ORIGINAL ARTICLE

EVALUATION OF SOFT TISSUE CHANGES AFTER USE OF TWIN BLOCK VERSUS HERBST APPLIANCE IN CLASS II PATIENTS

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ABSTRACT

The Objective of this study was to compare the mean changes in soft tissue parameters in Class II patients treated by Twin Block versus Herbst appliances .140 Class II , division 1, mandibular retrognathic patients coming to orthodontic department of the Dental section CH&ICH Lahore were divided into two groups. Seventy patients were randomly allocated to one of two functional appliance treatment groups. Both group comprised of 30 Female and 40 Male. First Group was treated with the Twin Block appliance. The second group received treatment with Herbst appliance. Pre-treatment (T0) and post-treatment (T1) Lateral cephalograms were used to evaluate soft tissue changes. Student t –test was used to compare mean changes in soft tissue profile parameters in both groups. P value < 0.05 was considered as significant.Mean age of patients were 12.06 ± 0.97 years. 60 Patients (42.8%) were males while 80 patients (57.14%) were females. Significant mean difference (p-value < 0.001) was observed between pre-treatment and post-treatment values of H angle in both groups. Pre-treatment to post-treatment mean difference for VRL-Si, VRL-Pog were more significant in Twin block treated Group.This study concluded that both Herbst and Twin Block significantly changed the soft tissue profile but greater advancement of soft tissue pogonion (VRL-Pog) and lower lip (VRL-Si) were observed in Twin Block group.

Key words: *Class II malocclusion, twin block appliance, growing patients, Herbst appliance.*

INTRODUCTION

Class II malocclusions are frequently encountered in orthodontics, manifesting in various skeletal and dental configurations. It is challenging to solve the anteroposterior problems in adults with Class II malocclusion and mandible retrognathism. The main goal of treatment for skeletal Class II in growing patients is to obtain "lengthening" of the mandible.[1] Skeletal Class II malocclusion can result from either maxillary protrusion, mandibular retrusion, or a combination of the two.[2] Treatment plan of these patients should be directed towards to solve the dentoskeletal disharmony in order to obtain favorable facial aesthetics.[3]

Class II treatment can be done by use of orthopedic appliances, extra oral traction and functional appliances. Functional appliance therapy is a commonly used treatment protocol for growing Class II patients with mandibular deficiency.[4] Functional appliances have been used to correct skeletal Class II malocclusion by repositioning the mandible anteriorly, with favorable changes around Temporo-mandibular joint (TMJ). Stimulation of lateral pterygoid activity leading to increased condylar growth at its muscular attachment has been proposed as a mandibular growth controlling mechanism.[5]

With advancing age the rigidity of skeletal component limits the extent and stability of orthopedic change. That is why optimal age for Class II correction due to retrognathic mandible with functional appliance is at late mixed dentition or early permanent dentition period.[6,7] Posturing the mandibular forward by means of functional appliance provide increase in mandibular length.

Different types of functional appliances are available for the correction of Class II skeletal and occlusal disharmonies e.g. Bionator ,FR-2 of Fränkel,fixed and removable

Herbst appliances Mandibular Protraction appliance.[8] Twin Block and Herbst appliances are among the most Popular functional appliances[9] Twin Block appliance is the most preferred functional appliance in UK[10] and The Herbst appliance is most commonly used in most countries.[11]

Twin block was first introduced by Clark in 1988 [5]

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and consists of two separate, upper and lower, removable plates with acrylic blocks trimmed to an angle of 70 degrees. Twin block is is widely used because of its high patient acceptability and ability to produce rapid treatment change.[5] The Herbst appliance was introduced in the early 1900s by Emil Herbst as a fixed bite-jumping device for Class II treatment. Pancherz reintroduced the Herbst in the 1970s as a banded appliance.[12] It is reported in the literature that The Herbst appliance can correct Class II skeletal problems by encouraging mandibular growth.[13]

Therefore, the aim of this study is to evaluate the mean changes in soft tissue parameters in class II patient treated with two different appliances. This study will help in diagnosis and treatment planning of orthodontic cases with a more conservative option such as functional appliance instead of surgical procedure which is an aggressive option besides being more costly and fearful procedure.

