the extruded maxillary second molar (Fig. 2). Crimpable hooks were welded to the posterior ends of the connecting bars for engagement of power chain from bonded buttons on the second molar. Thus, an intrusive force was delivered simultaneously on the buccal and palatal sides.

After six weeks, one of the midpalatal screws became loose. The buccal connecting bar was then attached to the maxillary left second premolar with a rigid wire (Fig. 3). The maxillary left second premolar and first and second molars were bonded with .018" lingual brackets; an .016" × .022" nickel titanium sectional archwire was inserted, and a $^{3}/_{16}$", $3^{1}/_{2}$oz elastic was used for molar intrusion on the buccal side.

After seven more weeks of treatment, an .016" × .022" TMA sectional archwire was engaged for finishing. The desired molar intrusion was achieved in another six weeks, and a fixed prosthesis was placed (Fig. 4). Total treatment time was five months.

Case 2

A 12-year-old male was referred by a prosthodontist because of insufficient vertical space for restorative treatment of the mandibular left first molar, which had a higher gingival margin and alveolar bone level than the adjacent

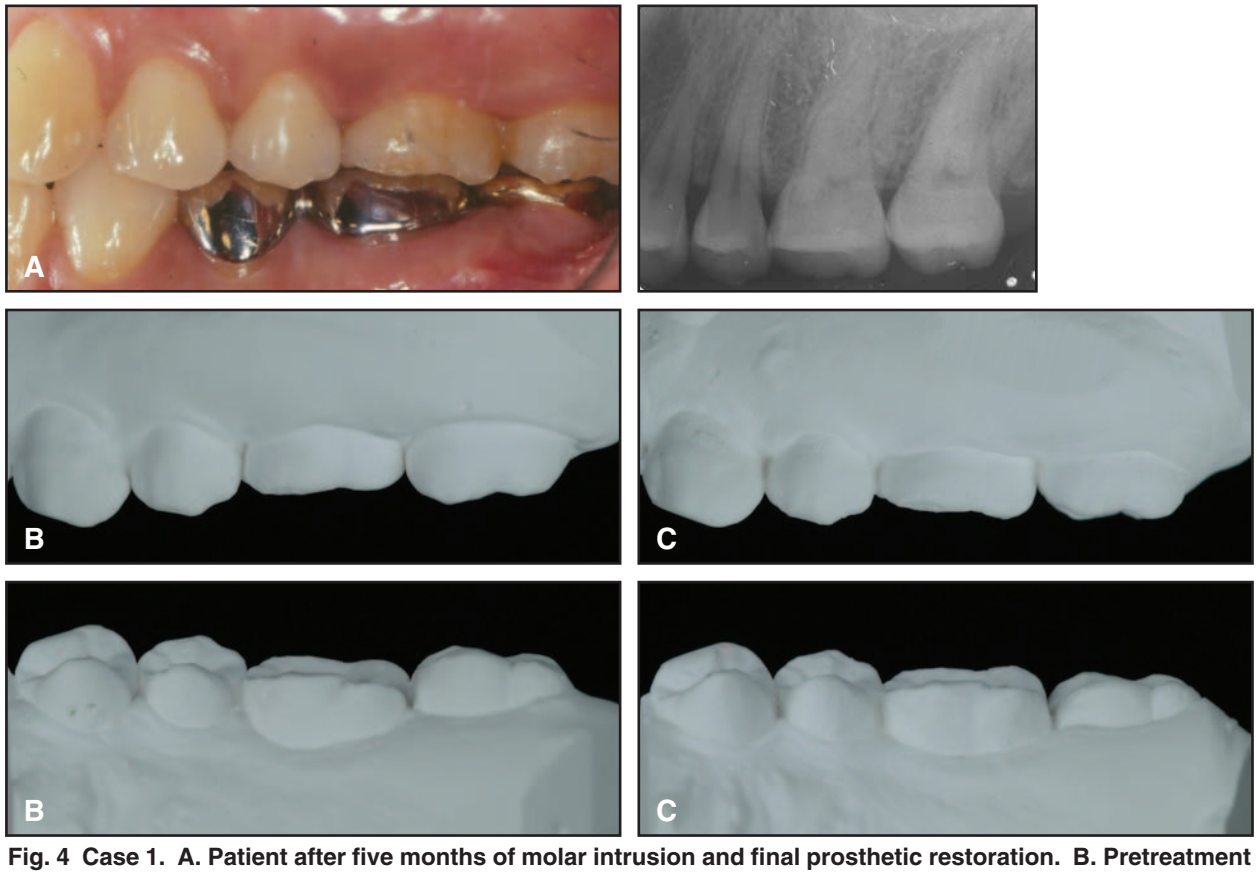

Fig. 4 Case 1. A. Patient after five months of molar intrusion and final prosthetic restoration. B. Pretreatment casts. C. Post-treatment casts.

