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Techniques for Attaching Orthodontic Wires to Miniscrews

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The advent of miniscrew anchorage in orthodontics has opened avenues of greater biomechanical efficiency and effectiveness.[1] With the ability to employ specific, directional forces, orthodontists can make use of treatment mechanics that might never have been reliable or even possible in the past.

Miniscrews are most often used for direct anchorage, in which forces are applied from the miniscrew to the specific teeth intended for movement using elastic chain, elastic thread, or coil springs. Another approach involves using the miniscrew for indirect anchorage, where it is connected to a tooth or group of teeth and those dental units serve as anchorage to move other teeth.

Although many shapes and sizes of miniscrews are available, the head of the screw is the most variable aspect. There are two main categories: those with cross-slots or single slots incorporated into the screw heads (such as tomas,* Aarhus,** OrthoEasy,*** and Lomas Quattro****) and those that do not have slots. The specific mechanics to be used in each case will determine the optimal type of miniscrew.[2]

Slotted heads permit the attachment of round, square, or rectangular orthodontic wires, which are secured to the screw head with a stainless steel or elastomeric ligature or with flowable, light-cured composite. There is always a risk, however, that the wire may translate through the slot, thus causing a loss of anchorage (Fig. 1). Here are some clinical tips to help reduce the potential for such incidents.

Attaching Wires to Miniscrew Heads

For a miniscrew with perpendicular cross-slots, a 90° bend can be made in the terminal end of a square or rectangular wire segment to lock the wire into the slot. The wire segment can then be secured with a ligature tie or with light-cured

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****Mondeal North America, Inc., P.O. Box 500521, San Diego, CA 92150; www.mondeal.us.

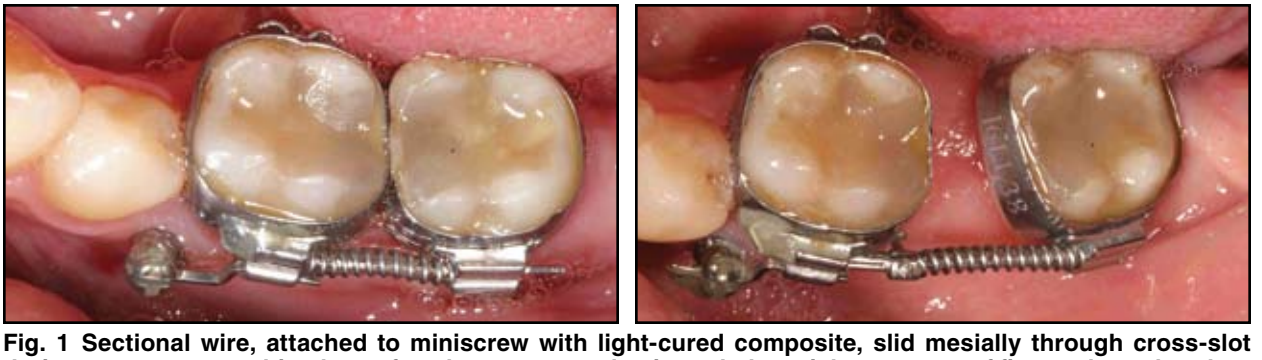

Fig. 1 Sectional wire, attached to miniscrew with light-cured composite, slid mesially through cross-slot during treatment; resulting loss of anchorage caused unintended mesial movement of first molar rather than controlled distal movement of second molar.

