

A Simplified Stent for Anterior Miniscrew Insertion

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Anterior miniscrews are now widely used for incisor intrusion and posterior dental protraction. Interradicular placement of orthodontic miniscrews in the anterior region can be particularly challenging because of the chairside vantage point and the risk of root damage due to the proximity of the roots to the buccal cortical plate.

Several stents for anterior miniscrew insertion have been designed,¹⁻⁴ but they all require an extra appointment for laboratory fabrication, and none is widely available at present. This article

describes a simplified stent that can be fabricated at the chair.

Stent Fabrication

1. Clinically locate the roots adjacent to the miniscrew insertion site by firmly pressing the long end of a periodontal probe against the buccal tissue.
2. Securely tie two L-shaped rectangular wires, facing each other, into the bracket slots adjacent to the miniscrew site (Fig. 1). These wires should extend

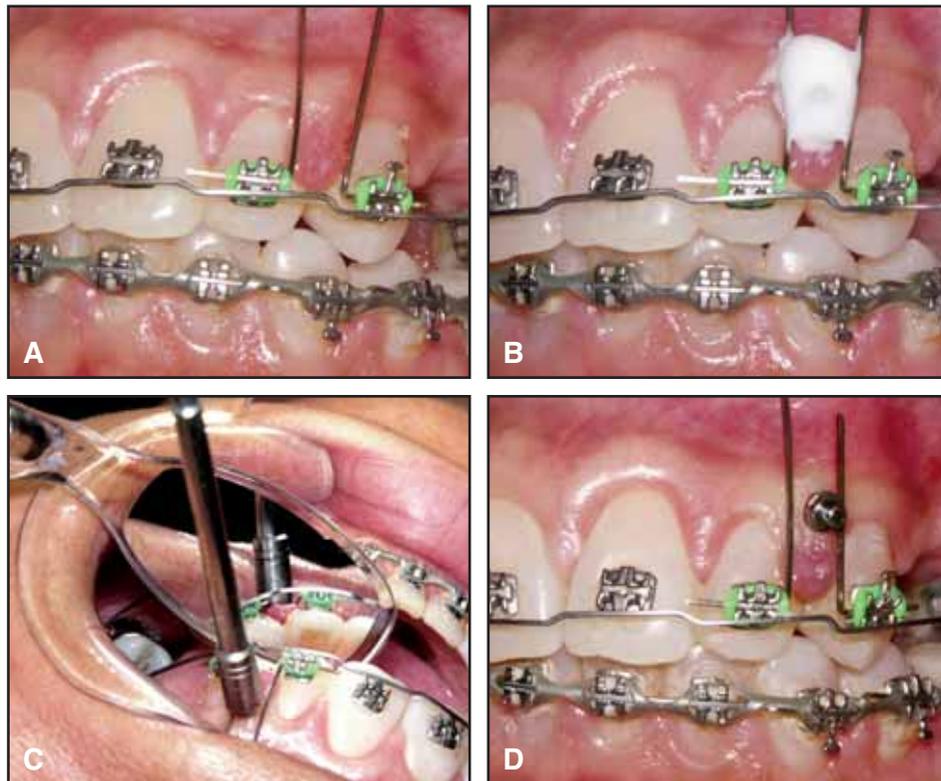


Fig. 1 A. L-shaped .016" × .022" stainless steel wires inserted into bracket slots adjacent to miniscrew insertion site. Wires extend vertically above mucogingival junction, approximating outer surfaces of roots, and horizontally past outer edges of brackets. B. Application of topical anesthetic gel. C. Visual access from operator sitting in 12 o'clock position behind patient. D. Miniscrew inserted at mucogingival junction.

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vertically well beyond the mucogingival junction, following the outer surfaces of the roots, and horizontally past the outer edges of the brackets. Using rectangular instead of round wire prevents the stent from rolling away from the gingiva when the patient closes over the film holder.

3. Take a periapical radiograph to confirm the proper positioning of the stent (Fig. 2). If necessary, slide the archwires within the bracket slots until they accurately follow the outlines of the roots.

Miniscrew Insertion

1. Dry the mucosa with a cotton roll or a 2" x 2" gauze pad without moving the stent. Apply a topical anesthetic gel for five to seven minutes⁵; we recommend a mixture of lidocaine 20%, phenylephrine 2%, and tetracaine 4%.* If the patient is particularly sensitive, consider waiting an additional three to five minutes for more profound anesthesia before inserting the miniscrew. Prolonged application of topical anesthetic, however, can irritate the soft tissue.⁵

2. Suction away the anesthetic, but do not dry the mucosa.

3. Test for adequate mucosal anesthesia by pressing the periodontal probe firmly against the tissue at the exact site of insertion. This soft-tissue "punch" provides a visual marker and helps prevent slippage during self-drilling of the miniscrew.

