Mollenhauer Aligning Auxiliary for Bodily Alignment of Blocked-out Lateral Incisors in Preadjusted Edgewise Appliance Therapy

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ABSTRACT

Background: Bodily alignment of teeth that are blocked out of the arch such as a lingually placed lateral incisor, is often time consuming and difficult. Though several treatment methods are available for accomplishing this, these approaches have some drawbacks.

Aim: To describe how Mollenhauer aligning auxiliary (MAA) can be adapted to bodily align lingually blocked-out lateral incisors in preadjusted edgewise appliance therapy and to present its application in three cases.

Methods: This auxiliary in the form of rectangular boxes is made with 0.009 inch AJ Wilcock Supreme Australian archwire, and is placed along with a stiff base archwire after sufficient space has been created for the blocked-out tooth.

Conclusion: Mollenhauer aligning auxiliary can be effectively used for the bodily alignment of lingually placed lateral incisors in preadjusted edgewise appliance therapy as an alternative to torquing with rectangular wires.

Keywords: Mollenhauer aligning auxiliary, Supreme Australian archwire, Bodily alignment, Blocked-out lateral incisors.

INTRODUCTION

One of the earliest challenges an orthodontist faces is that of proper alignment of the dentition without compromising the anchorage. This is especially true with blocked-out lateral incisors where both the crown and the root are placed lingually. The stability of these cases demand not only crown alignment but also ideal root positions. The traditional approach in such cases such as using a light round archwire would produce a simple tipping of the crown into the line of the arch while the root largely remained in the original position in the bone or become even more lingually placed. Unfortunately, such a tooth has a high chance of relapse when the active appliance is removed. To avoid this situation, rectangular NiTi archwires such as 0.017 × 0.025 inch A-NiTi have been used right from the beginning in an attempt to align the root along with the crown. However, this too has several disadvantages, such as distortion of the arch form, slow alignment and root resorption.1

To prevent distortion of the archform, round NiTi wire is used piggy-back on a stiff base archwire. Even though this aligns the crown fairly quickly, the root would still need to be torqued at a later stage. However, torque control is known to be one of the least effective components of edgewise mechanics.2 Since, preadjusted edgewise appliance is relatively inefficient in delivering torque,3,4 an extended period of torquing with a full size rectangular wire will be required to align the root. This presents a dilemma since increased time of treatment with rectangular wires has been shown to place teeth at a significant risk of root resorption.5-7 This concern is particularly relevant for maxillary lateral incisors since they have been found to be highly susceptible for root resorption.7,9

In this context, an extra-slot torquing system which is not limited to the bracket-wire interface and which would apply light forces, would be beneficial. One such system is the aligning auxiliary proposed by Barry Mollenhauer for ribbon arch brackets.10 The Mollenhauer aligning auxiliary (MAA) is made with 0.009 inch AJ Wilcock Supreme Australian archwire and placed along with a 0.018 inch AJ Wilcock Premium Plus base archwire. It has been shown by Mollenhauer to be an efficient and versatile system which could be adapted for use in different situations. Even though this auxiliary was developed for ribbon arch brackets, it could be adapted with good effect to bodily align lingually placed lateral incisors in preadjusted edgewise appliance therapy also. In this article, the application of this auxiliary in three cases is presented.
Fabrication and Usage

A 0.009 inch Supreme Australian archwire is used for the fabrication of this auxiliary. For ease of fabrication, a Nance Closing Loop plier could be used. The width of the rectangular boxes and the distance between them would depend on the size of the teeth. The adjacent boxes of the modified MAA are made in such a way that, viewed from the side, all the boxes remain in the same plane. After the last box is made, the wire is ideally wound on itself. For activation, v-bends are made in between the boxes so that when fully activated, the auxiliary will form a circle with the boxes on the inside of the circle (Figs 1A to D). It is engaged between the base archwire and the tooth (Fig. 1E). Tying the crossover part of the auxiliary under the gingival tie-wings of the bracket provides greater efficiency of correction.

