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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 reminding 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[1-4] descent and Asian populations[5,6]. 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.[7]

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[8,9,10]. Retraction of anterior teeth during extraction space closure can be achieved by two techniques (a) friction (sliding) mechanics and (b) frictionless (loop) mechanics.[11] The ideal force delivery technique should meet the following criteria[12]: 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[13]. Various loops used in frictionless mechanics are vertical loop, boot loop, tear drop loop, T loop, omega loop, delta loop, mushroom loop etc[14]. 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.

Fig 1: Pre treatment facial photographs

Fig 2: Pre treatment intra oral photographs

Fig 3: Pre treatment panoramic and lateral cephalometric radiographs

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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).

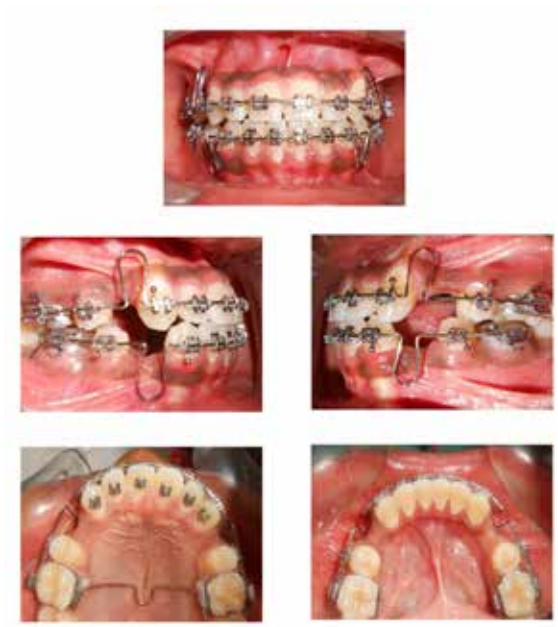

Figure 4- Tear drop loop in upper arch and lower arch

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

VARIABLE	STANDARD	PRE-TREATMENT	POST-TREATMENT
SKELETAL			
SNA	82° ± 2°	81°	81°
SNB	80° ± 2°	79°	79°
ANB	2°	2°	2°
GO GN – SN	32°	34°	35°
WITS APPRAISAL	-1 mm	-1 mm	-1 mm
DENTAL			
U1 – SN	102°±2°	120°	101°
U1 – NA	4 mm / 22°	11 mm / 45°	4 mm / 24°
L1 – NB	4mm / 25°	11 mm / 41°	3.5 mm / 19°
IMPA	92°±5°	107°	90°
OVERJET	2 mm	0 mm	1 mm
OVERBITE	2 mm	0 mm	1 mm
SOFT TISSUE			
NASOLABIAL ANGLE	90-110mm	79°	98°
U LIP – S LINE	0 mm	4 mm	0.5 mm
L LIP – S LINE	0 mm	3 mm	0 mm

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-

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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.

Figure 6- Post treatment facial photographs

DISCUSSION

Bimaxillary proclination is common among various ethnic groups, the most affected population being Asians and Americans of African descent[1-7]. 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[15]. 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[16], 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.

Figure 8- Post treatment orthopantomogram and lateral cephalogram

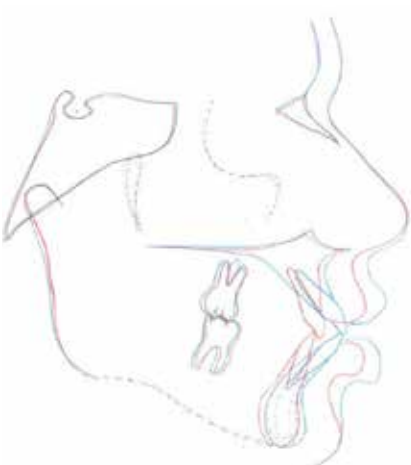

Figure 9- Superimposition

Orthodontic tooth movement during space closure may be accomplished with two different types of mechanics[11]. The first type is the "sliding mechanics", which involves the ac-

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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 sliding 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 movement efficiency and further complicate anchorage control. Uncontrolled tipping and deepening of overbite are other unwanted side effects of poorly managed sliding mechanics. These limitations of sliding mechanisms suggest that an alternative approach needs to be considered. Well-designed 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. Contemporary studies on force constancy suggest that continuous 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]. TAD's have been frequently used to enhance anchorage but many uncertain factors associated with TADs are anatomical limitations, cost and the possibility of failure[27, 28]. Upper and lower were 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 minimal changes in vertical dimension of face.

CONCLUSION

Bimaxillary dental proclination was treated successfully by extracting four first premolars followed by retracting anterior with Tear drop loop. Tear drop loop augment the anchorage by producing differential moment in anterior and posterior segment and by reducing friction. Upper and lower anterior was retracted by 7 mm in this case. Thus, with a Tear drop loop, desirable biomechanical responses were achieved successfully in a patient with bimaxillary proclination.

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