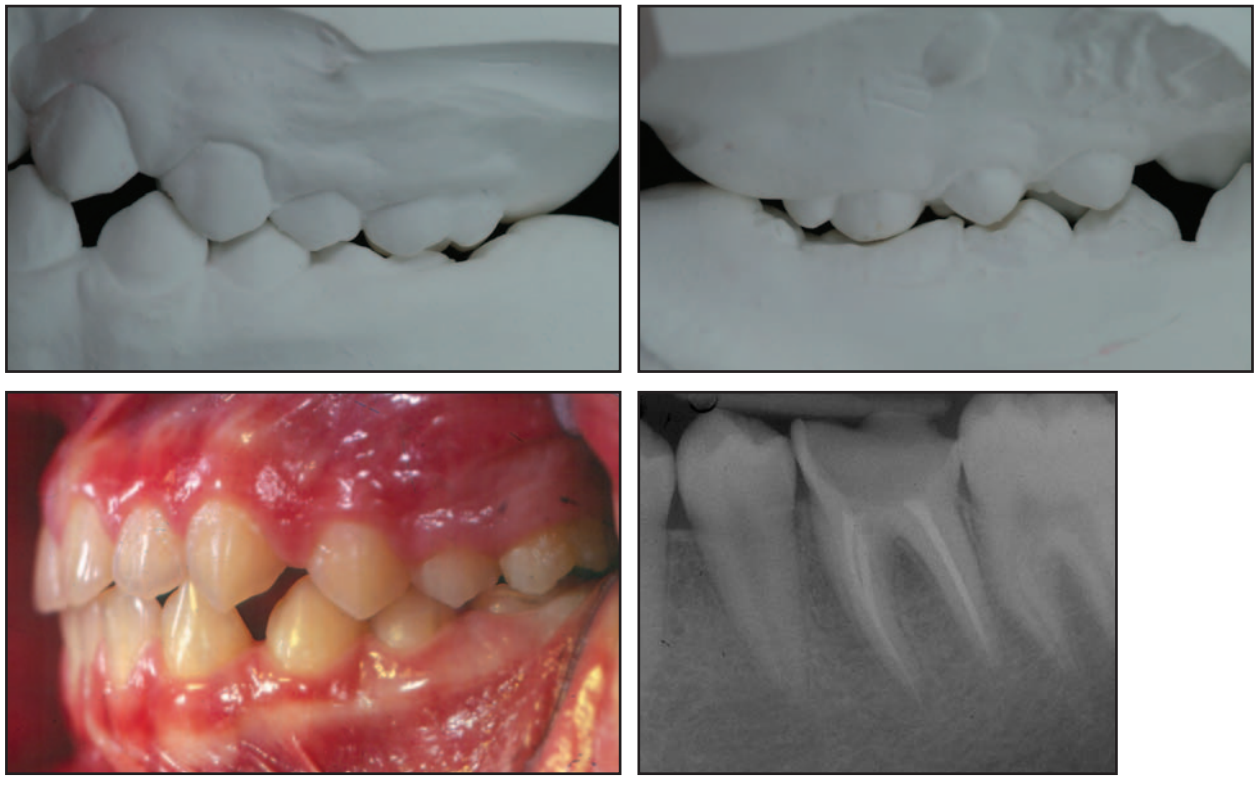

Fig. 5 Case 2. 12-year-old male patient with extruded mandibular left first molar before treatment.