Typical Treatment Sequence

1. Initial alignment.
2. Space creation: A 0.016 inch Premium Plus Australian archwire or a 0.016 × 0.022 inch stainless steel wire for a 0.018 inch slot bracket, and 0.018 inch Premium Plus Australian archwire or a 0.017 × 0.025 inch stainless steel wire for a 0.022 inch slot bracket is placed with an open coil spring in the region of the lingually placed incisor, to create sufficient space for its alignment.
3. Placing the auxiliary: Once sufficient space is available, the auxiliary is placed along with the stainless steel base archwire. The open coil spring may be substituted with an archwire sleeve at this stage.
4. The coil spring is maintained until the lateral incisor approach the line of occlusion. At this stage, the coil spring is removed and a 0.014/0.016 inch NiTi piggy-back archwire is tied in the lateral incisor bracket along with the auxiliary while the same base archwire is continued.
5. Subsequent wire progression would be dictated by the plan for the particular case. The auxiliary is maintained during the initial rectangular archwires on the corrected lateral incisor.

It is preferable to have a transpalatal arch or a lingual arch in place for anchorage control and for the avoidance of any

Figs 1A to E: (A and B) Fabrication of the Mollenhauer aligning auxiliary, (C) viewed from the side, the adjacent boxes of the auxiliary are in the same plane, (D) the auxiliary after activation, with the boxes on the inside of the circle, (E) the auxiliary in place between the archwire and the teeth
inadvertent effects of the auxiliary. In case of upper lateral incisors, inverting the bracket could also be considered.

**CASE REPORTS**

**Case 1 (Roopak Bose)**

An 18-year-old male patient whose 22 was positioned lingually and in crossbite. Treatment plan was to create space for the lateral incisor and to use the MA auxiliary to bodily align 22 with a nonextraction approach. The base archwire used along with the auxiliary was 0.018 inch Premium Plus Australian archwire and the bracket system 0.022 inch slot. The total duration of the auxiliary wear was 5 months (Figs 2A to G).

**Case 2 (Asha Rani)**

A 13-year-old female patient whose 22 was positioned lingually with 23 overlapping it. Treatment plan was to use the MA auxiliary to bodily align 22 with a nonextraction approach. The base archwire used along with the auxiliary

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Figs 2A to G: (A and B) Case 1 (RB). Pretreatment, (C) open coil spring to open space, (D) the auxiliary engaged, (E) occlusal view of the auxiliary, (F and G) post-treatment
Figs 3A to G: (A and B) Case 2 (AR). Pretreatment, (C) space opened with open coil spring, (D) the auxiliary engaged, (E and F) post-treatment, (G) 1 year 7 months post-treatment

was 0.017 × 0.025 inch stainless steel and the bracket system 0.022 inch slot. The total duration of the auxiliary wear was 5 months. The 1 year 7 months post-treatment photograph shows the stability of the correction without the aid of a fixed lingual retainer (Figs 3A to G).

Case 3 (Bala Krishna)

A 22-year-old male patient whose 12 and 42 were totally blocked out of the arch. Treatment plan involved extraction of all first bicuspid and the use of the MA auxiliary for 12 and 42. The base archwire used along with the auxiliary was
Figs 4A to I: (A to C) Case 3 (BK). Pretreatment, (D) upper and lower auxiliary engaged, (E) occlusal view of the upper auxiliary, (F) occlusal view of the lower auxiliary, (G to I) post-treatment
The total duration of the auxiliary wear was 6 months each in the upper and lower arches (Figs 4A to I).

