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TREATMENT EFFECTS OF TWIN BLOCK THERAPY- A REVIEW OF LITERATURE.

Orthopaedics

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KEYWORDS

INTRODUCTION

Since the development of the twin block appliance by W.J. Clark in 1982[1] for the treatment of Class II malocclusions with mandibular skeletal retrusion, it has been the most popular and successful functional appliance for correction of sagittal skeletal discrepancy. Twin block has been described by the patients as the most successful and comfortable of all functional appliances[2]. In cases of growing patients with skeletal Class II malocclusion with mandible retrusion, the Class II Twin-block appliance can be used to stimulate and enhance mandibular growth. This appliance consists of upper and lower removable plates[1]. Since the success with removable appliances largely depends on patient's compliance, using a more tolerable appliance can increase the chances of a favourable outcome[3]. In comparison with removable functional monoblocks, the appliance's separate plates and a less bulky appearance improve patient compliance and increase the time for which the subjects wear the appliance.

The prime goal of T.B. therapy is to achieve increase in the mandibular length concommittent with positive soft changes, but the Twin Block appliance has been observed by various investigators to bring about changes in cervical column, airway and even on body posture[4,5].

This article reviews the skeletal , dentoalveolar and facial soft tissue changes following twin block therapy. Moreover we also discussed the variations in the upper airways ,psychological impact and cervical column after the treatment with twin block appliance

SKELETAL AND DENTAL EFFECTS

MANDIBULAR EFFECTS

The main objective of Twin-block therapy is to increase mandibular growth by stimulating increased growth at the condylar cartilage. The biological responsiveness of the condylar cartilage depends on the growth rate of the jaw[6]. However, the jaw growth rate is not constant throughout the life but has a peak during puberty. Better results are obtained when the treatment with functional device coincides with the growth peak[7,8].

The effect of functional appliance on mandibular growth is controversial. Many researchers have claim extra mandibular growth with Twin-Block appliance (Illing *et al*[9].,Mills and McCulloch[10], Lund and Sandler[11]). Some authors demonstrated only small changes in mandibular growth and concluded that it was not affected by treatment with functional appliances. On the other hand, other authors suggested that there may be significant influences on mandibular growth after timely intervention.

Lund and Sandler reported an average increase in the distance from articulare to gnathion of 2.4 mm during a 12-month period of Twin-block treatment[11], Mills and McCulloch[10] also found a greater mandibular growth (4.2 mm) with Twin Block therapy. Toth and McNamara[12] found 3.0 mm additional increase in condylion to gnathion length during a standardized 16-months period of Twin-Block therapy as compared to 1.9 mm increase in Frankel group. Study by sharma et al[13] also showed a statistically significant increase in mandibular length following Twin-block treatment by 7.1 mm.

Clark,[14,15] Illing *et al.*[9], Lund and Sandler[11], Mills and McCulloch[10], Trenouth[16], Sidlauskas[17], Sharma et al[13] reported increase in the SNB angle. Jena AK *et al.*[18], has found 1.65 mm and 1.05 mm extra mandibular growth following in the Twin Block and bionator group respectively compared with controls. The greater increase in total mandibular length was associated with significant increases in the height of the mandibular ramus and in the length of the mandibular body in the group treated at the peak. The greater additional growth of the mandible is concomitant with significant changes in the direction of condylar growth. Although most studies, except for O'Brien *et al.*'s[19] study, found statistically significant increases in angle between cephalometric points S, N and B (SNB).

Some authors reported significant lower incisor proclination during treatment with Twin Block appliance: Lund and Sandler[11]-7.9°, Mills and McCulloch[10]-5.2°. However some other studies, found that lower incisor remained comparatively stable after Twin-Block therapy (Trenouth[16] reported 1.4°, Toth and McNamara[12] by 2.8°, Sidlauskas[17] by 3.2°, Sharma et al[13] by 1.1°.