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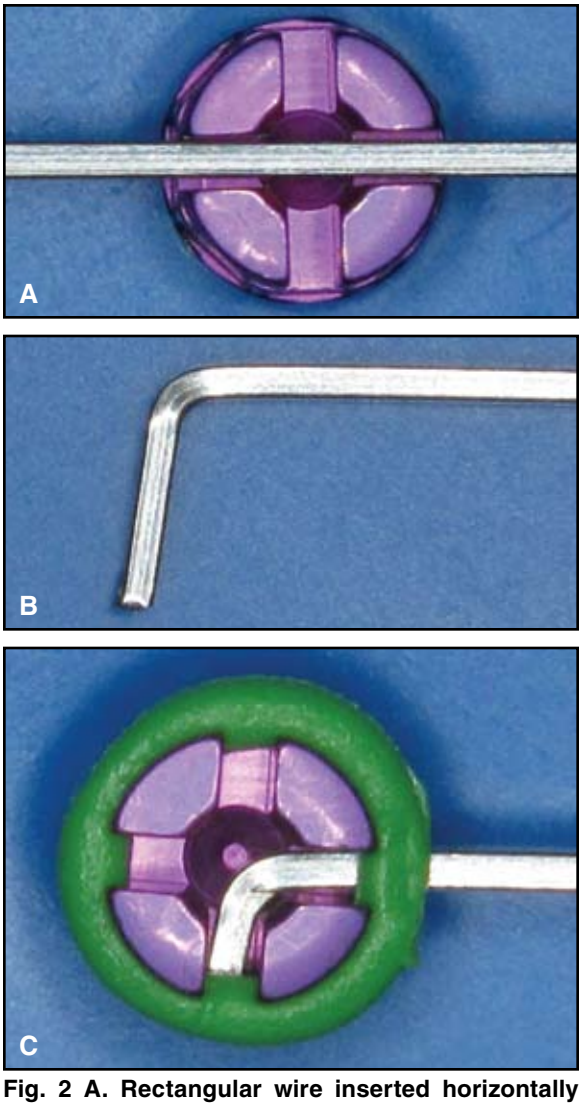

Fig. 2 A. Rectangular wire inserted horizontally into cross-slot of OrthoEasy* miniscrew. B. After bend position is marked on wire, 90° bend is made at terminal end; bent wire has L-shape and rounded inner curvature. C. Bent section of wire inserted into cross-slot of miniscrew and tied in with elastomeric ligature.**

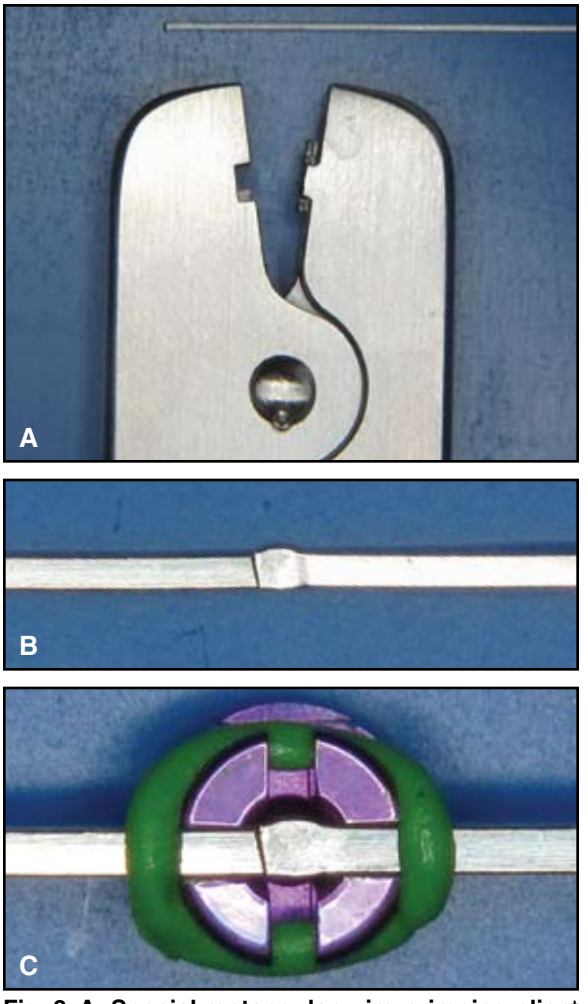

Fig. 3 A. Special rectangular-wire-crimping plier.† B. Crimped section of wire. C. Wire secured with elastomeric ligature in cross-slot of OrthoEasy miniscrew, with crimped section centered at junction of slots.

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†Denvenio, Stettiner Strasse 4, 64732 Bad König, Germany; www.denvenio.com.

