Holy Nexus of Variable Wire Cross-section: New Vistas in Begg’s Technique

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ABSTRACT

Begg appliance is losing its popularity because of limitations encountered in the system. The biomechanics of the conventional Begg technique has an inherent shortcoming in its ability to achieve true intrusion of the maxillary incisors. Additionally, round-tripping of the maxillary incisors during retraction has proven mechanically and biologically disadvantageous with compromised esthetic outcomes. The clinician is often left wishing for a holy nexus of the wires with variable cross-section which would facilitate biomechanics with enhanced treatment results and negligible side effects.

With the objective of overcoming these shortcomings, customized hybrid wires were designed and used in varied clinical situations to achieve desired results.

Keywords: Controlled tipping, Customized hybrid wires.

INTRODUCTION

The conventional Begg’s technique, with its promise for rapid correction of deep overbite and overjet with the differential force system, obviating the need for headgear with additional claims of reduced treatment time was preferred by numerous orthodontists.

Maxillary incisor intrusion during retraction often remains a problem and shortcoming with the Begg’s technique. In fact, maxillary incisors are found to have extruded in spite of the attempts made in the classic Begg’s technique to achieve incisor intrusion by increasing the anchor bends in the maxillary arch wire. This is unsuccessful as the vertical component of the Class II elastic traction counteracts the intrusive force from the anchor bends with the end result of extrusion of the maxillary incisors. Undesirable distal tipping and extrusion of maxillary molars have been observed in response to the heavy anchor bends which further dissipates the desired intrusive force on the maxillary incisors. In addition to the aforementioned shortcomings, correction of overjet in the conventional Begg’s technique is achieved through round-tripping of maxillary incisors, which is mechanically and biologically disadvantageous.

In Refined Begg’s, to achieve true intrusion, the forces are manipulated in such a manner that the resultant force passes through or very close to center of resistance. The intrusive force vector with anchor bend in the highly resilient base arch wire along with light Class II elastics provided true intrusion of upper anterior segment. The inclination of upper incisors is the deciding factor for changing the direction of retractive component from Class II to Class I and then to oblique using power arm or palatal elastics. For controlled tipping in Refined Begg, it is suggested that MAA auxiliary or its alternative rectangular sectional piggy-back wires can be used along with anchor bends and light Class II elastics.

Refined Begg probably provided the answers to majority of the shortcomings of conventional Begg. But we found that it is difficult to assess the timing of switching over of the retractive component depending on the clinical judgment of incisor inclination. Patient compliance is also one of the major factors since there is continued use of Class II, Class I, oblique or palatal elastics throughout the different stages of the treatment. Additional armamentarium is also required in varied clinical situations of Refined Begg, such as lingual bonding and fabrication of transpalatal arch to use palatal elastics, EVAA or bite blocks to control the vertical anchorage in hyperdivergent cases.

The need of the day was to provide relief to the astute clinicians in their problem zones with simplified mechanics through efficient, economic and innovative technique. This paper presents the design, fabrication and advantages of customized hybrid wires which helps to overcome the drawbacks of Begg’s technique.
Fabrication of Customized Hybrid Wires

Fabrication of Hybrid Wire-IA

For controlled tipping of anteriors in Begg’s mechanotherapy, 0.017 inch × 0.025 inch SS wire in ribbon mode—anterior segment 0.018 inch Australian wire—posterior segment.

Guerin lock: Positioned distal to canine and used to join the two wire segments. Distal end of the 0.017 inch × 0.025 inch SS wire in ribbon mode lies gingival to the mesial end of 0.018 inch stainless steel wire in the lock assembly.

Anchor bend: Placed in 0.018 inch stainless steel wire at contact point of second premolar and first molar (Fig. 1).

Fabrication of Hybrid Wire-IB

Similar as hybrid wire-IA but with the wire dimension in the anterior segment changed to 0.019 inch × 0.025 inch stainless steel wire in ribbon mode.

