

Upper molar intrusion in rehabilitation patients with the aid of microscrews

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Background: Overeruption of an upper molar following loss of the opposing tooth is a common clinical finding. Rehabilitation can be difficult when the interocclusal space is reduced.

Aim: To intrude an overerupted upper first molar and replace the missing lower first molar.

Methods: Buccal and palatal microscrews and a transpalatal bar were placed. The palatal miniscrew loosened shortly after implantation and was not replaced. A short length of elastomeric chain from the buccal miniscrew applied 30 g of force to the overerupted molar. The elastomeric chain was replaced every four weeks.

Results: Sufficient intrusion of the upper molar was obtained in 4 months.

Conclusion: A single buccal microscrew and transpalatal arch can be used to intrude an overerupted upper molar.
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Introduction

Overeruption of an upper molar following loss of the opposing tooth reduces the interocclusal space and makes rehabilitation difficult. Restoration of the edentulous space in such cases usually requires an interdisciplinary approach, which may involve endodontic treatment and reduction of the overerupted tooth, surgical impaction of the overerupted tooth or orthodontic treatment.¹ Molar intrusion is the least invasive option, but it is one of the most difficult clinical procedures in orthodontics because it requires complex mechanics. Furthermore, if insufficient intrusion is obtained, rehabilitation may be very difficult if not impossible. Molars are difficult to intrude because the intrusive force is opposed by an equal and opposite extrusive force acting on the supporting teeth.^{2–4} The mechanisms proposed to resist these unwanted reactive tooth movements are often complicated and demand good patient compliance.

The possibility of using absolute anchorage has revolutionised our approach to many problems in orthodontics, including intrusion of an overerupted molar. Absolute anchorage was developed from the osseointegration studies carried out by Bränemark and colleagues,⁵ although Gainsforth and Higley unsuccessfully used screws for basal bone anchorage as early as 1945.³ Osseointegrated implants were first used as intraosseous anchors for orthodontic movement in the 1980s.^{6–9} However, they could only be placed in edentulous areas or the retromolar region,⁹ they were bulky and uncomfortable during the surgical phase and a force could not be applied until osseointegration had occurred, which usually required several months.^{10,11} Other methods of stationary anchorage, such as zygomatic ligatures¹² and miniplates¹³ also served as skeletal anchorage to move teeth. More recently, temporary anchorage devices such as palatal implants^{2,4,15} and microscrews^{10,11,14,16,17} have been introduced to the profession.



Figure 1. Pretreatment periapical radiograph.



Figure 2a. Buccal microscREW positioned between the upper premolars.



Figure 2b. Palatal microscREW between first and second upper molar.



Figure 3. Transpalatal bar used to avoid unwanted tipping.



Figure 4. A 0.021 x 0.025 inch rectangular stainless steel wire hook for the elastomeric chain.



Figure 5. Implant and crown restoring the right molar occlusion.

The aim of this article is to describe the use of a microscREW and transpalatal arch to intrude an overerupted upper molar in a prosthodontic patient.

Case description

A 50 year-old woman sought an implant to restore an edentulous space in the lower right molar region. The lower first molar had been extracted some years previously, and the opposing upper first molar had overerupted leading to inadequate interocclusal space for a mandibular implant. The patient would not accept full orthodontic treatment.

To avoid tipping the upper first molar during intrusion, direct forces from buccal and palatal microscREWS were proposed. The buccal microscREW was placed between the upper first and second premolar roots because a periapical radiograph disclosed that there was insufficient space between the roots of the upper first molar and the upper second premolar for a microscREW (Figure 1). The palatal microscREW was inserted between the roots of the first and the second molars.

Following local anaesthesia the microscREWS were inserted with a regular surgical motor (Intrasurg 350, Kavo, Germany) with a maximum torque of 10 N cm, as advocated by the manufacturer. The microscREWS used (Neodent, Curitiba, Brazil) are self-tapping so it was not necessary to elevate flaps. The surgeon chose the diameter and length of the microscREWS according to the bone conditions and the space between the roots of the teeth. Both microscREWS were 11 mm in length with a 1.3 mm diameter. Following placement, the heads of the microscREWS projected beyond the mucosa, and were available for direct force application (Figure 2).

After surgery, periapical radiographs were taken of the implanted area, and the patient was instructed on care of the implant site to prevent inflammation of the soft tissues that could lead to failure of the microscREWS. One week later, it was observed that the palatal microscREW was loose. It was decided to remove this microscREW and intrude the first molar with a force from the single buccal microscREW. The upper molars were banded and a transpalatal arch



Figure 6. Periapical radiograph at the completion of treatment. There was no evidence of root resorption on the intruded molar.

placed to prevent undesirable molar tipping (Figure 3).

A 0.21×0.25 inch rectangular stainless steel wire with a terminal hook was adapted to the buccal tube and extended forwards to the level of the micro-screws. A short length of elastomeric chain was stretched between the hook and the micro-screw (Figure 4). The length of the chain was adjusted to deliver 30 g of force measured with a dynamometer. Every 4 weeks the elastomeric chain was replaced and the force checked. After 4 months the upper molar was intruded sufficiently for an implant to be placed in the lower arch (Figure 5). There was no evidence of root resorption (Figure 6). The buccal micro-screw was easily removed with the manual driver: there was no need for local anaesthesia. The periodontal tissues remained healthy and tooth vitality was maintained throughout treatment.

Discussion

Intrusion of an overerupted molar can be a difficult procedure, even when the patient agrees to full orthodontic treatment. Non-orthodontic methods, which may involve crown reduction, endodontic treatment and periodontal surgery, are not always acceptable to the patient. Although microscrews require a minor surgical operation they have changed what was formerly a difficult problem to one that is more easily managed, and relies less on patient compliance. The case presented demonstrates how a light force from a single micro-screw, and a transpalatal arch to prevent unwanted molar tipping, can be used to intrude an upper molar.

The microscrews are small temporary anchorage devices that may be inserted into the alveolar bone

between roots of the teeth.^{3,9} They are relatively straight-forward to use and, compared with implants replacing missing teeth, can be loaded immediately.¹¹ There have been many reports of successful problems treated with the aid of these devices, and experimental studies of the histological changes around microscrews.^{9,13,18–20} We planned to use forces from buccal and palatal microscrews to prevent the overerupted molar from tipping either bucco-palatally or mesio-distally as it was intruded. Unfortunately, the palatal screw loosened and was removed after one week, possibly because of jiggling due to tongue pressure. It was not replaced because the patient considered it uncomfortable to the tongue. The transpalatal arch prevented the upper molar from tipping as it was intruded.

Another important aspect to consider is the force used for intrusion. According to Kyung et al.,¹⁴ small microscrews can support forces of up to 450 g; well in excess of the forces usually used in orthodontic treatment. We used 30 g of force delivered from a short length of elastomeric chain, and we carefully measured the force to ensure that it did not exceed the desired force level. The light force used was sufficient to intrude the molar to the desired level in four months without evidence of root resorption. It has been claimed that heavy intrusive forces can result in severe root resorption.²¹ Finally, the diameter and length of the microscrews were chosen according to the expected quality of the bone in the selected sites.

Conclusion

A single buccal micro-screw and transpalatal arch can be used to intrude an overerupted upper molar without unwanted tipping. The temporary anchorage provided by microscrews facilitates orthodontic treatment in prosthodontic patients.

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