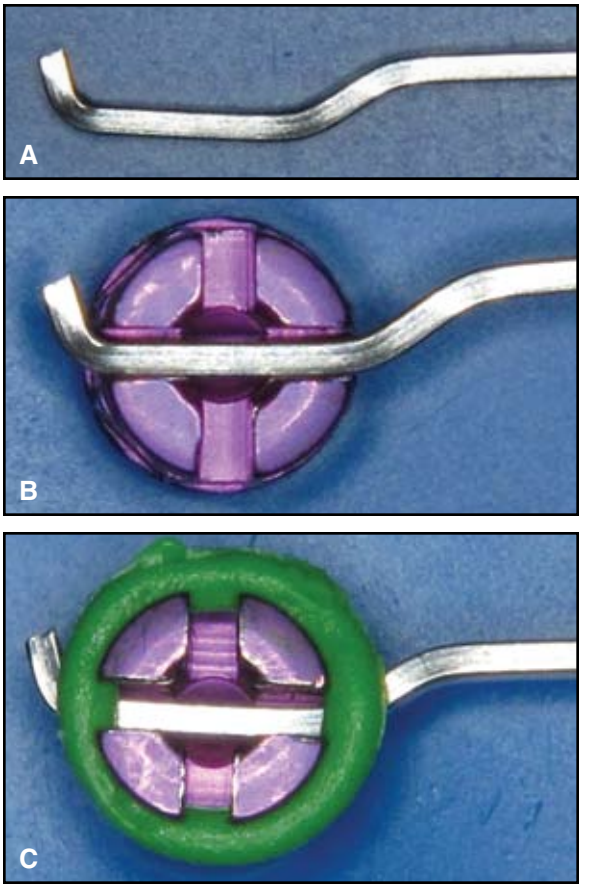

Fig. 4 A. "Shepherd's hook" bent into rectangular wire segment. B. Insertion of hook into cross-slot of OrthoEasy miniscrew. C. Wire tied in with elastomeric ligature.

Fig. 5 A. Sandblasting wire segments, using MacroCab‡ dust-collecting unit, to enhance retention of flowable light-cured composite. B. Terminal end of sandblasted rectangular wire segment inserted into cross-slot of tomas miniscrew.

composite (Fig. 2).

If the miniscrew head is designed with square corners at the junction of the two perpendicular slots, it may not accommodate larger, L-shaped rectangular wires. The tomas pin and OrthoEasy miniscrew have rounded internal corners at the slot intersection, making it easier to seat right-angle bends.

An alternative method that works with either type of slotted head involves crimping a rectangular wire segment to slightly alter its dimensions. A special crimping plier† is used to "pinch" the rectangular wire, providing a "press" or friction fit in the slot (Fig. 3).

Another technique uses a kind of "shepherd's hook" bent into the end of a rectangular wire segment (Fig. 4). A bayonet bend combined with a terminal right-angle bend prevents the wire from sliding through the slot and losing anchorage support. This wire segment may also be secured to the head of the screw by ligation or bonding.

When a wire segment is to be bonded into a slot, it may be advisable to roughen that portion of the wire by sandblasting[3] (Fig. 5). This will

†Denvenio, Stettiner Strasse 4, 64732 Bad König, Germany; www.denvenio.com.

‡Trademark of Danville Materials, 3420 Fostoria Way, Suite A-200, San Ramon, CA 94583; www.danvillematerials.com.

increase the surface area and enhance mechanical retention of the adhesive to the wire. A flowable light-cured composite such as Flow Tain††† is then expressed into the slot around the wire and, ideally, around the undercut of the screw head (Fig. 6), then light-cured according to the manufactur-

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‡‡American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI 53081; www.americanortho.com.

Fig. 6 Flow Tain††† light-cured composite flowed into Aarhus miniscrew head slot, over wire segment, and around screw head, including undercuts, to secure wire. (In actual intraoral application, gloves would be worn.)**

Fig. 7 Wires attached to miniscrews, using both ligation and bonding, to provide direct and indirect miniscrew anchorage for various tooth movements, including Class II correction with a Jasper Jumper,‡‡ molar intrusion, and molar protraction.

er's directions. Such a composite can also smooth the surface of the miniscrew head to reduce soft-tissue irritation.

