Congenitally missing lateral incisors or second premolars, extremely displaced canines, or severe trauma to the central incisors all result in a reduced upper dentition. The two most common treatment approaches are space closure or space opening to allow prosthodontic replacement with either a fixed prosthesis or single-tooth implants. Both of these approaches involve compromises in terms of esthetics, periodontal health, and function.1

In many cases, space closure by means of mesial tooth movement seems to be the most desirable option, since treatment can be finished as soon as the dentition is complete.2 Esthetic canine substitutions can be achieved with tooth reshaping and positioning, bleaching, and porcelain veneers.3,4

Anchorage demands are much more severe when teeth are missing in the anterior segment, especially in asymmetrical cases with midline deviations. For this reason, mini-implants are increasingly used in such patients,5,6 especially with the development of palatal anchorage that avoids interference with tooth movements.8 Further advantages of the anterior palate as an implant site include good bone quality, thin attached mucosa, avoidance of root injury, and a high success rate.9

The Mesialslider

When the central incisors are correctly positioned in terms of midline, torque, and angulation, a T-wire can be bonded to their lingual surfaces for indirect anchorage from palatal mini-implants, thus preventing lingual tipping during space closure10-12 (Fig. 1A). Alternatively, the Mesialslider10,11 can be employed as a direct-anchorage device (Fig. 1B), leaving the incisors free for simultane-

Fig. 1 A. T-wire bonded to properly aligned upper central incisors for indirect anchorage. B. Mesialslider, consisting of coupled mini-implants, Beneplate with incorporated .045" stainless steel wire, two nickel titanium coil springs, two activation locks, and two sliding hooks (Benetubes) inserted into lingual molar sheaths.

ous correction of a midline deviation.

The Mesialslider, attached via coupled mini-implants in the anterior palate, enables clinicians to mesialize upper molars either unilaterally or bilaterally. Miniscrews with abutments, such as Benefit* mini-implants,\textsuperscript{11} are recommended for a stable and safe connection with the tooth-moving components (Fig. 2). For maximum stability, we use two Benefit mini-implants coupled along the line of force by a Beneplate*\textsuperscript{10} with an incorporated .045" stainless steel wire. The Beneplate is attached to the mini-implants with small fixing screws.

The basic design is similar to that of the Bene-slider,\textsuperscript{*} which uses mesially inserted Benetubes* and open-coil springs to distalize upper molars.\textsuperscript{13}

**Clinical Procedure**

1. After applying topical or local anesthesia, measure the soft-tissue thickness from the anterior to the posterior of the palate, using a dental probe to identify a region with thin mucosa. The soft tissue in the region distal to the third palatal ruga is generally thin enough to achieve sufficient primary stability and avoid the need for long lever arms\textsuperscript{8,14,15} (Fig. 3A).

2. Predrill to a 3mm depth near the midpalatal suture. This can be done manually using a 1.3mm drill in a 1:1 contra-angle with a special handpiece\textsuperscript*; at such a low speed, there is no need for cooling. Although Benefit mini-implants can be inserted without predrilling, the high bone density of the anterior palate makes predrilling advisable in older patients. It is not necessary in patients younger than age 12, due to the low mineralization level of the bone.

3. Insert two Benefit* mini-implants (2mm × 11mm anterior and 2mm × 9mm posterior), again using the contra-angle screwdriver (Fig. 3B,C).

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Mini-implants with a diameter of 2mm or 2.3mm are recommended because they provide superior stability compared to narrower miniscrews.14

4. Place bands with lingual sheaths on the upper first molars.
5. Adapt a Beneplate with an incorporated .045"

Fig. 3 A. Two mini-implants (2mm × 11mm anterior and 2mm × 9mm posterior) inserted in anterior palate. (Thickness of mucosa directly posterior to papilla makes this region inappropriate for implant insertion.) B. Insertion of Benefit mini-implant with contra-angle attached to special handpiece.* C. Two mini-implants inserted near midpalatal suture and distal to third palatal ruga.

