Class I Bimaxillary Proclination Treated With Tear Drop Loop- A Case Report

KEYWORDS
Bimaxillary proclination, frictionless mechanics, Tear drop loop, first premolar extraction

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ABSTRACT
Seventeen years male presented a skeletal Class I relation with bimaxillary dental proclination and edge to edge bite with tongue thrusting habit. Extraction of first premolars was planned to correct anterior proclination and achieve lip competency. Tear drop loop was used to retract upper and lower anteriors in order to reduce proclination. Habit remanding appliance was placed on the palatal surface of upper anteriors. Post treatment incisors inclination was improved and tongue thrusting habit was eliminated. As the incisors were retracted, lip competency, facial convexity and nasolabial angle improved.

INTRODUCTION
Bimaxillary dental proclination is a condition characterized by proclined upper and lower incisors and an increased procumbency of the lips. It is a malocclusion frequently encountered in Americans of African descent and Asian populations. Etiology of bimaxillary proclination is multifactorial and consists of a genetic component as well as environmental factors, such as mouth breathing, tongue thrusting habit and tongue volume.

Treatment protocol routinely consists of extracting first premolars followed by retraction of the anterior teeth with maximum anchorage. Group A anchorage mechanics allows the anterior teeth to be retracted to greatest extent, with minimal forward movement of anchoring teeth. Retraction of maxillary and mandibular anterior teeth is aimed at a decrease in the soft tissue procumbency and convexity. Retraction of anterior teeth during extraction space closure can be achieved by two techniques (a) friction (sliding) mechanics and (b) frictionless (loop) mechanics. The ideal force delivery technique should meet the following criteria: It should provide optimal tooth moving forces, comfortable for the patient, differential space closure, augment anchorage and economical. The optimal force level for retracting anterior has been indicated to be in the range of 150 to 250 grams. Various loops used in frictionless mechanics are vertical loop, boot loop, tear drop loop, T loop, omega loop, delta loop, mushroom loop etc. Tear drop loop is simple, economic, easy to fabricate and easy to activate. This case report describes use of frictionless mechanics with Tear Drop loop in a patient with bimaxillary dental proclination.
CASE PRESENTATION

20-year-old male patient’s chief complaint was “I want to get braces because my upper and lower front teeth are forwardly placed.” Patient presented tongue thrusting habit. Patient’s oral hygiene was satisfactory with no relevant medical history. Extra- orally, he showed skeletal Class I relation, convex profile, procumbent upper and lower lips, shallow mentolabial sulcus and excessive lip strain on closure (Fig 1). Dentition was characterized by a Class I molar relation bilaterally with severe bimaxillary dental proclination rotated upper canine, spacing, and edge to edge bite, with coincident midlines (Fig 2). Panoramic radiograph showed presence of 32 teeth with no evidence of bone loss. Lateral cephalometric radiograph showed a Class I skeletal pattern with Class I bimaxillary dental proclination and vertical growth pattern, as evidenced by SN-mandibular plane angle of 34°. Maxillary and mandibular incisors were proclined with U1 Na-11 mm/45° and L1 Nb-11 mm/41° (Fig 3).

TREATMENT OBJECTIVES

The primary objective was to eliminate tongue thrusting habit. In the maxillary dentition, the treatment objectives were to reduce dental proclination and achieve a more normal axial inclination of the incisors. Treatment objectives in the mandibular arch included reduction of dental proclination and reduce anterior spacing. Treatment objectives for the occlusion were to maintain the Class I canine and molar relation, establish ideal overjet and overbite.

TREATMENT PLAN

The main criteria in determining the applicable treatment plan was the severity of dental proclination and lip incompetency. Extraction of four first premolars was planned to correct dental proclination and reduce lip incompetency. Group A anchorage was needed to retract incisors and prevent mesial movement of maxillary molars. To enhance anchorage, transpalatal arch in maxilla and lingual arch in mandible was considered and frictionless mechanics was planned to accomplish differential space closure.

Table 1. CEPHALOMETRIC FINDINGS

<table>
<thead>
<tr>
<th>VARIABLE STAND-ARD</th>
<th>PRE-TREATMENT</th>
<th>POST-TREAT-MENT</th>
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<tr>
<td>SKELETAL</td>
<td></td>
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<tr>
<td>SNA</td>
<td>82° ± 2°</td>
<td>81°</td>
</tr>
<tr>
<td>SNB</td>
<td>80° ± 2°</td>
<td>79°</td>
</tr>
<tr>
<td>ANB</td>
<td>2°</td>
<td>2°</td>
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<tr>
<td>GO GN – SN</td>
<td>32°</td>
<td>34°</td>
</tr>
<tr>
<td>WITS APRAISAL</td>
<td>-1 mm</td>
<td>-1 mm</td>
</tr>
<tr>
<td>DENTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1 – SN</td>
<td>102° ±2°</td>
<td>120°</td>
</tr>
<tr>
<td>U1 – NA</td>
<td>4 mm / 22°</td>
<td>11 mm / 45°</td>
</tr>
<tr>
<td>L1 – NB</td>
<td>4 mm / 25°</td>
<td>11 mm / 41°</td>
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<tr>
<td>IMPA</td>
<td>92°±5°</td>
<td>107°</td>
</tr>
<tr>
<td>OVERJET</td>
<td>2 mm</td>
<td>0 mm</td>
</tr>
<tr>
<td>OVERBITE</td>
<td>2 mm</td>
<td>0 mm</td>
</tr>
<tr>
<td>SOFT TISSUE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NASOLABIAL ANGLE</td>
<td>90-110mm</td>
<td>79°</td>
</tr>
<tr>
<td>U LIP – S LINE</td>
<td>0 mm</td>
<td>4 mm</td>
</tr>
<tr>
<td>L LIP – S LINE</td>
<td>0 mm</td>
<td>3 mm</td>
</tr>
</tbody>
</table>

