Soldered Power Arm: An Easy and Effective Method for Intrusion and Retraction of Anterior Teeth

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ABSTRACT
The orthodontic correction of deep overbite can be achieved with several mechanisms that will result in true intrusion of anterior teeth, extrusion of posterior teeth, or a combination of both. For the orthodontic correction of bimaxillary dentoalveolar protrusion with deep bite, there are several treatment modalities like segmented arch approach, retraction and intrusion utility arches, temporary anchorage devices. Though not a novel therapeutic concept, the use of miniscrew implants to obtain absolute anchorage has recently become very popular in clinical orthodontic approaches. To allow the use of sliding mechanics for bodily retraction with intrusion of anterior teeth, we devised a soldered power arm (SPA) on standard molar tube. It is simple, stable, precise and effective in cases where anterior teeth need to be simultaneously retracted and intruded. A power arm can be readily fabricated from 20 gauge stainless steel wire and soldered on the molar buccal tube so as to avoid any distortion or loosening of power arm from molar tube during the course of the treatment. The SPA works efficiently with the molar being stabilized in all three planes of space. The resultant force vector is directed more apically toward the center of resistance of the anchor unit, which resulted in the treatment outcome of retraction and intrusion of the anterior teeth and correction of the deep bite.

Keywords: Soldered power arm, Retraction, Intrusion, Adult treatment.

INTRODUCTION
Various treatment techniques and biomechanical approaches have been suggested over the past decades for the correction of bimaxillary dentoalveolar protrusion with deep bite to achieve en masse retraction and intrusion of anterior teeth with minimal or no anchorage loss.1,2 During intrusion of anterior teeth, optimal magnitudes of force may be delivered constantly using low load deflection springs. Low force (10-15 gm/tooth) is applied during intrusion to minimize root resorption and decrease side effects on the reactive unit. It has been documented that the use of heavier forces will not increase the rate of intrusion.3-5

For the orthodontic correction of bimaxillary dentoalveolar protrusion with deep bite, there are several treatment modalities like segmented arch approach, retraction and intrusion utility arches, temporary anchorage devices. The segmented arch technique requires precise wire bending controlled tooth movement with anchorage control. But these are unesthetic and require good patient compliance. Though not a novel therapeutic concept, the use of miniscrew implants to obtain absolute anchorage has recently become very popular in clinical orthodontic approaches.6,7

To maintain the arch perimeter while using sliding mechanics, 0.017” × 0.025” stainless steel wire (for 0.018” appliances) or 0.019” × 0.025” stainless steel wire (for 0.022” appliances) without any 2nd-order bends. An auxiliary attachment can then be bonded to the cervical portions of the involved teeth, allowing the applied force to pass through the center of resistance.8

To allow the use of sliding mechanics for bodily retraction with intrusion of anterior teeth, we devised a soldered power arm (SPA) on standard molar tube.

Appliance Construction
1. The length of the power arm is determined according to the resultant force vector that is needed for simultaneous retraction and intrusion of teeth and also according to the sulcus depth in buccal vestibule in molar region.
2. Bend the desired section of the 20 gauge stainless steel wire with rounded hook for attachment of the nickel titanium closed-coil springs or elastic chain (Fig. 1).
3. Care should be taken for any mucosal irritation with the cut end of the wire.
4. Place the distal end of the power arm on the molar tube (Fig. 2) and stabilize it.
5. Before starting soldering the power arm to molar tube, auxiliary tube and archwire slot should be blocked with 0.017” × 0.025” stainless steel wire (for 0.018” appliances) or 0.019” × 0.025” stainless steel wire (for 0.022” appliances), so that the solder material will be restricted from flowing at these sites (Fig. 2).
6. Apply flux and solder material and start with soldering, once soldered, finishing of the power arm is done.
7. Adjust the hooked vertical end of the SPA so that the assembly clears the alveolar mucosa.
8. Cement the molar bands and SPA assembly with glass ionomer cement.
9. Nickel titanium closed-coil springs, each exerting a retraction force of 250 to 300 gm, are engaged between the SPA and soldered anterior hooks on the archwires, the forces exerted by the springs were directed more apically, toward the center of resistance of the anchor units. The SPAs also exerted distal forces against the molars.

**Appliance Placement**

Prior to appliance placement, patient selection is done and patient is evaluated for overjet and overbite (Fig. 3). Once the upper and lower arches have completed alignment and leveling, maxillary and mandibular anterior teeth from canine to canine are consolidated and single unit is formed with continuous steel ligation. Full slot engagement of stainless steel wire is done either in 0.018 or 0.022" slot. Transpalatal arch should be given for stabilization of upper arch in transverse plane.

Power arms are soldered to the molar tubes and molar bands cemented. To prevent deepening of the bite during retraction, 0.017" × 0.025” SS wire placed in 0.018” slot whereas in 0.022” slot 0.019” × 0.025” SS wire is used. Anta hooks are soldered on the wire. Nickel titanium closed-coil springs (12 mm), each exerting a retraction force of 250 to 300 gm, is engaged between the SPA and soldered anterior hook on the archwires (Fig. 4). Forces, as vectors, can be combined or divided...
mathematically. Two or more forces acting at a single point can be added using simple trigonometry or vector addition and represented as a single force at that point.\textsuperscript{9} So, resultant force required is the resultant vector which is more than the horizontal vector (Fig. 5).

Force level for simultaneous retraction and intrusion is to be maintained throughout the treatment. As the force vector is directed more apically, toward the center of resistance of the anchor units, there is simultaneous retraction and intrusion of the anterior teeth with correction of the deep bite (Fig. 6).

**DISCUSSION**

It is simple, stable, precise and effective in cases where anterior teeth need to be simultaneously retracted and intruded. A power arm can be readily fabricated from 20 gauge stainless steel wire and soldered on the molar buccal tube so as to avoid any distortion or loosening of power arm from molar tube during the course of the treatment. The SPA works efficiently with the molar being stabilized in all three planes of space. The resultant force vector is directed more apically toward the center of resistance of the anchor unit, which resulted in the treatment outcome of retraction and intrusion of the anterior teeth and correction of the accentuated overjet and deep bite. SPA eliminates
the use precise and unesthetic segmented wire bending and use of miniscrew anchorage for the correction of bimaxillary dentoalveolar protrusion with deep bite.

Advantages of this Technique

- Soldering the power arm makes the unit stronger and more stable, avoiding any loosening of the appliance during the course of the treatment
- The need for apical miniscrews near the center of resistance of the posterior teeth is eliminated, thus reducing the treatment cost.
- The hooked vertical end of the SPA can be adjusted in the buccopalatal direction away from the gingiva in molar region and the buccal mucosa, so that curvature of the archwire will not result in soft tissue impingement by the retraction spring or elastics.
- As the posterior teeth are stabilized, there is less chance of rotation of the occlusal plane.

REFERENCES