

Zygoma Ligatures: An Alternative Form of Maxillary Anchorage

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Adults are increasingly desirous of retaining as many of their permanent teeth as possible, even after extractions due to caries or periodontal involvement. Although such patients often have anterior teeth remaining, occlusal forces can cause migration and loosening of those teeth. Without sufficient posterior anchorage for the necessary tooth movements, orthodontic treatment is difficult at best, and the dentition may deteriorate to the point that a full denture is necessary.

Removable dentures have been suggested for use as anchorage,¹ but since the force system must be light and extremely well controlled, this approach cannot be recommended except for minor tipping of teeth. Osseointegrated implants have also been suggested,²⁻⁶ but the malocclusion can deteriorate further while the osseointegration takes place. Furthermore, the maxilla often lacks sufficient bone quantity and quality, so that the insertion of implants may require a sinus lift⁷ and hence a longer healing period. Implants have recently been placed in the midpalatal suture,^{8,9} but these implants likewise require healing before treatment can be initiated.

In a partially edentulous patient, the best bone quality is found in the region of the zygomatic arch and the infrazygomatic crest. We therefore decided, in extreme cases where no other solutions could be found, to try inserting stainless steel ligatures in that region. This article introduces the zygomatic ligature—an inexpensive and simple method of anchorage for intrusion and retraction of maxillary incisors.

Surgical Technique

Under local anesthesia (2% lidocaine with adrenaline 12.5 micrograms/ml), a 1cm-long incision is made down to the bony surface of the infrazygomatic crest, opposite the maxillary first molar, at a right angle to the alveolar process (Fig. 1A). After the lower portion of the infrazygomatic crest has been localized, a horizontal bony canal is drilled about 1cm lateral to the alveolar process, with entrance and exit holes in the superior portion of the infrazygomatic crest (Fig. 1B).

A double-twisted .012" soft, stainless steel wire is pulled through this canal (Fig. 1C) and then twisted for about 2cm on the anterior side of the infrazygomatic crest (Fig. 1D). The twisted portion is covered by a 2cm-long thin polyethylene catheter, which will protect the mucosa where the wire penetrates into the oral cavity. The polyethylene catheter is fixed to the twisted wire with a "ring" of .012" soft wire, placed outside the soft tissues (Fig. 1E). The loose end of the twisted wire is temporarily fixed to the orthodontic appliance in the cuspid region.

The incision is closed with two or three 4-0 silk sutures, which can be removed after a week (Fig. 1F). The patient is referred back to the orthodontist, who can adjust the length of the extramucosal wire to obtain the correct point of application for the desired direction of force.

Orthodontic Technique

A small bend is made in the wire, and a coil spring delivering the force needed is extended from the zygomatic ligature to the determined point of force application on the anterior appliance. The initial

maxillary anterior unit can extend from canine to canine, but more often will include only the incisors. These teeth are tied together to form, in effect, one big tooth; the center of resistance of this unit determines the point of force application.

Treatment time is usually three to six months, during which only minor adjustments will be needed if the correct line of force has been selected. The result should be retained for about the same period of time, and the prosthetic reconstruction, bridge, or unitor should be constructed immediately after removal of the appliance.

Any intrasegmental tooth movements needed for space closure should be carried out during the active intrusion and retraction, but final alignment should be left for the last stage of treatment. The zygomatic wires are removed under local anesthesia by pulling at one end; no surgical reopening is required.

Case Reports

Zygomatic anchorage has been used to date in 10 patients, all of whom have been nearly or fully edentulous in the posterior region. All the patients showed migration of the maxillary anterior teeth, with subsequent overbite, overjet, and spacing.

The first patient, treated about 10 years ago, was 48 years old, with the chief complaint of increasing maxillary anterior spacing (Fig. 2A). She had lost a considerable number of permanent teeth due to earlier caries and more recent periodontal problems. Because the only remaining maxillary teeth were the six anterior teeth and the left second molar, there was no posterior anchorage for orthodontic movement.

The treatment plan involved retraction and intrusion of the maxillary anterior teeth and closure of the midline diastema (Fig. 2B). A force diagram was made to indicate the point of application from a zygomatic ligature (Fig. 2C). After surgery, Sentalloy coil springs were attached from the zygomatic anchorage to the anterior fixed appliance, with a central T-loop for space closure (Fig. 2D).

The anterior spaces were closed, and the clinical crown height was reduced (Fig. 2E). The results were maintained with a 3-3 bonded lingual retainer and a removable unitor.

Another patient, a partially edentulous adult, was treated by Dr. Costa (Fig. 3A).

After surgery to attach the zygomatic ligatures, the anterior teeth were consolidated to avoid individual movements while intruding the three incisors with the most severe marginal bone loss (Fig. 3B). The left lateral incisor was only incorporated after the diastema between it and the left central incisor had been closed. The line of force of the coil springs was close to the long axes of the anterior teeth in the sagittal plane.

After orthodontic treatment, a fixed prosthetic unit with extensions for the maxillary left bicuspids was placed (Fig. 3C).

Conclusion

Patient compliance has been satisfactory in all cases treated. Any minor gingival irritation has been kept under control by daily rinsing with .2% chlorhexidine. All the results have been adequately maintained in prosthetic reconstructions following the orthodontic treatment.

