A Simplified Stent for Anterior Miniscrew Insertion

NEAL D. KRAVITZ, DMD
BUDI KUSNOTO, DDS, MS
WILLIAM F. HOHLT, DDS

Anterior miniscrews are now widely used for incisor intrusion and posterior dental protrac-
tion. Interradicular placement of orthodontic mini-
screws 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 inser-
tion 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 mini-
screw insertion site by firmly pressing the long end of a periodontal probe against the buccal tissue.
2. Securely tie two L-shaped rectangular wires, fac-
ing each other, into the bracket slots adjacent to the miniscrew site (Fig. 1). These wires should extend vertically above the mucogingival junction, approximating the outer surfaces of the roots, and horizontally past the outer edges of the brackets. Application of topical anesthetic gel. C. Visual access from operator sitting in 12 o’clock position behind patient. D. Miniscrew inserted at mucogingival junction.

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.
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" × 2" gauze pad without moving the stent. Apply a topical anesthetic gel for five to seven minutes; 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.

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.
A Simplified Stent for Anterior Miniscrew Insertion

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 ade-
quate 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 ante-
rior 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-diam-
ter 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 lat-
eral incisors and canines; in the mandibular ante-
rior 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 ante-
rior region, the optimal bone stock is located
4-10mm from the cementoenamel 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 tis-
ue. 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 perfor-
ation. 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 man-
ual miniscrew drivers will probably become com-
mercially 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 anti-
or miniscrews.

REFERENCES

8. Schnelle, M.A.; Beck, F.M.; Jaynes, R.M.; and Huja, S.S.: A radiographic evaluation of the availability of bone for place-

9. Liou, E.J.; Pai, B.C.; and Lin, J.C.: Do miniscrews remain sta-


bility of titanium screws placed in the posterior region for