TREATMENT PROGRESS

MBT appliance (Ormco, Glandora, CA) 0.022×0.028” slot was used. Bondable buttons were bonded on the palatal aspect of maxillary anteriors as a habit reminder. A transpalatal arch in maxilla and a lingual arch in mandible were placed on banded first molars to enhance anchorage. Alignment and leveling was accomplished with following sequence of arch wires: (a) 0.016” heat activated nickel-titanium arch wires (b) 0.018” stainless steel arch wires and (c) 0.017×0.025”stainless steel arch wires. The arch wires were cinched distal to molar to avoid maxillary and mandibular incisor proclination. After aligning and levelling, the maxillary and mandibular dentition was consoli-
dated on 0.017×0.025˝ stainless steel arch wires. The en masse retraction was accomplished by the Tear drop loop, which was fabricated with 0.019×0.025˝ stainless steel wire. The loop was activated by 2 mm every six weeks. 15° of α bend and 25° of β bend was given in the Tear drop loop which generated differential moment to accomplish differential space closure (Fig 4). The space closure was completed 14 months after commencement of orthodontic treatment (Fig 5). After accomplishing space closure, 0.021×0.025˝ titanium molybdenum aluminum wires was placed for finishing. Settling was accomplished with 0.021×0.025˝ braided stainless steel arch wires with triangular vertical elastics. Treatment was ended in nineteen months. Post treatment photographs, diagnostic models and radiographs were taken. At the debond visit, the patient was given maxillary and mandibular removable circumferential retainer from second molar to second molar. The patient was instructed to wear the retainers full time for 6 months, half time for 12 months, then once per week at night indefinitely. The patient is being recalled every six months for follow up.

TREATMENT RESULTS
There was an impressive change in the patient’s appearance and smile on completion of treatment. With extraction of the first premolars, retraction of his upper and lower anterior were achieved. The lip incompetency, convexity of face and nasolabial angle was reduced. Post treatment intraoral photographs, study models and lateral cephalogram (Figs 6-8) showed that the maxillary incisors are inclined appropriately and mandibular incisors were slightly retroclined over basal bone. Panoramic radiograph (Fig 8) showed adequate root parallelism in both upper and lower arch. Habit was intercepted which improve treatment stability and minimize chance of relapse.

DISCUSSION
Bimaxillary proclination is common among various ethnic groups, the most affected population being Asians and Americans of African descent. It is characterized by severe proclination of anterior teeth of both the arches and lip procumbency. Extraction of first premolars was carried out to correct anterior proclination, achieve lip competency and deacrease facial convexity. Drobocky revealed that patients treated with extraction of first premolars have an average reduction of 3.4 mm and 3.6 mm in lip procumbency in relation to Rickett’s E-line. When premolars are extracted to correct the malocclusion, treatment plan must account for closure of extraction space. The main challenges confronted by orthodontist are anchorage maintenance, since mesialization of the posterior segment may compromise retraction of anterior teeth. According to Nanda, Group A anchorage describes the critical maintenance of the posterior tooth position, 75 % or more of the extraction space is required for anterior retraction. To augment the anchorage, a variety of adjuncts such as transpalatal arch, Nance holding button, TADs, frictionless technique or extraoral traction, are usually a necessity.
tual sliding of brackets and tubes along the wire. The other
is “frictionless mechanics”, in which the tooth or group
of teeth move due to the moment to force ratio generated
during activation of the loops. The attractiveness of slid-
ing mechanics is in its clinical simplicity, minimal chairside
time and patient comfort. Regardless of these advantages,
the efficiency of sliding mechanics may be compromised
due to effects of friction. High levels of friction may reduce
the effectiveness of the mechanics, decrease tooth move-
ment efficiency and further complicate anchorage control.
Uncontrolled tipping and deepening of overbite are other
unwanted side effects of poorly managed sliding mechan-
ics. These limitations of sliding mechanisms suggest that
an alternative approach needs to be considered. Well-de-
dsigned closing loops promote a more continuous type of
tooth movement by eliminating the intermittent “stick-slip”
force delivery seen in sliding mechanics. Additionally, since
closing loops deliver frictionless forces, the tissues of the
periodontium experience more continuous stresses. Con-
temporary studies on force constancy suggest that contin-
uous forces promote greater rates of tooth displacement.14
Burstone, Faulkner, and Germane advocated the use of
frictionless mechanics for space closure.17, 21.

The Tear drop loop has been recognized as an effective
means to achieve desired tooth movement by differential
moments between anterior and posterior segments.22 The
increase of wire length while maintaining the wire size
decreases the load-deflection rate. Also, the distribution of
the wire in relation to the bracket determines the moment-
to-force ratio. Since the tooth movement is achieved by
the deactivation of the loop itself, friction is not an issue.23
There is a greater constancy of force in the Tear drop loop.
However, precise control of tooth movement is possible in
a predictable manner with Tear drop loop. Differential
moment can be achieved in Tear drop loop which improves
anchorage control during space closure.24-26 TADs have
been frequently used to enhance anchorage but many un-
certain factors associated with TADs are anatomical limita-
tions, cost and the possibility of failure.27, 28

CONCLUSION

Bimaxillary dental proclination was treated successfully by
extracting four first premolars followed by retracting ante-
rior with Tear drop loop. Tear drop loop augment the an-
chorage by producing differential moment in anterior and
posterior segment and by reducing friction. Upper and
lower anterior was retracted by 7 mm. Upper incisor to NA plane
had decreased from 45° to 24° and lower incisor to NB plane
decreased from 41° to 19°. Superimposition showed mini-
mal changes in vertical dimension of face.

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