Functional Jaw Orthopaedics for Management of Class II Division 1 Malocclusion

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Introduction

Malocclusion is a deviation from rarely attained ideal arrangement among teeth (normal occlusion) that does not necessarily cause a functional problem [1]. Class II Division 1 malocclusion is characterised by the mandibular dentition “distal” to the maxillary dentition; the malrelation may be due to a basic osseous dysplasia or due to forward movement of the maxillary dental arch and alveolar processes or combination of skeletal and dental factors.

The purpose of dentofacial orthopaedics is to modify the pattern of facial growth and the underlying bone structure of the face. The objective is to promote harmonious facial growth by changing the functional muscle environment around the dentition. The principle of functional therapy is to reposition a retrusive mandible to forward position by constructing an appliance with a protrusive bite when the appliance is placed in the mouth. The mechanics are reversed to correct a retrusive maxilla, but the principle remains the same [2].

The twin block appliance (TBA), described by William J Clark in 1982, is considered the most successful functional appliance in the treatment of Class II division 1 malocclusion. [3]. The TBA incorporates the use of upper and lower bite blocks, interfacing at 70° to achieve the desired forward position of the mandible and redirect occlusal forces to achieve rapid correction of malocclusion.

Case Report

An 11 year old girl presented a well established late mixed dentition with an Angle's Class II division 1 malocclusion (Fig. 1a, 1b), a retrognathic mandible with an overjet of 11 mm. The tongue was normal in size and posture, adenoids were not enlarged and there was no history of deleterious oral habits. The patient was mesocephalic. A hyperactive

mentalis activity was present. The maxillary anterior dentition was proclined. The overbite was deep and complete. The buccal segments showed a full unit distal occlusion. A construction wax bite with 7mm mandibular protrusion and 2 mm inter-incisal separation was recorded. A modified TBA (Fig. 2a, 2b) was fabricated with Adam's clasps on 16, 26, 34 and 44 for retention and a midline screw to expand the maxillary arch. Minimal wire components facilitated faster and easier fabrication and since there was no anterior wire component, the appliance was esthetically more acceptable to the patient.

The appliance was fitted and the patient instructed to wear appliance at all times except while brushing; during contact sports and swimming. The patient was reviewed every eight weeks. Therapeutic trimming of the posterior bite blocks was done to facilitate eruption of mandibular molars during follow up visits. The antero-posterior correction was achieved after ten months. The TBA was replaced with a modified maxillary Hawley's appliance with an anterior inclined plane to support the corrected occlusion and an active labial bow to close the midline diastema.

Support and retention continued for a period of 14 months, reducing appliance wear when the buccal segments were settled into a stable occlusion with good cuspal interdigitation. The total treatment time was two years, including retention. This case illustrates the treatment response to the modified TBA. The final result shows well-aligned arches with the overjet and overbite reduced successfully, improved inter-digitation in the buccal segments (Fig. 3a, 3b) and improved facial profile.

Pre and post-treatment cephalometric appraisal reveal that sagittal correction was achieved by an increase in the SNB angle (Fig. 4a, 4b). The maxillary incisors have retroclined with the inter-incisal angulation approaching normal Table 1. Prior to treatment, the index of orthodontic treatment need (IOTN) was 5a with an aesthetic component score of nine. After treatment, the IOTN and aesthetic component scores both reduced to one. A peer assessment review (PAR) score

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Fig. 1 : Pre-treatment photographs (a) right lateral intraoral showing increased overjet and overbite, (b) extraoral profile showing retruded mandible.

Fig. 2 : Intra-treatment photographs (a) right lateral intraoral showing TBA in situ. (b) maxillary occlusal showing expansion screw for transverse expansion.

Fig. 3 : Post-treatment intraoral (a) right lateral photograph showing normal overjet and overbite, (b) extraoral profile showing improved mandible position.

reduction of 95% placed the patient in the 'greatly improved' category.