Fig. 4 A. Installation of Mesialslider after adaptation of Beneplate and Benetubes to curvature of palate. B. Benetube bent to prevent soft-tissue irritation; Beneplate body modified according to angle and location of mini-implants. C. Changing angulation of .045" stainless steel wire can produce simultaneous molar intrusion or extrusion during mesialization.
stainless steel wire and incorporated Benetubes to the curvature of the patient’s palate (Fig. 4A). The Benetubes should be bent appropriately to avoid soft-tissue irritation; the Beneplate body can also be bent as needed, depending on the angle and location of the two mini-implants (Fig. 4B). By changing the angulation of the .045” stainless steel wire, it is possible to achieve simultaneous molar intrusion or extrusion (Fig. 4C).

6. Place the appliance by attaching the Beneplate to the two mini-implants with the fixing screws, using a screwdriver or the contra-angle and hand-piece, which is more comfortable for the clinician (Fig. 5A).

7. Insert the Benetube from the distal (Fig. 5B).

8. To activate the appliance, slide the activation lock with its attached nickel titanium closing spring mesially, thus producing 200g of force per side (Fig. 5C).

Follow-up appointments should be scheduled every four to six weeks.

The Mesialslider’s prefabricated components can be installed without welding, soldering, or even taking an impression. To save chairtime, however, the components can also be assembled and adapted on a plaster cast. In this case, impression caps are placed on the mini-implants prior to taking an impression, and laboratory analogs are then placed over the impression caps. Positioning the bands in the impression produces a plaster cast with all necessary elements in place.

Patients needing space closure only in the buccal segments, as shown in Figure 6, can often be treated with the Mesialslider without bonding brackets to the anterior teeth.

Two cases are presented here to demonstrate bilateral and unilateral application of the Mesialslider.

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Palatally Anchored Maxillary Molar Mesialization Using the Mesialslider

Fig. 7 Case 1. 32-year-old male patient with deep bite, missing upper first premolars, and impacted upper left and lower left and right third molars before treatment.

Fig. 8 Case 1. A. Two Benefit mini-implants inserted in anterior palate after leveling and alignment. B. Mesialslider installed. C. Spaces closed after 10 months of mesialization.
Case 1

A 32-year-old male presented with a deep bite, missing upper first premolars, and impacted upper left and lower left and right third molars (Fig. 7). After leveling and alignment, two Benefit mini-implants were inserted in the anterior palate (Fig. 8A), and a Mesialslider was placed and activated (Fig. 8B). The premolar spaces were closed in 10 months by bodily mesial movement (Fig. 8C). Brackets were debonded after a total 20 months of treatment, once proper overjet and overbite had been achieved (Fig. 9).

Case 2

A 27-year-old male presented with a missing upper right canine and resultant midline deviation to the right (Fig. 10). Because of the patient's severe Class III relationship (Wits appraisal = −9.6mm), a surgical correction was recommended, but the patient requested a nonsurgical alternative. We placed a unilateral Mesialslider, with an .024" segmental wire used to apply additional buccal force from an elastic chain between the canine space and the upper right first molar (Fig. 11). After four months of treatment, the panoramic radiograph showed bodily movement of the upper first right molar (Fig. 12A). Four months later, the molar had moved far enough mesially that the nickel titanium closing spring had to be replaced with elastic chain (Fig. 12B). After another four months of treatment, the space was completely closed; friction in the buccal molar tube had allowed the upper right quadrant to be pushed mesially (Fig. 12C), resulting in correction of the midline (“reverse anchorage loss”). Brackets were debonded after a total 14 months of treatment, with the accomplishment of proper overjet and overbite (Fig. 13).

Conclusion

The Mesialslider is a reliable device for mesialization of upper teeth, especially in cases requiring unilateral space closure or correction of midline deviation. Palatal mini-implant anchorage avoids interference with tooth movement, and the use of prefabricated components facilitates installation of the appliance without the need for laboratory work.

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REFERENCES


Fig. 12 Case 2. A. After four months of mesialization, showing bodily movement of upper first right molar. B. Four months later, nickel titanium spring replaced with elastic chain. C. After 12 months of treatment, canine space closed and midline shifted left due to friction from buccal molar tube.

Fig. 13 Case 2. After 14 months of treatment, with Mesialslider still in place.