Temporary Anchorage Devices in Bimaxillary Protrusion

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Abstract

Introduction of mini implants in orthodontic treatment mechanics has caused a paradigm shift in the treatment modalities. Mini-screw type of temporary anchorage devices (TADs) are small, placed with a minor surgical procedure and have helped treat complicated as well as borderline surgical cases with relative ease. This case report highlights the use of TADs for the treatment of a 19-year-old female with severe bimaxillary dento-alveolar proclination, protrusive lips and divergent face type. Clinical examination and cephalometric parameters indicated that the case was a critical anchorage case which required extraction of all first premolars. The TADs were placed in all four quadrants between the roots of the second premolar and first molar with the aim of providing absolute anchorage. After retraction of the anterior teeth, fullness of the upper and lower lip has reduced, lip incompetency is eliminated and the severe dentoalveolar proclination is corrected providing absolute anchorage.

Clinical Relevance: The treatment of severe bimaxillary dento-alveolar proclination cases with conventional orthodontics has always remained as a challenge; with a greater chance of anchorage loss and inadequate retraction of anterior into the extraction space resulting in an unsatisfactory treatment result. Use of TADs helps us in implementation of absolute anchorage into the treatment mechanics.

Keywords: Temporary Anchorage Devices; Premolars; Dentoalveolar Protrusion; NitiWires

Introduction

The ultimate goal of orthodontic treatment has always been to improve the patient’s aesthetic harmony, achieve a structural balance and functional efficiency. Anchorage i.e. resistance to unwanted tooth movement [1], is an integral part of orthodontic treatment to achieve an ideal result [2,3].

Absolute anchorage means no movement of the anchorage unit as a consequence to the reactionary forces applied to move teeth which are impossible if the force applied is from the anchorage unit since it defies Newton’s Third law of Motion i.e. Every action has an equal and opposite reaction. Thus, it is essential to have absolute anchorage, a term which was never a reality before the introduction of TADs in orthodontic treatment mechanics [4-6]. Introduction of TADs have changed the orthodontic scenario and expanded the boundaries of tooth movement [7-10].

Treatment of bimaxillary dentoalveolar protrusion cases involves alignment and leveling of teeth, complete retraction of maxillary as well as mandibular incisors resulting in a decrease in soft tissue procumbency and convexity. Usually treatment plan will include extraction of all first premolars and complete retraction of the anterior teeth into the extraction space with minimal or no movement of the posteriors into the extraction space i.e. absolute anchorage. Therefore, this case report demonstrates the orthodontic treatment of a severe bimaxillary dentoalveolar protrusion with incompetent lips with the use of TADs to achieve absolute anchorage.

Case Report

A 19 year old female patient reported to the clinic with forwardly placed upper anterior teeth. Extraoral examination revealed a convex profile, incompetent lips at rest, protrusive upper as well as lower lips, and an acute nasolabial angle. Due to protrusive lower lip the mento-labial sulcus appeared deep. Intra-oral examination revealed Angle’s Class I molar and canine relationship with mild crowding in upper as well as lower incisors and normal overjet/overbite (Figure 1).

Radiographic examination confirmed the presence of permanent set of teeth with normal mandibular condyle. The cephalometric analysis showed a borderline Class I skeletal pattern (ANB 1°) with proclined upper and lower anteriors (U1 to NA 46°/15mm; L1 to Md 34°/10.5 mm; IMPA was 115°). Upper and lower lips were protruded when compared to the E-line, 3.5 mm and 5.5 mm, respectively and compared to S line lower lip was protrusive by 4 mm. Nasolabial angle was very acute (83°).

The treatment objectives were (i) to decrease the bimaxillary proclination, (ii) correct crowding in upper and lower anteriors, (iii) maintain class I molars, (iv) improve the facial esthetics with retraction of upper as well as lower lip, and (v) treat it as a critical anchorage case.