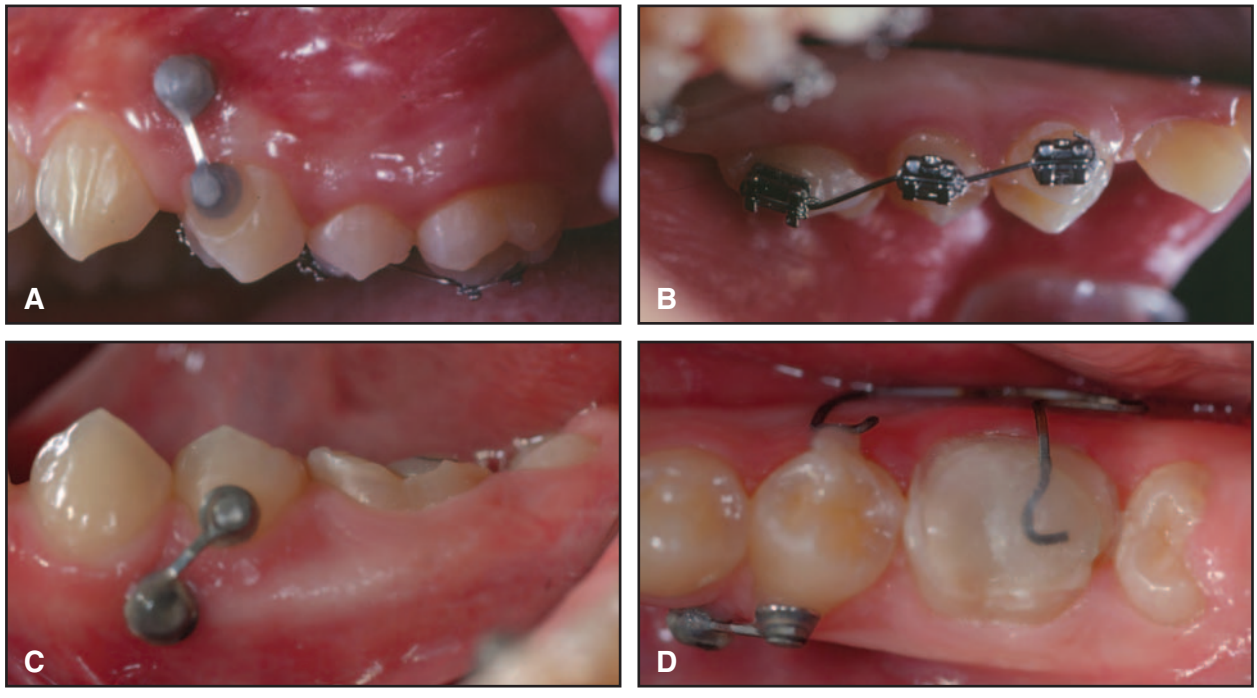

Fig. 6 Case 2. A. Maxillary microscrew connected to button on first premolar with bonded wire. B. Lingual .016" nickel titanium sectional archwire engaged in brackets on maxillary first and second premolars and first molar. C. Mandibular microscrew connected to button on second premolar with bonded wire. D. Molar intrusion spring bonded to occlusal surfaces of mandibular second premolar and first molar.

