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Anterior Open Bite Correction Using Passive Self Ligating System: A Case Report

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Abstract

Anterior open bite (AOB) is defined as the lack of incisal contact between anterior teeth in centric relation. It is a difficult malocclusion to correct due to post treatment stability. Its prevalence ranges from 1.5% to 11%. Several etiological factors related to oral function have been associated with AOB. For example, sucking habits, presence of hypertrophic lymphoid tissues, mouth breathing, atypical phonation and swallowing, and anterior posture of the tongue at rest.

Key words: Anterior open bite, Self ligating

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Introduction

Anterior open bite in non-growing patients represents one of the most difficult challenges in orthodontic practice to treat due to its multifactorial aetiology[1]. Its high prevalence in children can be attributed to factors such as non-nutritive sucking habit[2] however its occurrence decreases with adults, since sucking habits decrease with age. The demand for correction of this malocclusion is very common as approximately 17% of orthodontic patients have AOB,[1] which means that as clinicians a thorough understanding of the most effective treatment options available in an effective and stable manner is invaluable to a successful orthodontic practice.

Due to its multifactorial aetiology, [1]various treatment modalities have been given for correcting this malocclusion. However, no conclusion has been reached as to the best treatment modality required for it. Some of the treatment modalities suggested in literature are as follows:

(a) Changes in behavior to eliminate habits or abnormal functions
(b) Orthodontic movement by extruding the anterior teeth or intruding the molars
(c) Surgical treatment of the basal bone.

A valid alternative to orthognathic surgery is the use of the passive self ligating (PSL) system.[3] However the cephalometric analysis must reveal the absence of a vertical growth pattern and the patient must also adhere strictly to the diligent wear of retainers in order to avoid relapse post operatively.

The choice of the passive self ligating system in the treatment of AOB in this case is due to the low force, low-friction of the system which permits the movement of teeth to their physiologic position without overpowering the musculature or compromising the periodontal tissues - This prevents ischemia in the surrounding periodontal tissues. It is also of noteworthy that the forces generated by the small dimension, high tech archwires of the PSL are too low to completely occlude the periodontal vascular supply; the use of heavy forces result in hyalinization in the periodontal ligament space and this ultimately halt tooth movement.[4,5]

Diagnosis and Aetiology

A 14-year-old female patient presented at the orthodontic clinic of the Lagos University Teaching Hospital Idi Araba Lagos Nigeria, complaining of "inability to bite with her front teeth." She was in good general health and had no significant medical and dental histories. According to her parents, she had no childhood history of a sucking habit but on examination her tongue's resting position was anterior.

She presented with Class 1 Angle's malocclusion with a skeletal pattern 3, a concave profile and an anterior open bite of 5mm that extended from the canine to canine.

ORIGINAL ARTICLE



Figure 1: Extraoral and Intraoral photographs

Treatment Objectives

The objectives of treatment were to break the habit; achieve a complete and normal bite; unravel the crowding in both upper and lower arches; Derotate all rotated teeth and to maintain the molar and canine in a class 1 relationship.

Treatment Alternatives

The treatment options consisted of the use of the Passive self ligating appliance (Damon); non-extraction with the use of tongue tamers or pre adjusted edgewise with four unit extraction of all first premolars and a tongue rake. Other options include the use of TADs to intrude the molars with either a preadjusted edgewise or self ligating brackets and Orthognathic surgery. Retention will be achieved with the use of Hawley's retainer with a tongue rake incorporated into it and or an Essix retainer with permanent retention in both upper and lower arches.



