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Use of a Tip-Edge Stage-1 Wire to Enhance Vertical Control During Straight Wire Treatment: Two Case Reports

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ABSTRACT

Vertical control is one of the problems occasionally encountered in Straight wire treatment. Two cases, one with deep overbite and one with anterior open-bite, demonstrate the use of a Tip-Edge stage-1 wire to enhance vertical control in conjunction with Straight wire brackets and superelastic main arch wires.

KEY WORDS: Intrusion, Low friction, Low force.

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INTRODUCTION Return to TOC

The straight wire[1] appliance gives supreme control and finishing potential, but there can be difficulties during the overbite reduction phase because of the continuous arch mechanics. The Begg[2] appliance is renowned for its superb ability regarding overbite and overjet reduction because it is able to provide the consistent low forces required for intrusion. It does, however, often have a prolonged stage 3 while the case is finished to a high standard.

Several appliances have been developed with the aim of enhancing vertical control without losing the finishing capabilities of the Edgewise mechanism. Two of the better-known appliances are the Beddtiot[3] appliance and the Tip-Edge[4] appliance. In addition, several methods also have been developed that incorporate the bypass-type mechanics of the Begg appliance into an Edgewise regimen, notably the Burstone[5] intrusion utility arch and the intrusion mechanics of Ricketts et al.[6] More recently, Greenfield[7] and Nanda[8] have described intrusion systems using commercially available components. The concept of using twin wires is not new. Proffit[9] described the use of a 0.018-inch auxiliary wire to help with arch leveling, but the following cases demonstrate the use of such wires throughout a substantial part of treatment.

Case 1: CL

This 17.2-year-old patient presented with a Class II, division 2 incisor relationship, a significant anteroposterior skeletal discrepancy, a mandibular deficiency, and a low angle between the maxillary and mandibular planes (Figure 1). The patient requested treatment to improve his dental appearance.

To achieve an ideal result, a treatment plan using mandibular advancement surgery was proposed initially. The patient firmly declined this suggestion, and a treatment plan based on orthodontic compensation and extraction of both upper first premolars was implemented.

Only the upper arch was bonded with 0.018-inch Roth prescription brackets with vertical slots and molar bands with twin rectangular tubes. A 0.012-inch superelastic arch wire was placed, and a 0.016-inch Tip-Edge stage-1 type arch was used as an auxiliary wire and tied only to the central incisors using steel ligatures through the vertical slots in the central incisor brackets. Tip-back bends were placed to provide 40 g of intrusion. The ends of the auxiliary wire were cinched and no intra-arch traction was applied at this stage. A Nance arch was fitted to enhance anchorage control.

Three months into treatment, the overbite was reducing, and a 0.016-inch superelastic main arch wire was placed (Figure 2). The auxiliary wire was adjusted to maintain 40 g of intrusive force. There was still no horizontal traction apart from a tight cinch. The mechanics at this stage were aimed at overbite reduction and at encouraging the apex of the upper incisors to move lingually, as described by Liu and Herschleb[10] for the modified Begg technique.

At 7.5 months, sufficient overbite reduction had occurred to allow the lower arch to be bonded. A 0.012-inch superelastic wire was placed in the brackets, and a 0.016-inch auxiliary arch with 30 g of intrusive activation was placed. At 10 months, the lower arch wire was replaced by a 0.014-inch superelastic wire.

At this appointment, a cephalometric radiograph also was obtained to assess the completion of the clinical upper-incisor intrusion. Because the angulation of the upper incisors was satisfactory, a superelastic 0.016 × 0.022-inch main upper arch wire was placed to maintain torque. The auxiliary wire was retained to hold the overbite correction and the space closure achieved thus far.

At 11.5 months, a 100-g intra-arch traction was applied to the upper left-quadrant where spontaneous space closure was slower than that seen in the right quadrant. This was done using a lightweight elastomeric chain from the hook on the molar tube to the traction loop on the auxiliary wire.

At 13 months, the Nance arch was removed, and a 120-g traction force was applied to both sides in the upper arch (Figure 3). Because no dimpling of the palate was seen at Nance removal, it was concluded that there had been no significant anchorage loss.