Compared to alternative solutions such as implants or mini-plates, zygomatic ligatures have the following advantages:

- No special equipment is required.
- Materials are inexpensive.
- Anchorage can be used immediately after insertion.
- Treatment is rapid.
- Removal is quick and easy. □

FIGURES



Fig. 1 A. Incision made down to bony surface of infrazygomatic crest. B. Horizontal canal drilled through superior part of crest. C. Twisted .012" stainless steel wire inserted through holes. D. Wire twisted for about 2cm anterior to crest. E. Twisted wire covered with polyethylene catheter to protect mucosa; incision sutured. F. After healing, patient ready for orthodontic treatment.

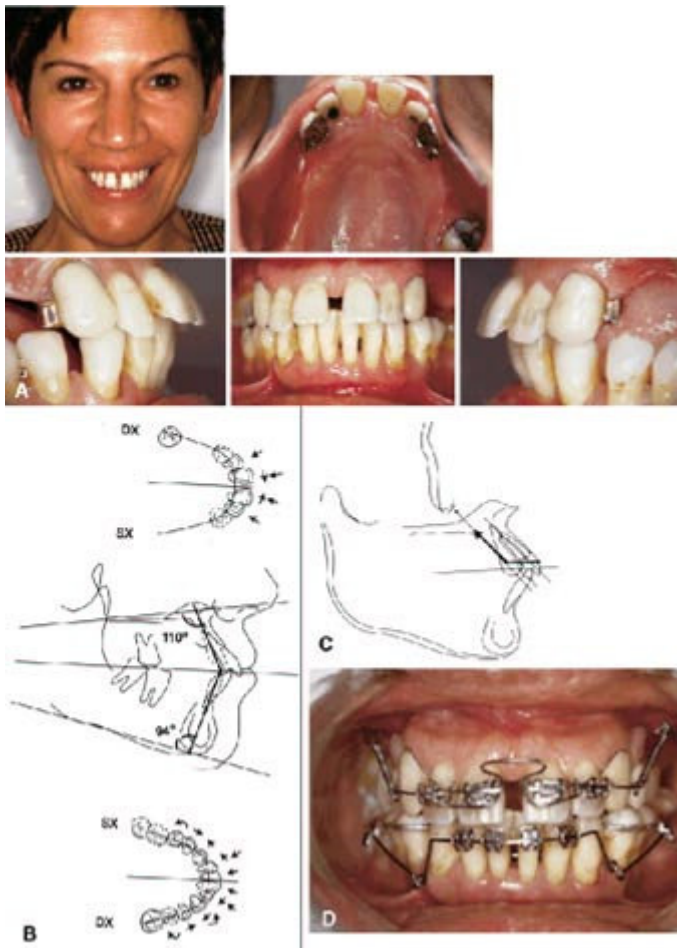


Fig. 2AD A. 48-year-old female with numerous missing posterior teeth due to caries and periodontal problems. Attachments for removable partial dentures can be seen. B. Treatment goal involving retraction and intrusion of maxillary anterior teeth and closure of midline diastema. C. Point of force application to zygomatic ligature. D. Appliance using two Sentalloy springs attached to zygomatic ligatures and central T-loop for space closure.

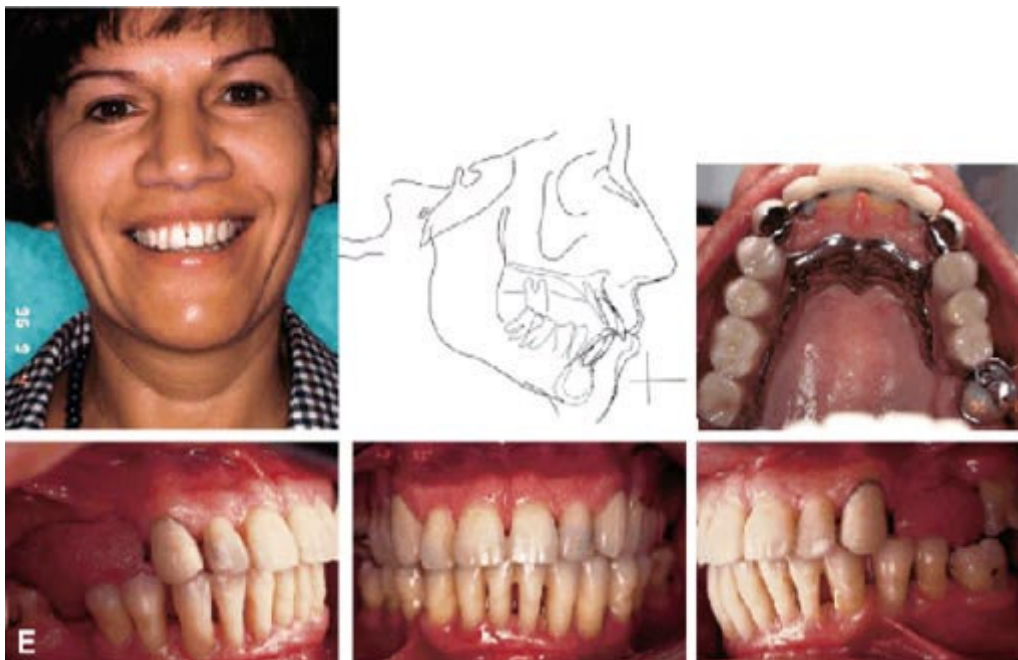


Fig. 2E E. After orthodontic treatment.



Fig. 3 A. Partially edentulous adult patient. B. Patient with zygomatic anchorage. Front teeth are consolidated to avoid individual movements while intruding three most protrusive incisors. C. Treatment result maintained with fixed prosthetic unit, with extensions for maxillary left bicuspids.

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FOOTNOTES

- 1 Sentalloy : Trademark of GAC International, Inc., 185 Oval Drive, Central Islip, NY 11722.