Clinical Application of Hybrid Wire-IA and IB in Begg’s Technique

The treatment steps of a Class II division 1 malocclusion with extraction of upper first and lower second premolars are described in three phases to illustrate the clinical application of hybrid wire-IA and IB as modifications of the Begg’s technique.

First Phase of Treatment

Construction of the anchorage unit: Preformed molar bands are fitted on the maxillary and mandibular first and second molars. An impression made to transfer bands and cast poured. On the working dental cast, 0.032 inch round SS wire is adapted along the palatal/lingual contour of the molar bands and soldered in place. The anchorage unit was then cemented in the patient’s mouth (Fig. 2).

The anchor unit helps in achieving true intrusion of the maxillary and mandibular incisors by preventing the distal tipping of molars while simultaneously preserving anchorage to achieve controlled tipping.

Leveling and aligning: Begg brackets were bonded on the maxillary and mandibular anterior teeth. The initial alignment was commenced with 0.016 inch NiTi. Progress made to 0.016 inch Australian archwire followed by 0.018 inch Australian archwire along with light Class I elastic force to counteract the side effect of proclination during intrusion. The wire design consisted of intermaxillary hooks and anchor bends. Elastic modules were placed from distal of canine bracket to the intermaxillary hooks on the 0.018 inch Australian wire for space closure between incisors.

The recommended force value for intrusion of anterior segment is approximately 80 gm.

The intrusive force exerted by the archwire should be determined with a force gauge (by pulling the wire downward along the midline between the incisors to the midpoint of the vertical slots of the brackets). The position and magnitude of the anchor bend can be suitably altered to achieve the correct force magnitude.

Class II elastic traction is avoided which helps appropriately capitalize the force from the anchor bends to achieve genuine intrusion of the maxillary incisors while avoiding unwanted extrusion of the mandibular molars.

Second Phase of Treatment

For controlled movement of the maxillary incisors, hybrid wire-IA (anteriorly 0.017 inch × 0.025 inch SS in ribbon mode and posteriorly 0.018 inch SS) was used with anchor bends (at contact point of second premolar and first molar) and combined with Class I elastic traction.

For mandibular molar protraction, cut the soldered wire between the mandibular first and second molars and hybrid wire-IB (anteriorly 0.019 inch × 0.025 inch SS in ribbon mode and posteriorly 0.018 inch SS) with gable bends were placed along with Class I elastic traction to achieve Class I molar relationship by mesialization of mandibular molars.

Third Phase of Treatment

As the maxillary incisors were guided with controlled movement with this modification using the hybrid wires, the need for incisor
torque correction was avoided. Usual uprighting procedures were followed.

CASE REPORT

A female patient aged 20 years reported to the department with the chief complaint of spacing between her upper front teeth.

Clinical examination showed that she had Class I molar relationship with 7 mm of overjet, a moderate (30%) overbite, and moderate spacing between maxillary incisors.

Cephalogram revealed patient had skeletal Class I jaw bases (ANB 20), vertical growth pattern (FMA 290 and Sn-GoGN-350), proclined upper and lower anteriors (U1 to NA 400 and 14 mm and L1 to NB 380 and 13 mm). Both upper and lower lips were protrusive (S-line to upper lip 4 mm and to lower lip 6 mm) (Fig. 3).

A conventional Begg treatment procedure was initiated after extraction of the four second premolars. A review of treatment progress after 8 months revealed that two-thirds of the extraction spaces were still present, while the maxillary incisors were overuprighted, and slight clockwise rotation of the mandible had occurred which lead to the increase in lower face height (Fig. 4). It was obvious that continued tipping of the incisors to close extraction spaces would result in considerable difficulty to achieve sufficient root torque of the incisors at later stages and
Fig. 4: After conventional Begg’s technique

Fig. 5: U/L hybrid wire-IA (modified Begg’s technique)
This loss of torque would result in unacceptable facial esthetics. Moreover, downward and backward rotation of the mandible could be expected to continue with detrimental effects on the soft- and hard-tissue facial pattern.

