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Long-term stability of maxillary molar intrusion using temporary anchorage devices: A 17-year case report

KEYWORDS
Prosthetic implants;
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Interdisciplinary therapy are commonly used to treat a patient with missing posterior teeth and opposing extruded teeth.[1] The goal is to intrude the extruded molars to increase the interocclusal space and facilitate the restoration of the implant with a more consistent occlusal plane. Intrusion in adult patients is one of the most mechanically challenging types of tooth movement. Various skeletal anchorage techniques have been proposed for correcting overerupted maxillary molars, including mini-screws, miniplates, palatal implants, and prosthetic implants.[2] Mini-screws, as temporary skeletal anchorage devices (TADs), are relatively simple, convenient, and effective for maxillary molar intrusion (MMI). Nevertheless, reported complications of MMI using TADs include relapse and root resorption. In addition, the long-term studies on the stability of MMI using TADs are scarce.[1,2] This 17-year long-term case report aimed to evaluate the clinical and radiographic outcomes of intruded maxillary molars corrected by TADs.

A 47-year-old female patient presented with missing posterior teeth (35, 36, 37) and opposing extruded molars, rendering inadequate interocclusal space for implant restoration. To create enough space for implant replacement of the mandibular molars, the treatment plan involved extraction of the maxillary left third molar, followed by intrusion of the overerupted maxillary left first and second molars using mini-screw anchorage (Fig. 1A). The miniscrews (2 mm in diameter, 10 mm long, A1 Anchor Screw System, BioRay Biotech, Taichung, Taiwan) were inserted into the left maxillary buccal alveolar bone: one in the tuberosity and the other above the roots of the first molar. Palatal anchorage was supplied by two miniscrews in the left paramedian area of the palate. Immediately after screw placement, about 150–200 g of intrusive forces were delivered with power chain from the miniscrew heads on both sides to bonded buttons on the overerupted molars. The power chain was replaced monthly. After nine months of intrusion, the maxillary molars were in the acceptable position and a temporary bridge (implants 35 and 36) was delivered to provide function (Fig. 1B). Clinical and radiographic evaluations at the 14-year follow-up revealed a healthy periodontal and peri-implant tissues with minimal tissue recession and marginal bone loss (Fig. 1C). After a 17-year follow-up, root resorption of 0.58 mm was observed at the tooth 26, and 0.28 mm at the tooth 27. A 2.1 mm M intrusion was achieved at the tooth 26, and 3.2 mm at the tooth 27. Root resorption of 0.58 mm was observed at the tooth 26, while 0.28 mm was noted at the tooth 27 (Fig. 1D).

This 17-year long-term case report is probably the first to confirm that the MMI with TADs is a safe, effective, and stable treatment modality. Minimal marginal bone loss and soft

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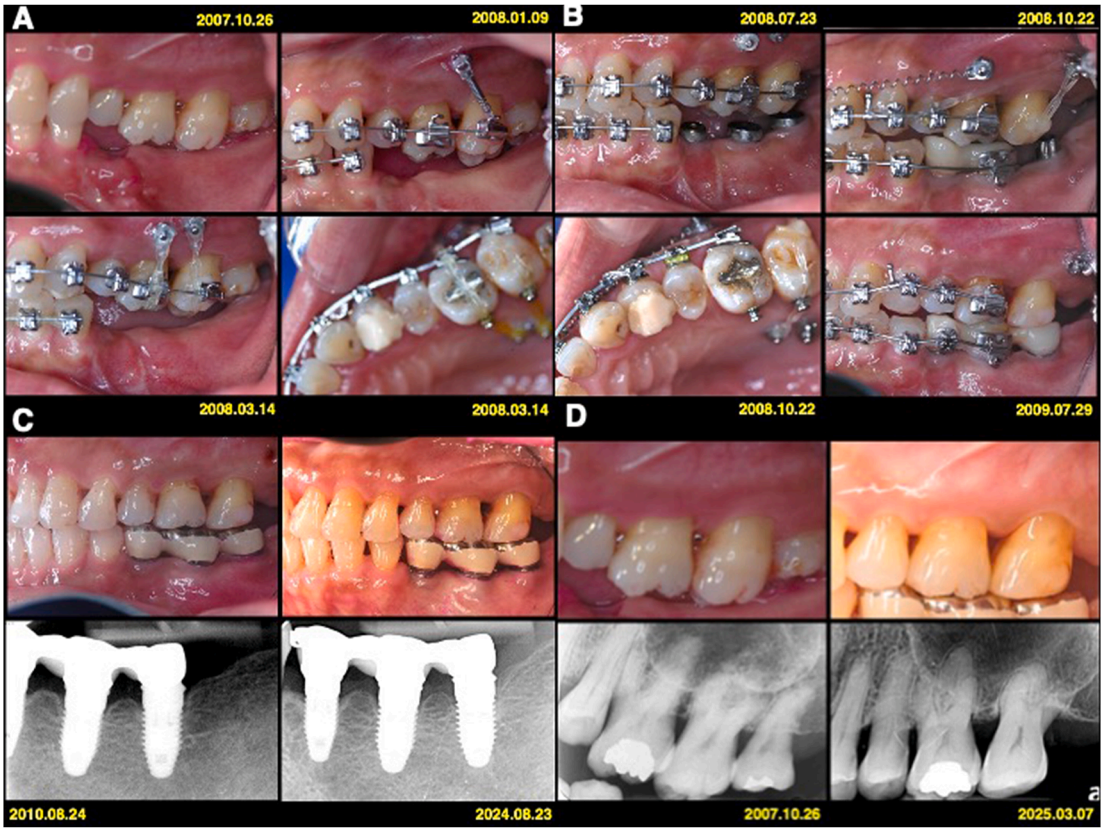