METHODOLOGY

This Randomized Clinical Trial was done on 140 Class II division 1 ,mandibular retrognathic patients (80 Males, 60 Females), who reported to Children Hospital and Institute of Child Health Lahore from 13-01-2017 to 24-01-2018. Inclusion criteria was age 11 to 14 years, Skeletal Class II relationship (ANB > 4 °and SNB < 78), Over jet ≥

5 mm and SN – MP= 30° ± 4°,Bilateral Class II molar and canine relation (at least 3.5 mm). Exclusion criteria was standardized as previous history of orthodontic treatment, Congenitally missing or extracted permanent tooth (except third molars), Syndromes and skeletal dysplasia patients

All basic demographic information of each case (Name, age, address and contact) were noted and patients were randomized according to Lottery method to either Group 1 or Group 2. All this information was recorded through pre-designed Proforma attached.

GROUP 1: Twin block group, patient were treated with twin block appliance.

GROUP 2: Herbst group, Patient were treated with Herbst appliance.

For Twin block group construction bite was record with the mandible forward by 70 percent of the maximum protrusive path [7] and 2 – 4 mm beyond the free way space. The patients were instructed to wear the appliance full time. When a normal or corrected overjet in retruded position was recorded, the active treatment finished and records of patients were taken including Cephalometric radiograph and study cast model.

For Group II Acrylic splint design of Herbst was used. The construction bite was recorded with the mandible forward by edge-to-edge incisor position. When a normal or corrected overjet in retruded position was recorded, the active treatment finished and records of patients were taken as for Group I.

Soft tissue linear measurements were traced on Lateral Cephalometric radiographs according to a vertical reference line.A horizontal reference line was constructed 7° less than sella–nasion line. Then, a vertical reference line perpendicular to horizontal reference line and passing through sella was drawn.[9] Soft tissue linear measurements were measured on lateral cephalogram before start of treatment and then The twin block and herbst were removed and following post treatment soft tissue angular and linear measurements of lateral cephalogram were repeated after 1 year of treatment. All this information was collected through specially designed Proforma. Measurements used in the study are shown in fig 1. Mandibular soft tissue measurements

1. VRL – Si 2. VRL – pog

Soft tissue angular measurements

3. H angle.

VRL-pog, (2).H angle (3)

Statistical analysis was done using SPSS 20. Pre treatment and Post treatment measurements and change in VRL-Si, VRL-pog, H angle and age were presented as means and standard deviation. Gender was presented by Frequency and percentage (qualitative variables).Mean change in VRL-Si, VRL-pog, H angle at the end of 1 year will be calculated by subtracting Pre treatment measurements (T1) from post treatment measurements (T2) Student t –test will be used to compare mean changes in soft tissue profile parameters in both groups. P value ≤ 0.05 was considered as significant. Data was stratified for age, gender to address the effect modifiers. Post –Stratification Student t-test was be applied to check the significance with P value ≤ 0.05 as significant.

RESULTS

The age range of 140 patients were between 11 years to 14 years of age. The mean age was 12.57 ± 0.71 years. About 60 (42.8%) of them were males and the remaining were females. There were 30 (21.48%) patients aging < 12 years, 90 (64.28%) .Patients aging 12-13 years, 20 (14.28%) patients aging < 14(Table1).

The mean H angle in Herbst treated group at pre-treatment was 18.25 ± 5.26 mm and at post-treatment was 16.13 ± 3.38 mm. There was significant difference 2.12 ± 1.88 mm in mean H angle at the 2 treatment time points (p < 0.001) (Table 3).

The mean H angle in Twin block treated group at pre-treatment was 19.27 ± 4.57 mm and at post-treatment was 16.95 ± 2.88 mm. There was significant difference 2.32 ± 1.69 mm in mean H angle at the 2 treatment time points ($p < 0.001$) (Table 2).