Removal of bonded wire segments is quite simple: they are "peeled" out of the slots, and any residual adhesive is flaked or picked away from the head of the screw with a scaler.

Figure 7 shows an assortment of wires attached to slot-head miniscrews using the techniques described here.

Figures 8 and 9 present cases showing excellent stability of the wires placed in miniscrew slots over 10 and 19 months of treatment, respectively.

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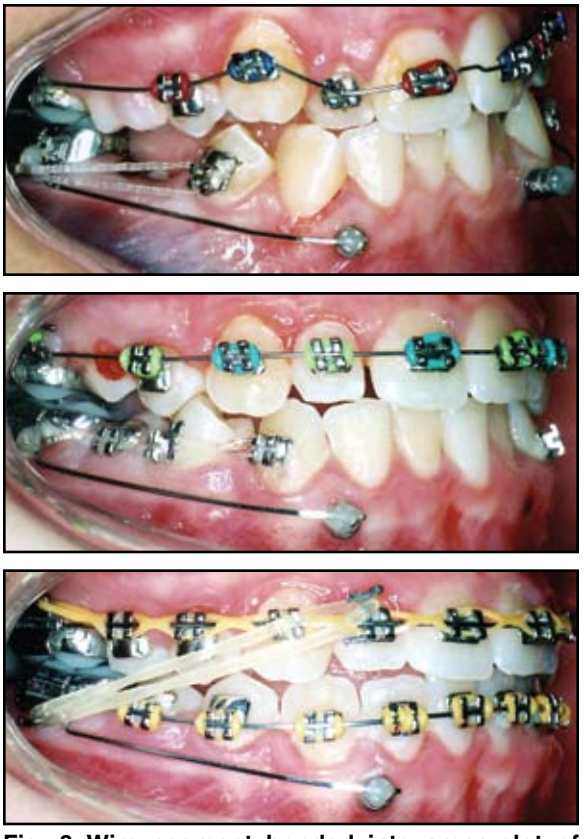

Fig. 8 Wire segment bonded into cross-slot of miniscrew to maintain position of mandibular molars, providing support for Class II elastics and thus permitting effective conservation of leeway space in patient with anterior discrepancy, without extraction or unstable arch development.

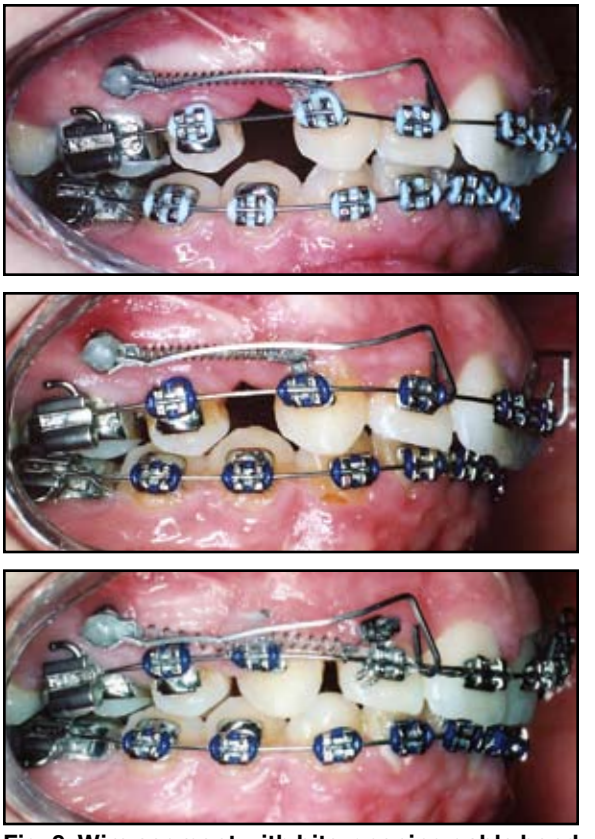

Fig. 9 Wire segment with bite-opening gable bend and sandblasted terminal end inserted into cross-slot of tomas pin and held in place with flowable composite. Sectional mechanics simultaneously intruded and retracted anterior teeth in 19 months.