At 16 months, a superelastic 0.016 × 0.022-inch wire was placed in the lower arch, and a rotation spring was placed on the lower left second premolar. After 20 months and 14 scheduled appointments, fixed appliances were removed and retainers placed (Figure 4).

A comparison of the start and finish cephalometric radiographs shows that correction was achieved partly by bodily retraction and intrusion of the upper incisors and partly by proclination of the lower incisors. No appreciable growth occurred to aid the treatment (Figure 5).

Case 2: LP

This 14.8-year-old patient presented with dental crowding in both arches and an anterior open-bite that demonstrated both dental and skeletal components (Figure 6). It was decided to attempt orthodontic treatment alone with the extraction of four first premolars and with the proviso that, if the upper-incisor exposure were unacceptable to the patient at the conclusion of orthodontic treatment, surgery to intrude the maxilla at a Le Fort I level would be an option.

Treatment was initiated with bonding of the upper and lower arches with 0.018-inch Roth prescription brackets with a vertical slot. The molar bands had twin rectangular tubes, and 0.012-inch superelastic wires were placed in both arches.

At 1.5 months, 0.016-inch superelastic wires and 0.016-inch stage-1 Tip-Edge–type arches without significant vertical activation were placed in both upper and lower jaws. An intra-arch traction force of 100 g was applied in all quadrants.

At four months, the upper auxiliary arch was activated to give 40 g of intrusion, and the lower auxiliary arch was activated to give 30 g of extrusion. Box elastics (0.25-inch, 3.5-oz) were worn full-time in the anterior segment (Figure 7). Treatment was aimed at correcting the open-bite by retracting both upper and lower labial segments while keeping the upper incisors at the same level and allowing the lower labial segment to extrude. An intra-arch traction force of 100 g was continued in all quadrants until space closure was achieved.

At eight months, a Class II elastic (0.25-inch, 3.5-oz) was worn on the left side only to correct the midline. At 14 months, buccal-segment box elastics (0.25-inch, 3.5-oz) with a Class II component were added to settle the buccal segments, but these were continued for one month only. At 19 months, fixed appliances were removed and retainers placed (Figure 8). The active treatment took 11 scheduled appointments.

Analysis of the cephalometric changes shows that the treatment aims of correcting the open bite while maintaining the upper incisor vertical position were achieved and that surgery was not required (Figure 9). There has been no appreciable growth to aid treatment.

DISCUSSION Return to TOC

The majority of the treatment for both cases was carried out using twin round wires, one of which was a superelastic wire. This is in contrast to more routine Straight wire treatment in which arch wire progression is aimed at the placement of a large-dimension rectangular wire to gain control before overbite and overjet reduction is addressed to any great extent, using working arch wires of stainless steel with a high degree of stiffness.

The flexible main arch wire, however, gives good control over rotation and, even in the lower arch in a high-angle case, the tipping of teeth into the extraction sites that one might expect is not seen. This is because of the added control given by the 0.016-inch Australian wire auxiliary, giving all the advantages of tip-back mechanics. This particular wire was chosen as the auxiliary for two main reasons. First, it has a proven record with respect to vertical control; also, the small-dimension round wire slides easily through the molar tubes, keeping the frictional resistance of the system low. The forces needed for space closure are very light for this reason. To further improve the low-friction qualities of the system, the author now uses self-ligating brackets on premolars in extraction cases, which is proving to be very efficient.

By balancing the forces of intrusion and retraction, it is possible to guide the upper incisor apices lingually, thereby reducing the need for root torque to finish the case. Therefore, the use of rectangular wire early in treatment is not necessary, and these wires can be placed later for finishing. This again helps to reduce friction and to apply more predictable and reliably light forces to the teeth.

An additional advantage of keeping a flexible wire throughout much of the treatment is that an accidental de-bond, which happens to even the best of patients, does not cause any need to change a working arch wire for a more flexible one, thereby preventing loss of time while the tooth is realigning. The flexible wires already in use as the working wires accommodate any new bonds or pick up second molars late in treatment.