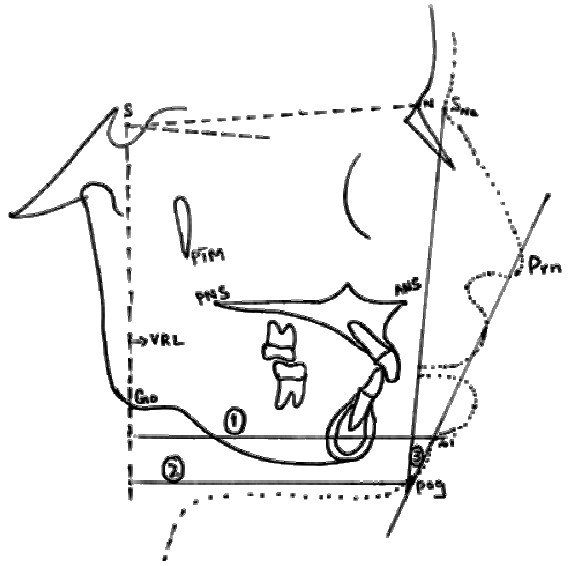

Fig 1: Soft tissue linear and angular measurements: VRL-si, (1) VRL-pog, (2).H angle (3)

TABLE 1: DISTRIBUTION OF PATIENTS BY AGE (N=140)

Age (in years)	Number	Percentage
< 12	30	21
12-13	90	64
≥14	20	15
Total	140	100.0
Mean±SD	12.57 ± 0.71	

The mean VRL-Si in Herbst treated group at pre-treatment was 69.51 ± 5.51 mm and at post-treatment was 71.61 ± 4.98 mm. The mean difference was observed to be non significant at the 2 treatment time points ($p = 0.01$) (Table 2).

The mean VRL-Si in Twin block treated group at pre-treatment was 70.30 ± 5.42 mm and at post-treatment was 76.90 ± 5.51 mm. A difference of 6.60 ± 0.09 mm was observed which was ascertained as significant ($p < 0.001$) (Table 2).

VRL-Si was much more significant in twin block group than herbst treated group(Table 2)

The mean VRL-Pog in Herbst treated group at pre-treatment was 70.50 ± 5.91 mm and at post-treatment was 72.15 ± 6.11 mm. The mean difference was observed to be non significant at the 2 treatment time points ($p = 0.04$) (Table 2).

The mean VRL-Pog in Twin block treated group at pre-treatment was 73.77 ± 6.11 mm and at post-treatment was 79.81 ± 7.59 mm. A difference of 6.04 ± 1.48 mm was observed which was ascertained as significant ($p < 0.001$) (Table 2).

VRL-Pog was much more significant in twin block group than herbst treated group (Table 2)

DISCUSSION

Functional appliance therapy is treatment protocol for growing Class II patients. Twin Block and Herbst appliances are stimulating mandibular growth by keeping lower jaw in forward position. The use of a functional jaw orthopaedic, at the correct time during growth, ultimately results in the malocclusion patient to achieve a broad smile, an excellent functional occlusion, a full face with beautiful jaw line and lateral profile. There are obvious advantages of treating class II patients with removable functional appliance prior to

TABLE 2: MEAN DIFFERENCE BETWEEN H ANGLE, VRL-SI, VRL-POG PRE AND POST TREATMENT(N=140)

Variables	Herbst appliance		Twin Block		P value(t-test)
	Mean	SD	Mean	SD	
H angle(mm) at pre-treatment	18.25	5.26	19.27	4.57	
H angle(mm at post-treatment	16.13	3.38	16.95	2.88	
Difference	2.12	1.88	2.32	1.69	< 0.001
VRL-Si(mm) at pre-treatment	69.51	5.51	70.30	5.42	
VRL-Si(mm) at post-treatment	71.61	4.98	76.90	5.51	
Difference	-2.10	0.53	-6.60	-0.09	0.001
VRL-Pog(mm) at pre-treatment	70.50	5.91	73.77	6.11	
VRL-Pog(mm) at post-treatment	72.15	6.11	79.81	7.59	
Difference	-1.65	-0.20	-6.04	-1.48	< 0.001

fixed appliance therapy. Management of distal occlusion with functional appliance can lead to improvement in oro-facial function through muscle adaptation along with dental and skeletal change. The ideal time for orthopaedic treatment for mandibular deficiency is after onset of pubertal growth spurt.