Figure 2: Pretreatment study models

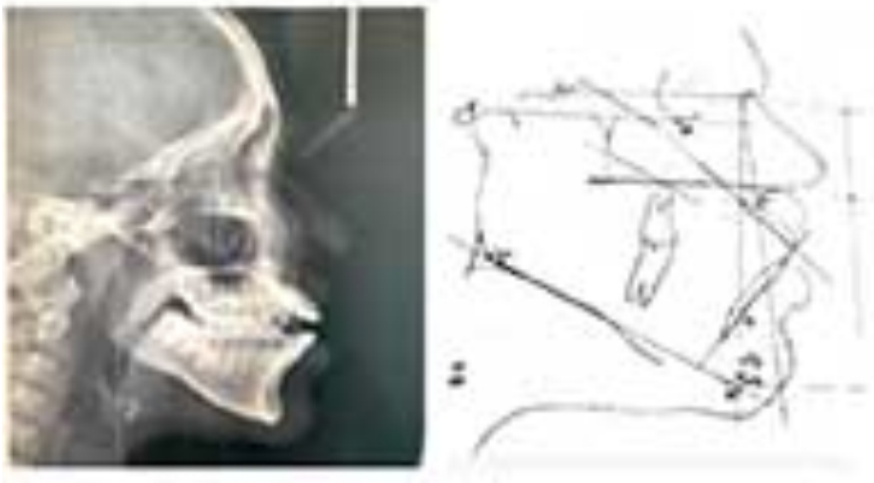


Figure 3: Pretreatment Cephalometric Radiograph and Tracing

Table 1: Standard and Initial Cephalometric Measurements

Parameter	Normal	Pre-Treatment	Comment
SNA	85.5±3.5°	85.5°	Normal
SNB	82.7`±3.0°	85°	Normal
ANB	2-4°	1.5°	SK. Pattern 3
UI-FP	119-127°	133°	Increased
LI-MP	96-104°	94°	Decreased
IIA	108-116°	97°	Decreased
FMA	24-26°	32.5°	Increased
MMA	24-26°	35°	Increased
LFH	55% of TFH	61.2%	Increased



Figure 4: Pretreatment Panoramic Radiograph

Treatment Progress

Set up of the upper and lower arches were done using the Self ligating prescription (Damon Q) with tongue tamers placed in the cervical and incisal regions of the palatal and lingual surfaces of the maxillary and mandibular incisors. Levelling and alignment was commenced with round wires -0.014 CuNiti wires for 10 weeks and 0.018 CuNiti for 8 weeks. After the levelling and alignment stage, we moved onto light rectangular archwires to begin torque expression i.e. 0.014 by 0.25; 0.018 by 0.25CuNiti. In addition, Light anterior elastics 5/16 (Ormco) were used for 8 weeks each. Treatment ended with 0.019 by 0.025 stainless steel.



Figure 5: Set up of the upper and lower arches.



Figure 6: Intraoperative photographs

Treatment Results

After 28 months of active treatment, a normal overbite; competent lips; proper alignment with satisfactory occlusion of all teeth, and a molar and canine class 1 relationship were achieved.



Figure 7: Post treatment Extraoral and Intraoral Photographs



Figure 8: Post treatment Photograph showing Upper Hawley's Retainer.



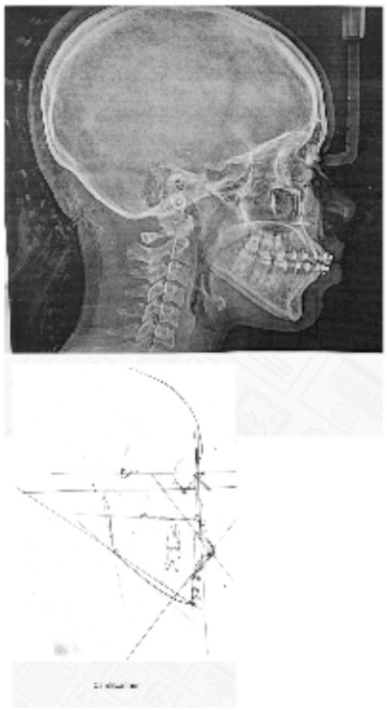
Figure 9: Post treatment Intraoral photograph showing Fixed lingual Retainer



Figure 10: Post treatment study models



Figure 11: Post treatment Cephalometric Radiograph



Parameter	Post Treatment	Normal
SNA	86° Normal	85.5±3.5°
SNB	84° Normal	82.7±3.0°
ANB	2° Skeletal Pattern 1	2-4°
UI-FP	124° Normal	119-127°
LI-MP	97° Normal	96-104°
IIA	105° Reduced	108-116°
FMA	35° Increased	24-26°
MMA	29° Increased	24-26°
LFH	62.4° Increased	55%

Figure 11: Post treatment Cephalometric Radiograph

Table 2: Post treatment Cephalometric Radiograph

Parameter	Normal	Post-Treatment	Comment
SNA	85.5±3.5°	86°	Normal
SNB	82.7`±3.0°	84°	Normal
ANB	2-4°	2°	SK. Pattern
1UI-FP	119-127°	124°	Normal
LI-MP	96-104°	97°	Normal
IIA	108-116°	105°	Decreased
FMA	24-26°	35°	Increased
MMA	24-26°	29°	Increased
LFH	55% of TFH	62.4%	Increased



Figure 13: Photograph of pre and post extraoral and intraoral frontal views



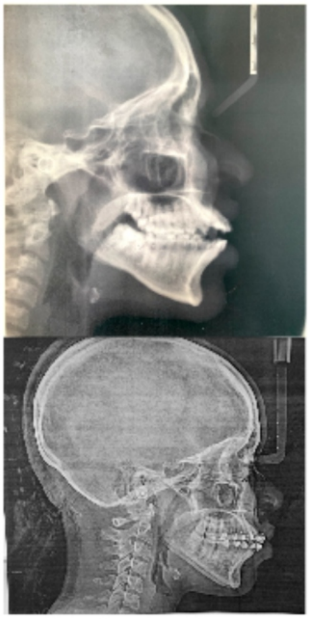
Figure 14: Photograph showing pre and post study models.