Sidlauskas[17] found forward migration of lower molars of 0.9 mm dentoalveolar and 1.7 mm skeletal component. Jena et al[18] found the forward movement of the mandibular molars in the Twin-block subjects was 1.45 mm, significantly greater than in the control group. Lund and Sandler[11] noted substantial (2.4 mm) forward movement of the lower molars.

MAXILLARY EFFECTS

Findings about maxillary skeletal effects are controversial. Many studies did not find a 'headgear effect' with Twin-block, Lund and Sandler[11] hypothesized that upper incisors retroclination and labial tipping of their roots can result in remodelling of point A to a more anterior position. This anterior remodeling could therefore mask any maxillary restraint effects that might have occurred. However, on the other hand, Mills and McCulloch[10] and Sidlauskas[17] both found statistically significant headgear effect based on reduction of angle between cephalometric points S, N and A (SNA) (1 and 0.8 degree, respectively) and Sidlauskas[17] and O'Brien *et al*[19] both found statistically significant changes in maxillary base length (0.7 and 0.8 mm, respectively); but, these changes were too small to be considered clinically significant.

Most studies found retroclination/ retrusion of upper incisors regardless of presence or absence of a labial bow. Authors like Jena *et al.*[18]Toth and McNamara[12] Baccetti *et al.*[20], Mills and McCulloch[10] , Illing *et al*[9]., Sidlauskas[17] , all found that there is retroclination of upper incisors either due to the labial bow or due to the pressure of upper lip musculature during functional treatment. Sharma et al[13] in their study found a mean reduction in the proclination of upper incisor (6.9°) which was both statistically and clinically significant, which was more than that reported by Rakosi , McNamara,Trenouth ,Lund,Toth and less as reported by Illing et al[9] ., (9.1°). Sidlauskas[17] found that upper first molars were distalized 1.0 mm. In addition, some withholding effect was noted with respect to the eruption of the maxillary molars, only 0.2 mm net eruption under the Twin-block action.

CHANGES IN MAXILLA TO MANDIBLE RELATIONSHIP

SKELETAL AND DENTAL CHANGES:

ANB angle is a measure for the change in skeletal maxillomandibular

relationship. Clark[14,15] Trenouth[16], Illing et al[9]., Lund and Sandler[11], Mills and McCulloch.[10] , Sharma et al[13] reported a significant reduction in the ANB angle. A statistically significant reduction observed in angle ANB following treatment is mainly because of increase in SNB which is increased significantly by anterior positioning of mandible and slightly with a small reduction in angle SNA due to restraint of forward maxillary growth. Thus the resultant reduction in the severity of maxillomandibular discrepancy was majorly mandibular skeletal changes and so called headgear effect was minimal.

A highly significant decrease in the magnitude of overjet is observed in almost all the studies. The overjet correction was a combined effect of maxillary incisor retroclination and slight mandibular incisors proclination with marked skeletal contribution (forward growth of mandible) at the end of the treatment. This is supported by results shown by Weiland[21], Illing *et al*.[9], and Mills and McCulloch.[10] Clark[14,15], Vergervik[22] , Lund and Sandler[11], Tumer and Gultan[23], Sharma et al[13] found that the overbite reduced following the Twin Block treatment significantly. This reduction in overbite was because of combined effect of downward and backward rotation of mandible along with selective eruption of molars.

Twin-block therapy produces an efficient reduction in the overjet and a remarkable correction in the molar relation. Both the distal movement of upper molars and the mesial movement of lower molars contributed to the correction in molar relation. Mills and McCulloch [10]concluded that the headgear effect caused relative distalization of the maxillary molars during Twin-block appliance treatment.

Control of the vertical dimension is one of the proposed benefits of the Twin-block appliance[15]. Other changes included the delay of eruption of the upper maxillary molars and the enhanced eruption of the mandibular molars.[24,25]

The acrylic bite blocks either can inhibit molar eruption in patients with increased facial height (long face) or can be modified to allow posterior dental eruption in patients with reduced facial height (short face). Removing acrylic selectively we allow an increase in the vertical dimension and this an important component of Twin-block therapy[14].