The goal of this study was to determine the skeletal effects following functional appliance in growing patients with class II malocclusion. The original feature of this investigation was to use the twin block in patients of the age range of 10-15 years. We selected this approach because of the following reasons:

The Twin Block's high comfort level allows it to be worn 24 hours a day even while eating [5]. This versatile design allows you to take advantage of all the functional forces applied to the dentition during mastication leading to faster results and shorter treatment times.

The mandible is free to move normally in anterior and lateral excursions without being restricted by a bulky one-piece appliance.[5]

Control and correction of upper and lower arch width and length can be done independently, at the same time that skeletal changes are being made.

Patients' speech is normal as tongue movement is not restricted.[5]

Patient appearance and profile gets improved immediately. This is an excellent patient motivator.[5]

Long-term stability following Class II malocclusion treatment is the fundamental key to a successful orthodontic treatment outcome[14]. A large amount of variability is seen between patients with regard to post-treatment changes. Previous studies that used lateral cephalometric radiographs that investigated the skeletal, dental, and soft-tissue effects of the Class II Twin-block appliance have reported reduced maxillomandibular discrepancy, decreased overjet, and advancement of the lower lip and chin point in response to mandibular growth stimulation[15].

According to one of the stusy Twin block was more efficient in inhibition of forward movement of maxilla.[16] Correct diagnosis, treatment, retention protocols forces are derived from the surrounding orofacial tissues. The Twin-block appliance has been the subject of numerous clinical trials and systematic reviews with a mean increase in mandibular length of just 1 mm observed in 8- to 10-year-old subjects relative to matched untreated controls.[17]

The improvement in facial convexity of soft tissue after use of functional appliances for mandibular propulsion was previously reported in the literature for patients in mixed dentition, adolescents and adults[18]. Muscles of mastication may play a role in stability and relapse potential following functional appliance treatment.

Decrease in soft tissue convexity was reported after Herbst[19] and Twin Block therapies[20]. In Twin Block group, soft tissue convexity measurement (VRL-pog) was increased with treatment. However, in Herbst group, soft tissue convexity angle

including the nose was different from Twin block group. This may be attributed to nasal growth that was found to be greater in Herbst group than other group.

Pancherz and Anehus-Pancherz [19] reported similar results. Six months after Herbst treatment finished, soft tissue profile convexity (including the nose) did not differ between treated and control subjects, when the nose excluded, the difference in soft tissue convexity was statistically significant.

Morris et al[20] evaluated treatment effects of three different functional appliances (Bass, Bionator, and Twin Block) with laser scanning system. They reported marked changes in lower face region. Anterior and inferior movement of chin, forward movement of lower lip, and reduction in lower lip curvature were reported. Statistically and clinically significant changes were found for Twin Block group.

Singh and Clark (2003)[21], using finite-element scaling analysis, found a reduction in the prominence of lower lip sulcus. Results of our study support the findings of the above-mentioned studies that have used different methods to evaluate the effects of Twin Block appliance.

Upper lip was positioned backwards relative to E plane in both treatment groups. In Twin Block group, mandible advancement was greater than Herbst group. Forward position of soft tissue pogonion results in concomitant forward positioning of E plane. Although Herbst appliance treatment did not result in statistically significant increase in soft tissue pogonion to VRL measurement, the increase in nose projection would result with retruded position of upper lip relative to E plane.

Similar and contrary results were reported in the literature. The study does have its set of limitations. First, the study was conducted from one center in Lahore, Pakistan.

Though having multiple centers in the city and elsewhere might have increased the power of the study, we are pretty confident of our results to be robust at 5% level of significance. Second, we might have collected data on the follow up assessment on the patients who had opted for the twin block procedure, but did not as that was not our main objective.

Propospective study, involving different centers

in different cities of Pakistan, having a prospective follow up assessment on the after math of the twin block procedure for class II malocclusion patients may enrich these findings for this part of the world.

CONCLUSION

The analysis of the results leads to the following conclusions

Soft tissue profile is improved with use of both Twin block and Herbst appliance but greater advancement of soft tissue pogonion and lower lip were observed in Twin Block group as compared to Herbst group..

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4 Rabia Aziz:	Analysis of data.