4. The best visual access for miniscrew insertion is gained by sitting in the 12 o'clock position directly behind the patient, with the patient's head turned to the side. Use an intraoral mirror to make sure the manual screwdriver is properly angulated for insertion.

This stent can also be used for placement of posterior interradicular miniscrews (Fig. 3).

Discussion

During placement of a self-drilling miniscrew, there is a tendency to inadvertently pull the screwdriver toward the operator, thus changing the angle of insertion. If the miniscrew is 8mm long,



Fig. 2 A. Periapical radiograph showing stent before miniscrew insertion. Both wires should be moved to more closely approximate outer surfaces of roots. B. Radiograph taken after miniscrew insertion.

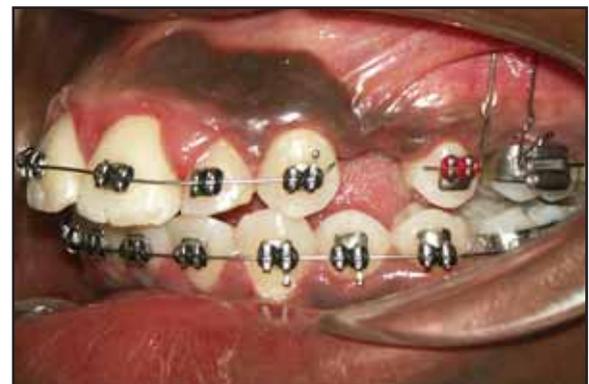


Fig. 3 Stent used for posterior miniscrew insertion; crimps placed with optical plier as vertical reference to indicate adequacy of alveolar bone.

*TAC 20% Alternate, Professional Arts Pharmacy distributors.

every degree of variation from the ideal angle of insertion will cause the screw tip to deviate by about .1mm.⁴

Stationary skeletal anchorage requires adequate cortical thickness and bone density. Bone of type D1 to D3 is optimal for self-drilling miniscrews. The maxillary anterior region is composed of type D2 bone with a thin cortical layer and thick trabeculae.⁶ The mandibular anterior region contains both D1 bone with a thick cortical layer (primarily in the mental region) and D2 bone.⁶

To achieve adequate skeletal anchorage, an orthodontic miniscrew needs .75-1mm of bone stock around its circumference.^{7,8} A 1.5mm-diameter miniscrew therefore requires a minimum of 3-4mm of interradicular bone.⁸ If heavy forces of 200g or greater are used, a minimum of 4-5mm of interradicular bone is recommended to allow for minor tipping (as much as .5mm) of the screw head.⁹ This means that in the maxillary anterior region, there is adequate interradicular bone between the central incisors and between the lateral incisors and canines; in the mandibular anterior region, the bone stock is adequate between the lateral incisors and canines.⁸

After primary stability of a miniscrew is achieved, it is imperative to maintain optimal soft-tissue health to ensure stationary anchorage during force loading.¹⁰ Ideally, miniscrews should be inserted into thin, attached gingiva.¹¹ Placement of miniscrews in the loose alveolar tissue increases the risk of inflammation, peri-implantitis, soft-tissue overgrowth, and aphthous ulceration, raising the likelihood of miniscrew failure by 30%.¹⁰

Unfortunately, at most locations in the anterior region, the optimal bone stock is located 4-10mm from the cemento-enamel junction, often in alveolar tissue.⁸ The clinician must then choose between diverging the roots prior to insertion or placing the miniscrew in the loose alveolar tissue. In the maxilla, superior placement may increase the risk of nasal sinus perforation. In the mandible, inferior placement may increase of the risk of anchorage failure due to the pull of the mentalis muscle.

The greatest risk encountered in inter-

radicular miniscrew insertion is that of root perforation. Unless there is pulpal involvement, however, even severely damaged outer roots can be expected to recuperate completely within 12-16 weeks, assuming the miniscrew is removed immediately.^{12,13}

Conclusion

Stents to guide the proper angulation of manual miniscrew drivers will probably become commercially available in the near future. Until then, stents that can be fabricated at chairside, such as the one described in this article, will be needed to ensure accurate insertion of interradicular anterior miniscrews.

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