Toth and Mcnamara[12] reported 3.0 mm increase in anterior face height and 3.2 mm increase in posterior face height. Lund and Sandler[11] found 2.6 mm increase in total anterior face height after Twin Block therapy . Mills and McCulloch[10] noted an increases of 3.8 mm in total anterior face height and 2.9 mm for posterior face heights. Therefore, two-block therapy is indicated in patients with deep bite.

SOFT TISSUE CHANGES

With the Class II Twin-block treatment, lower facial soft-tissue adaptation occurs in response to mandibular advancement. Previous studies investigating the effect of the Class II Twin-block appliance have shown esthetic improvement of the facial profile however, some other studies have shown no significant change in the soft tissue. Individual variation in response to Class II functional appliance treatment has also been reported, with some patients exhibiting poor facial profile improvement after treatment.

Kim et al[26] concluded that clinicians cannot accurately judge whether a patient's soft-tissue profile will improve after Class II Twin-block treatment based on facial profile examinations alone. In various other studies which analyzed soft-tissue profile changes after Class II Twin-block treatment, some of the features reported included the retraction of the upper lip, anterior movement of the soft-tissue pogonion, reduction in soft-tissue convexity, and reduction in the H and mentolabial angles. However, Kim et al[26] observed advancement of the lower lip and soft-tissue pogonion after treatment in both favourable and unfavourable groups. They concluded that esthetic judgment may be more dependent on total facial balance rather than regional changes. Furthermore, they indicate that the soft-tissue response is not fully synchronized with the underlying hard tissue. A study evaluating the soft-tissue changes after Twin-block and mini-block appliance treatment reported a wide range of responses and concluded that a simple hard-tissue to soft-tissue change ratio may not be ideal. In addition, the measurement method itself may be inappropriate because, while growth may occur in both the vertical and sagittal directions, only the sagittal direction is measured. Studies by Luo and Fang[27] ,Moris et al[28] concluded that even though studies have reported significant dentoalveolar changes and some skeletal changes with the twin block appliance, it seems that those changes do not produce significant soft tissue profile changes.

AIRWAY AND CERVICAL COLUMN CHANGES

It is reported that the upper cervical spine is the mediator between head and trunk that forms a functionally inter-related system. A strong association has been devoted among the sagittal skeletal malocclusions and posture of the neck in the literature. The relationship between a habitual lack of an upright head posture, an inferior position, and a lordosis of the cervical spine relation with the angle Class II has been demonstrated[29]. In addition, a negative correlation between the cervical lordosis angle and mandible length in adult skeletal Class II individuals was stated. It was established that craniocervical system changes occur after mandibular base is repositioned in a more anterior position.

Aglarci[4] observed that besides skeletal improvements of the skeletal-sagittal relationship, there was an increase of the cervical curvature angle. Kamal and Fida [30] found that craniocervical posture became more upright after Twin-block therapy. Craniocervical posture was also found to be related to the size of the mandible, which in turn has been related to airway size.[31] Both Jena et al[33] and Ghodke et al[32] found that there is an increase in the PAP dimension following twin-block therapy among subjects with retrognathic mandible.

CONCLUSION-

It is evident from the studies that patients treated with Twin Block app liance for correction of skeletal class II malocclusion benefit from the treatment. Positive post treatment changes such as increase in the mandibular length, reduction in the overjet ,profile changes ,etc. have been documented in the past. However classification and analysis of Class II skeletal patterns needs to be more detailed and sophisticated to differentiate patients with Class II malocclusion in the view of the potential benefits of twin block. More over there is not much data available showing the long term effects and stability of Twin block treatment. Also very few studies have measured actual measurements of mandibular fossa adaptation or relocation. Therefore, it is recommended that further studies be conducted to assess the long term effects of the Twin Block appliance on mandibular growth increments as well as to see the role of mandibular fossa adaptation and possible relocation with the functional appliance.

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