Treatment Progress

After the extraction of all first bicuspids, fixed pre-adjusted Edgewise appliances (Clarity SL 022 MBT) were used (0.022 × 0.028 slot). Alignment and levelling was performed with 0.014" Niti wires followed by 19 x 25 Niti wires. Four orthodontic mini-

Figure 1: Extra oral and intra oral Picture With proclined upper and lower anteriors, protrusive upper and lower lips.
Implants (Dentos, Korea) of conical shape, 6 mm length and 1.3 mm diameter were placed inter-radically between the maxillary and mandibular second bicuspids and first molars during the alignment stage itself (Figure 2).

A 0.019 × 0.025-inch Stainless steel arch-wire with anterior hooks was placed in upper and lower arches with a Ni-Ti coil spring applied from the maxillary and mandibular mini-implants to the anterior hook on the arch wire to retract the anterior teeth (Figure 3). After retraction, the treatment was completed with ideal arch-wires sequencing and use of settling elastics. Angles Class I molar and canine relationship was preserved bilaterally with well coordinated upper and lower arches. The dentoalveolar protrusion was significantly reduced due to retraction of upper and lower anteriors completely into the extraction spaces without any anchorage loss (Figure 4).

After superimposition of the before and after treatment cephalometric tracing, the maxillary and mandibular incisors were bodily retracted (U1 to NA 25°/ 6mm; L1 to Md 29° / 5.5 mm). There were no significant change in the position of both maxillary and mandibular first molars nor was there any significant change in ANB angle. The upper and lower lip were retracted with an increase in nasolabial angle to 102° from 83° pretreatment resulting in significant profile changes in the patient’s lower facial third (Figure 4). The entire treatment duration was 18 months. The results of treatment were shown in table 1.

**Discussion**

Esthetics is one of the main reasons patients opt for orthodontic treatment especially in bimaxillary protrusion cases, which is characterized by flaring of the maxillary and mandibular anteriors and concomitant procumbancy of the upper as well as lower lips [11]. Depending on the severity of malocclusion the case is treated as non extraction, second premolar extraction or first premolar extraction case depending on the anchorage requirements.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre treatment</th>
<th>Post Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle ANB</td>
<td>1°</td>
<td>1°</td>
</tr>
<tr>
<td>U1 to NA</td>
<td>46°/15mm</td>
<td>25°/6mm</td>
</tr>
<tr>
<td>L1 to Md</td>
<td>34°/10.5 mm</td>
<td>29°/5.5 mm</td>
</tr>
<tr>
<td>Nasolabial angle</td>
<td>83°</td>
<td>102°</td>
</tr>
<tr>
<td>Upper lip to E line</td>
<td>3.5mm</td>
<td>0 mm</td>
</tr>
<tr>
<td>Lower lip to E line</td>
<td>5.5 mm</td>
<td>1.5 mm</td>
</tr>
<tr>
<td>Lower lip to S line</td>
<td>4 mm</td>
<td>0.5 mm</td>
</tr>
</tbody>
</table>

**Table 1:** Cephalometric parameters of patient before and after treatment.

Temporary skeletal anchorage such as retromolar implant [12], onplants [1,3], palatal implants [13,14], mini-plates [15], mini-screws [7] and mini-implants [16] have overcome previous limitation of orthodontic tooth movement of anchorage loss and helped make absolute anchorage a reality by causing en masse movement in the desired direction without anchorage loss. As shown in the above case report, the use of TADs have provided absolute anchorage in the posterior segment and facilitated complete retraction of the anteriors into the extraction space with no forward movement of the posteriors as shown in figure 5.
Various authors [8,16-19] have discussed the stability and efficacy of TADs in maximum en masse retraction of the maxillary and mandibular anteriors into the extraction space with absolute anchorage control preventing adverse effect of conventional mechanics like molar slippage which has resulted in the desirable outcome.

Conclusions
In Class I bimaxillary dentoalveolar protrusion cases, TADs provide absolute anchorage for en masse retraction of the anterior teeth into the extraction space.

References