Figure 1 Clinical photographs and radiographs of the patient. (A) A 47-year-old female patient presented with missing posterior teeth 35, 36, and 37 and opposing extruded molars, rendering inadequate interocclusal space for implant restoration. To create enough space for the implant replacement of the mandibular molars, the treatment plan involved extraction of the left maxillary third molar, followed by the intrusion of the overerupted left maxillary first and second molars using mini-screw anchorage. The miniscrews (2 mm in diameter, 10 mm long, A1 Anchor Screw System, BioRay Biotech, Taichung, Taiwan) were inserted into the left maxillary buccal alveolar bone: one in the tuberosity and the other above the roots of the first molar. The palatal anchorage was supplied by two miniscrews in the left paramedian area of the palate. Immediately after screw placement, about 150—200 g of intrusive forces were delivered with power chain from the miniscrew
heads on both sides to bonded buttons on the overerupted molars. The power chain was replaced monthly. (B) After nine months of intrusion, the maxillary molars were in the acceptable position and a temporary bridge (implants 35 and 36) was delivered to provide function. (C) Clinical and radiographic evaluations at the 14-year follow-up revealed a healthy periodontal and peri-implant tissues with minimal tissue recession and marginal bone loss. (D) After 17-year follow-up, a 2.1 mm M intrusion was achieved at the tooth 26, and 3.2 mm at the tooth 27. The root resorption of 0.58 mm was observed at the tooth 26, while 0.28 mm was noted at the tooth 27.

tissue recession were observed. Antonarakis et al. reported that in dentitions with reduced periodontal support, orthodontic intrusion does not cause periodontal damage, provided the periodontal tissues remain free of inflammation and plaque control is maintained through the excellent oral hygiene.[3] Intruded molars 26 and 27 showed a reduction in the root length of 8.5 % (0.58 mm) and 5.9 % (0.28 mm), respectively. The amount of root resorption observed in this report is consistent with the findings of Antonarakis et al., who reported that an average root resorption of 0.41 mm can be expected during the molar intrusion.[3]

The MMI, regardless of the proposed treatment mechanism, remains challenging and unpredictable. In this report, both buccal and palatal miniscrews, along with intrusive forces, were used to prevent molar tipping. The success of the MMI is influenced by multiple factors, including oral hygiene, patient compliance, age, bone density, the number of teeth intruded, the severity of overeruption, the type of appliance used, and the site of force application when using the TADs.[1]

A relapse rate of approximately 21 % has been reported in cases involving the MMI with skeletal anchorage.[2] No relapse was observed in this report after the 14-year follow-up which may be attribute to the stable opposing fixed implant restoration. In addition, no adverse responses were observed with the intrusion of molar roots into the maxillary sinus.[4] In an animal study in dogs, Daimaruya et al. found that the alveolar bone around the root apices was remodeled, the nasal floor membrane was lifted intranasally, and a thin layer of newly formed bone covered the intruded roots following the MMI using the skeletal anchorage system.[5] In summary, this case report demonstrated that with careful treatment planning and maintenance, the TADs for MMI maybe a simple, non-invasive,

effective, and long-term stable treatment modality. However, further high-quality randomized controlled trials are needed to validate these findings.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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