Figure 15: Photograph showing pre and post left buccal view.



Figure 16: Photograph showing pre and post cephalometric radiograph.



Parameter	Pre Treatment	Post Treatment	Normal
SNA	85.5°	86°	85.5±3.5°
SNB	85°	84°	82.7±3.0°
ANB	1.5°	2°	2-4°
UI-FP	133°	128°	119-127°
LI-MP	94°	104°	96-104°
IIA	97°	101°	108-116°
FMA	32.5°	32°	24-26°
MMA	35°	32°	24-26°
LFH	61.2°	57.8°	55%

Figure 17: Photograph of pre and post cephalometric radiograph and a table of results.

Discussion

In treating anterior open bite, the following must be analyzed: treatment objectives and the stability of the specific case. Various therapies have been recommended for the correction of this malocclusion; all with the aim to promote dental or dentoalveolar compensation.[1] Skeletal correction with the aid of orthognathic or orthopedic surgery can also be performed. However, for non-growing patients, surgery is recommended and this entails maxillary intrusion, with counter-clockwise mandibular rotation.[1]This was a non-surgical case.

The continuous evolvement of orthodontics since the early 20th century has seen changes in treatment philosophy, mechanics, and appliances and this has greatly influenced our understanding of orthodontic tooth movement. From Angle's to Tweed to Andrews, despite all the different philosophies, one thing has remained constant; the wire still has to be ligated in the bracket with elastomeric module or steel ligatures.[6]

For sliding mechanics, brackets that experience low friction are the most desirable. Low friction is important during the leveling and aligning stages of orthodontic treatment as this permits a more efficient force delivery, less force produces faster expression of the wire.[7]

Self-ligating brackets are ligatureless bracket systems that have a mechanical device built into the

bracket to close off the edgewise slot. The door holds the archwire in the bracket slot and replaces the steel/elastomeric ligature and this moveable fourth wall of the bracket converts the slot into a tube. [8]

Light forces are the key to self-ligation, and this has been proposed to produce low force. These low-friction systems allow teeth to travel to their physiologic position because they do not overpower the musculature or compromise the periodontal tissues. Ischemia is also not induced in the surrounding periodontal tissues because the forces generated by the small-dimension, hightech archwires of the self-ligating system are too low to completely occlude the periodontal vascular supply. On the other hand, applying heavy forces on the teeth can cause hyalinization in the periodontal ligament space which brings tooth movement to a halt.[9] Self-ligating brackets place enough force on the teeth to stimulate tooth movement without completely disrupting the vascular supply and, therefore, tooth movement is more effective and physiologic.

The final position of the teeth after treatment with the self-ligating bracket systems is often determined by the balanced interplay between the oral muscles and periodontal tissues, not necessarily by heavy orthodontic forces. Also, its design permits tooth movement in the path of least resistance. When the gate is in its closed position, the bracket essentially becomes a tube in which the flexible nickel-titanium archwire can move freely.[10] By greatly reducing the amount of friction with passive self-ligating brackets, low force archwires can work to peak expression and stimulate teeth to move in a more biologically compatible method. Teeth movement is also more efficient when they are allowed to move individually, and passive self-ligating brackets offer more freedom for teeth to move to their natural positions, even though they are still interconnected because the archwire is never tightly engaged with the bracket slot.[10]

Two types of self-ligating brackets have been developed, active and passive. These terms refer to the mode in which they interact with the archwire. The active type has a spring clip that encroaches on the slot from the labial/buccal aspect and presses against the archwire providing an active seating force on the archwire and ensuring engagement. [5]
In the passive type, the clip does not press against the archwire. Instead, these brackets use a rigid door or latch to entrap the archwire providing more room for the archwire such as Damon (Ormco).
The proposed benefits include reduced friction between archwire and bracket, reduced clinical forces, reduced treatment time, faster alignment, faster space closure, different arch dimensions, better alignment and occlusal outcomes, less patient pain, and more hygienic.[10]
Lighter forces along with reduced friction of the passive self-ligating system were engaged in the treatment of this case. The Damon Q was used in this study due to the aforementioned benefits and also the early use of light anterior elastics also aided in the closure of the Anterior open bite and this is only possible with the use of the passive self-ligating system employed.

Conclusion

The treatment of Anterior open bite, which is thought to be a challenging malocclusion for orthodontists with the passive self-ligating bracket system and tongue tamers, provides us with another successful treatment alternative for this malocclusion with the exclusion of extractions.

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