CONCLUSIONS Return to TOC

Edgewise appliance treatment can involve difficulties regarding excessive time spent in overbite control and space closure. The addition of an auxiliary wire can be helpful in achieving good vertical control, and it can also be used for space closure. By using a superelastic wire as the main wire throughout the majority of treatment, forces are kept light and canine teeth are able to translate bodily distally with minimum anchorage loss. With the additional control afforded by the auxiliary wire, no tipping into extraction sites is seen despite the flexibility of the main arch wire. Once the main treatment objectives of overjet and overbite correction and space closure (if applicable) have been attained, getting into full-dimension TMA wires is achieved more quickly. This allows more scope for detailed finishing within the overall projected treatment time.

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REFERENCES Return to TOC

1. Andrews LF. The straight wire appliance, origin, controversy, commentary. *J Clin Orthod.* 1976; IV. 49–114.

2. Begg PR, Kesling PC. *Begg Orthodontic Theory and Technique.* 3rd ed. Philadelphia, Pa: WB Saunders Company; 1982.

3. Hocevar RA. Begg edgewise diagnosis determined totally individualised orthodontic treatment: foundations, description and rationale. *Am J Orthod.* 1985; 88:31–46. [PubMed Citation]

4. Kesling PC. Dynamics of the tip-edge bracket. *Am J Orthod.* 1989; 96:16–28.

5. Burstone CJ. Deep overbite correction by intrusion. *Am J Orthod.* 1977; 72:11805–821.

6. Ricketts RM, Bench RW, Gugino CF. *Bio-progressive Therapy*. Denver, Colo: Rocky Mountain Orthodontics; 1979.

7. Greenfield R. Simultaneous torquing and intrusion auxiliary. *J Clin Orthod.* 1993; 27:305–318. [PubMed Citation]

8. Nanda R, Mercban R, Kuhlberg A. The Connecticut intrusion arch. *J Clin Orthod.* 1998; 32:708–715. [PubMed Citation]

9. Proffitt WR. *Contemporary Orthodontics. 3rd ed*. St Louis, Mo: Mosby; 1999.

10. Liu S-Y, Herschleb CW. Controlled movement of maxillary incisors in the Begg technique. *Am J Orthod Dentofacial Orthop.* 1981; 80:300–315.

FIGURES Return to TOC

Click on thumbnail for full-sized image.

FIGURE 1. Start of treatment records for patient CL.

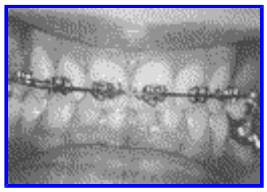

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FIGURE 2. Maxillary anterior teeth of patient CL after three months of treatment.

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FIGURE 3. Incisor relationship 3 months after lower incisors were bonded at 10 months into treatment.

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FIGURE 4. End-of-treatment records for patient CL.

Click on thumbnail for full-sized image.

FIGURE 5. Cephalometric tracings for patient CL. (A) Starting cephalometric tracing. (B) Cephalogram at end of the round wire stage. (C) Ending cephalometric tracing. (D) Starting and ending cephalometric tracings superimposed. (E) Cephalometric tracing of before- and after-treatment maxillae superimposed on ANS-PNS.

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FIGURE 6. Start-of-treatment records for patient LP.

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FIGURE 7. Patient LP. Anterior box elastic applied to super hi-hat pins placed on the lateral incisors demonstrating the usefulness of the vertical slot in the brackets

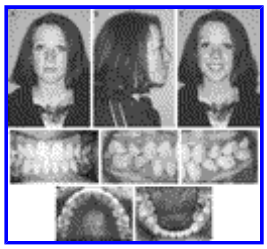

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FIGURE 8. End-of-treatment records for patient LP.

Click on thumbnail for full-sized image.

FIGURE 9. Cephalometric tracings for patient LP. (A) Starting cephalometric tracing. (B) Ending cephalometric tracing. (C) Starting and ending cephalometric tracings superimposed.

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