**DISCUSSION**

In situations where only one tooth is crowded out of line, Proffit\(^1\) has emphasized the importance of using a rigid wire to maintain the arch form, and the use of an auxiliary wire for the malaligned tooth. He warned about the danger of loss of arch form if a springy archwire is used alone in such situations. Mollenhauer\(^10\) observed archform and anchorage loss problems and difficulty in overbite reduction when single light rectangular archwires were used for alignment. He therefore recommended two archwires with different properties, a stiff base archwire and an auxiliary made of a lighter wire for root correction. He observed that a 0.018 inch base archwire provided better arch form and molar control than a 0.016 inch one in the Begg bracket. The high resilience of the Australian base archwire enables it to absorb the forces generated by the torquing auxiliary on the rest of the anterior teeth on which it is engaged. This prevents undesirable labial root torquing effect on these teeth.

The Supreme grade Australian archwire has several properties that make it appropriate for the fabrication of the auxiliary. Sankar et al,\(^11\) found that it exhibits an excellent working range and negligible stress relaxation. They recommended the usage of this wire for initial alignment, particularly in situations where the tooth displacement is large. According to them, this wire applies only light forces and may permit rapid alignment without overly taxing the anchorage. The high resilience and low stress relaxation of the wire allows the auxiliary to apply a constant force over a long period of time without deformation of the wire, and the large working range permits the auxiliary to move the lateral incisor through a considerable distance with just the initial activation. Wilcock\(^12\) described a reduction of tenderness in teeth, faster tooth movement and good gingival health with Supreme grade Australian archwires in labial Begg brackets. Mollenhauer\(^10\) also observed that the auxiliary is kind to the periodontium, and that the very light force applied by this auxiliary facilitates cortical bone remodeling. The auxiliary was well tolerated by the patients described in this article also and they reported no discomfort during its wear.

From the biomechanical aspect, when the auxiliary is tied onto a blocked-out tooth, it exerts a labial force on the tooth as well as a couple. The labial force creates a moment that leads to tipping of the crown labially. The couple applied by MAA creates a counterbalancing moment which cancels the moment created by the labial force. This results in the tooth being moved bodily into the line of occlusion (Figs 5A and B). The torquing efficiency of this auxiliary could be attributed to the large moment arm (distance between the two forces of the couple) that it provides. Compared to the small moment arm (D) available with even the largest wire in the PEA slot which necessitates a high force, the larger distance between the edges of the auxiliary permits the auxiliary to apply the same amount of torque with a much lighter force (Figs 6A and B). This could potentially translate clinically as a reduced risk of root resorption as the use of this auxiliary would help to avoid an extended period of torquing with a full size rectangular wire. The low forces applied would also help to avoid undermining resorption and possible loss of tooth vitality. We have also observed in the cases treated with this auxiliary that the risk of relapse is less and that fixed retainers are often unnecessary to maintain the correction. The reason for this could be that the correction accomplished early-on in treatment is maintained with the full-size rectangular wire for a period of time during the finishing stage. However, for proper bodily alignment of the tooth and for long-term stability of the correction, it is crucial that the auxiliary be left in place for an additional 2 to 3 months after the initial alignment. An examination

**Figs 5A and B:** (A) Labial force applied by the auxiliary creates a moment and the crown tips labially, (B) couple applied by the auxiliary creates a counterbalancing moment which cancels the moment created by the labial force. This brings about bodily movement of the tooth
of the tooth inclination after the initial correction would reveal that the root is still slightly lingually placed, as root movement is a high-resistance one. Premature removal at this stage would jeopardize the efficiency of correction. The auxiliary should be left in place until the root prominence of the lateral incisor is visible on the labial alveolus.

CONCLUSION

Mollenhauer aligning auxiliary can be effectively used for the bodily alignment of lingually placed lateral incisors in preadjusted edgewise appliance therapy as an alternative to torquing with rectangular wires. This auxiliary is easy to fabricate and engage, applies light forces, prevents distortion of the arch form and needs only a single activation to accomplish the correction. Further studies are being planned to assess the scientific validity and the effects of the use of this auxiliary.

REFERENCES