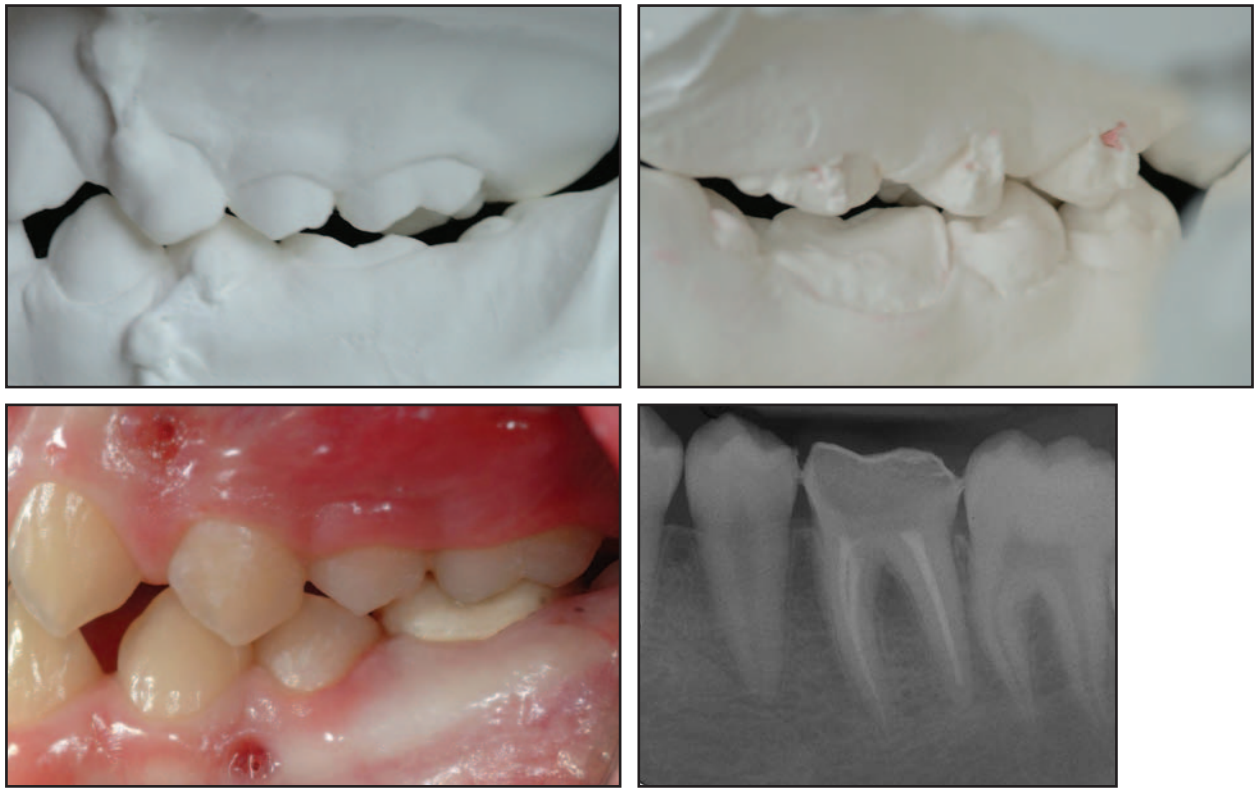

Fig. 7 Case 2. Patient after five months of intrusion, with temporary crown on mandibular left first molar.

teeth (Fig. 5). Because of the biologic width of the molar, orthodontic intrusion had to be limited to 1mm. The rest of the required vertical space could be obtained from simultaneous intrusion of the opposing maxillary left second premolar and first molar.

A microscrew* was implanted between the maxillary left canine and first premolar. A button was bonded to the first premolar, and a rigid .018" × .025" stainless steel wire was bonded to connect the screw and the button (Fig. 6A). Lingual .018" brackets were placed on the maxillary first and second premolars and first molar, and an .016" nickel titanium sectional archwire was engaged (Fig. 6B).

Another microscrew* was placed between the mandibular left first and second premolars and connected to a button on the second premolar with a rigid wire, as in the maxillary arch (Fig. 6C). Because there was not enough space to bond a bracket to the mandibular left first molar crown, an .017" × .025" TMA molar intrusion spring was bonded to the occlusal surfaces of the second premolar and first molar (Fig. 6D).

After five months of intrusion, adequate vertical space was obtained, and a temporary crown could be fabricated for the mandibular left first molar (Fig. 7).

*Part No. 1D16109, 1.6mm × 8mm OSAS self-drilling screw, EPOCH Medical, Seoul, Korea. www.osas.co.kr.

Discussion

The most critical factor in molar intrusion is the point of force application. To pass through the center of resistance and thus avoid unwanted rotation or transverse displacement, the force should be simultaneously applied on both the

buccal and palatal sides.[5] In Case 1, four microscrews were used for this purpose. The premolar area was selected on the buccal side because it is easily accessible. Moreover, if the screws had been placed mesiodistal to the molar, they could have interfered with its intrusion. On the palatal side, the midpalatal suture area was chosen because of its thin, soft tissue and compact, dense bone.[12]

The loosening of one midpalatal screw—a common complication with microscrew anchorage—changed the design of the intrusion appliance. Lingual brackets were added for more precise control of the palatal intrusive force, and an auxiliary wire from the buccal connecting bar to the maxillary second premolar was added to create a tooth-bone anchorage for pure intrusion of the molar.

In Case 2, the mandibular first molar had to be intruded simultaneously with the maxillary second premolar and first molar to avoid extended treatment time. Based on our experience in Case 1, a new method was designed, involving only a single microscrew on the buccal side of each arch, placed relatively far forward for ease of access. If a screw had loosened, an alternative site could have been selected. A secure bond of the connecting wire between the microscrew and the anchor tooth is essential, which makes microetching of the bond sites a necessity.

The mechanics shown here rely on absolute anchorage. The microscrew allows simultaneous intrusion of multiple molars to be easily and effectively achieved, facilitating eventual prosthetic reconstruction after a short period of orthodontic treatment.

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