Discussion

Dentofacial orthopaedics represents a positive approach to the treatment of craniofacial imbalance by addressing the underlying cause of malocclusion, in an effort to maximize the natural potential for corrective growth [4]. A functional appliance displaces the lower jaw downwards and forwards and increases the intermaxillary space in the anteroposterior and vertical dimensions. Repositioning the mandible stimulates a proprioceptive response in the muscles of mastication. The purpose is to encourage adaptive skeletal growth by maintaining the mandible in a corrected forward position for a sufficient period of time to allow adaptive skeletal changes to occur in response to a functional stimulus [2].

TBA rapidly reduces overjet, is versatile and allows early correction of overjet. TBA has a tendency to increase vertical face height [5]. This may be desirable in patients with deep bite, but it is contraindicated in those presenting with mandibular retrognathia and an increased vertical dimension, where a further increase in the vertical dimension is unfavourable for the soft tissues.

TBA is simple, economical and effective. Unlike most removable functional appliances, TBA is not bulky. Comfort, aesthetics and full-time wear translates to rapid correction of malocclusion. TBA has the advantage of independent control of the upper and lower arch. There

Fig. 4 : Lateral cephalograms (a) Pre-treatment showing retruded mandible, increased overjet and overbite (b) Post-treatment showing corrected mandibular position, overjet and overbite.

are good three dimensional arch developments in the antero-posterior, transverse and vertical planes. The benefit is shorter treatment time. Patients maintain normal function and appearance because there are no lip, cheek or tongue pads. The patient's appearance is noticeably improved when the appliances are fitted. Twin block appliance clinically significantly increases mandibular length and reduces overjet [6,7].

Functional appliances have a growth modification effect which may be used in the treatment of Class II malocclusion in growing patients. They are associated with an improvement of the sagittal intermaxillary relationship. TBA accomplishes this mainly by acting on the mandible and also shows a significant change in

Table 1**Pre and post treatment cephalometric appraisal**

Cephalometric measurement	Normal	Pre-treatment	Post-treatment
Sella-Nasion- A-point * (SNA)	82 + 2°	83°	83°
Sella-Nasion- B-point # (SNB)	80 + 2°	78°	81°
ANB (SNA- ANB)	2°	5°	2°
Wits measurement	1 mm	6 mm	2 mm
Cranial length (Basion to Nasion)	110 + 4 mm	112 mm	112 mm
Maxillary length (Basion to A-point)	97 + 5mm	95 mm	95 mm
Mandibular length (Basion to Pogonion)	110 + 6mm	107 mm	111 mm
Y Axis (Nasion- Sella- Gnathion)	66°	61°	68°
Convexity	2.3 mm	3 mm	2 mm
Upper incisor to Nasion- A-point (degree/mm)	22 + 2°/4 mm	36 °/9 mm	21 °/4 mm
Lower incisor to Nasion- B-point(degree/mm)	25 + 4°/4mm	26°/4 mm	26°/4 mm
Upper incisor to Lower incisor	131°	113°	133°
Lower incisor to A-point /Pogonion	1 + 2 mm	0 mm	1.5 mm
Nasolabial angle	95°+ 5°	78°	94°

* Subspinale, # Supramentale

the maxillary skeleton [8].

TBA therapy achieves about 40% overjet correction by skeletal and about 60% by dentoalveolar changes. Correction of buccal segments is by the combination of distal movement of the upper molars and forward migration of lower molars [7].

Conflicts of Interest

None identified

References

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ERRATUM

Letter To Editor : "Severe Symptomatic Diuretic Induced Hyponatremia" MJAFI April 2010; 66 : 198, para 4, line 7.

For: He was started with 3% normal saline at the rate of 30 ml/min (0.5ml/kg).

Read: He was started with 3% normal saline at the rate of 30 ml/hour (0.5 ml/kg/hour).

The error is regretted.