The modified technique was, therefore, used to complete the treatment.

After anchorage preparation (as explained in Fig. 2), hybrid wire-IA was placed in upper and lower (U/L) arch for 1 month (Fig. 5) followed by hybrid wire-IB and treatment was continued with Class I elastic traction in all four quadrants of the dental arches (Fig. 6). Anchor bends were incorporated in the maxillary and mandibular archwire to prevent extrusion of the incisors during retraction. After space closure anchor units were disbanded and 0.018 inch Australian arch wires was placed with molar offset bends for alignment of premolars, first and second molars (Fig. 7) followed by 0.020 inch archwire and usual uprighting procedures were carried out (Fig. 8).

During the 6 months of treatment with modified Begg’s technique, the analysis of post-treatment records revealed—molars showed minimal extrusion and mandibular plane remained stable (Table 1). Maxillary and mandibular incisors were moved over a 3 mm and 2 mm distance respectively, and inclination of incisors was also improved maintaining the normal overbite, overjet, and interdigitation of the teeth. The maxillary incisors were efficiently moved to the predetermined position without jeopardizing anchorage of the posterior teeth in the maxillary arch (Fig. 9).
DISCUSSION

The presentation so far focused on the technique of management of relatively tricky situations a clinician may face while treating with the Begg appliance system. The salient points of the modifications suggested are:

1. Anchorage conservation is essential to avoid reactive component from the retraction and intrusive forces producing unwarranted movements of the molars, resulting in anchorage loss. The cases laid emphasis on the creation of a special anchorage unit to combat this issue effectively.

Table 1: Cephalometric values of pretreatment with conventional Begg’s followed by modified Begg’s technique

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<th></th>
<th>SNA</th>
<th>SNB</th>
<th>ANB</th>
<th>Mand. plane angle</th>
<th>U1 to NA angle</th>
<th>U1 to NA linear</th>
<th>L1 to NB angle</th>
<th>L1 to NB linear</th>
<th>S-line to U/L lip</th>
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<tr>
<td>Pre-Rx</td>
<td>80°</td>
<td>78°</td>
<td>2°</td>
<td>35°</td>
<td>40°</td>
<td>14 mm</td>
<td>38°</td>
<td>13 mm</td>
<td>4/6 mm ahead</td>
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<tr>
<td>Intra Rx with conventional Begg’s</td>
<td>78°</td>
<td>73°</td>
<td>5°</td>
<td>38°</td>
<td>13°</td>
<td>7 mm</td>
<td>28°</td>
<td>9 mm</td>
<td>3/4 mm ahead</td>
</tr>
<tr>
<td>Present status with modified Begg’s</td>
<td>78°</td>
<td>73°</td>
<td>5°</td>
<td>38°</td>
<td>18°</td>
<td>4 mm</td>
<td>30°</td>
<td>7 mm</td>
<td>0/2 mm</td>
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Additionally, the posterior teeth were not aligned prior to the construction of the anchorage unit as (relatively) unmoved teeth would provide superior anchorage.

2. Hybrid wire IA with 0.017 inch × 0.025 inch SS in the ribbon mode anteriorly has a play of approximately 12°. Cases presenting with Class II div. I and bimaxillary protrusion, classically require uncontrolled tipping followed by controlled tooth movement of the anterior segment. The modified wire design is biomechanically advantageous as it permits simultaneous tipping of the anterior segment to a certain extent, while further reactivation would bring about controlled tooth movement. The round 0.018 inch Australian SS wire in the posterior segment allows free sliding of the molars to achieve treatment goals.

3. Hybrid wire IB with 0.019 inch × 0.025 inch SS wire in the ribbon mode anteriorly is a boon for cases with upright incisors as it eliminates the play and permits controlled tipping as illustrated in the case presented.

CONCLUSION

Customized hybrid wires hold promise to overcome the shortcomings of conventional Begg’s technique. However, considerable care must be exercised to monitor the movement of teeth and the stability of the anchorage unit throughout treatment.

REFERENCES