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ORIGINAL ARTICLE

Evaluation of Soft Tissue Changes in Patients using Twin block appliance pre- post treatment comparison

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***ABSTRACT*:**
Background: Functional appliance therapy is a commonly used treatment protocol for growing Class II patients. There appears to be a consensus that removable functional appliance therapy leads to improvement on facial appearance in Class II patients. Twin Block appliance is the most commonly used functional appliance. Hence the present study was planned to evaluate soft tissue changes in patients using Twin block appliance for correction of class II malocclusion. **Aim:** To evaluate soft tissue changes in patients using Twin block appliance for correction of class II malocclusion. **Materials and method:** The present study was conducted in the post- graduate department of Orthodontics and Dentofacial Orthopedics of the dental institution. For the study we selected 32 patients with Class II malocclusion that were given twin block appliance for correction of malocclusion. The pre-treatment (T1) and post-treatment (T2) cephalograms of all the patients were obtained from the records for the evaluation of soft tissue profile changes. The parameters evaluated were: middle third of face height (N'-Sn), lower third facial height (Sn-Me'), soft tissue profile angle (N'-Sn-Pog'), Holdaway angle (NB-tangent to upper lip through Pog'), soft tissue chin thickness (horizontal distance between Pog-Pog'), nasolabial angle and mentolabial sulcus angle. **Results:** We observed that there was definite improvement in the soft tissue parameters in patients leading to improved aesthetics. The patients exhibited statistically significant changes in all the studied parameters, namely, middle 1/3rd of face height, soft tissue LAFH, soft tissue profile angle, Holdaway angle, nasolabial angle and mentolabial sulcus angle. **Conclusion:** Twin-block appliance use provides significant changes in the soft tissues of the patients.
Key words: Class II malocclusion, Functional appliance, Orthodontic treatment, Twin-block appliance.

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INTRODUCTION:

Class II malocclusion with a mandibular deficiency/maxillary prognathism or a combination of the two has been the focus of orthodontists' attention long before the inception of speciality. Various treatment modalities, such as growth modification with varied appliances or camouflage treatment, have been used to improve aesthetics and function, with existence of two well-known schools of thought. But, the efficacy of functional appliances no longer needs to be proved, be it for their skeletal, dentoalveolar or soft tissue effects, with enormous literature substantiating their advantageous use.[1-4] [4]Functional appliance therapy is a commonly used treatment protocol for growing Class II patients. There appears to be a consensus that removable functional appliance therapy leads to improvement on facial appearance in Class II patients. Twin Block appliance is the most commonly used functional appliance.[5,6] Hence the present study was planned to evaluate soft tissue changes in patients using Twin block appliance for correction of class II malocclusion.

MATERIALS AND METHOD:

The present study was conducted in the post graduate department of Orthodontics and Dento-facial Orthopedics of the dental institution. The ethical clearance of the study was obtained from the ethical committee of the institute before starting the study. For the study, we selected 32 growing subjects in the age range of 9 to 14 years were selected from 2654 patients that reported to the out patient department of Orthodontics in the month of April 2016 to May 2016. Inclusion criteria were patients with i) skeletal Class II malocclusion with retrognathic mandible, ii) age range of 9-14 years, iii) Class II molar relation on both sides, iv)

overjet of 6mm and more, v) horizontal growth pattern, vi) parent's and patient both willing for the treatment, and vii) a positive VTO viii) no crowding in upper or lower arch.
Subjects with a history of orthodontic treatment, anterior open-bite, and any systemic disease affecting bone and general growth were excluded from the study. A written informed consent was obtained from the parents or guardians of the subjects after verbally explaining them the procedure of the study. The class II malocclusion in treatment group subjects was corrected by standard twin-block appliance. One-step mandibular advancement was carried out during the wax bite registration. An edge-to-edge incisor relationship with 2- to 3-mm opening between the maxillary and mandibular central incisors was maintained for all subjects. The patients were instructed to wear the appliance 24 h/day, especially during mealtimes and they were followed once in every 4 weeks. The parameters evaluated were: middle third of face height (N'-Sn), lower third facial height (Sn-Me'), soft tissue profile angle (N'-Sn-Pog'), Holdaway angle (NB-tangent to upper lip through Pog'), soft tissue chin thickness (horizontal distance between Pog-Pog'), nasolabial angle and mentolabial sulcus angle. To determine the measurement error, 5 lateral cephalograms were randomly chosen, retraced and measured. The Lateral cephalograms with teeth in occlusion were obtained for all subjects before the start of treatment and at the end of the treatment. The parameters undertaken in the study are explained in the fig 1.
The statistical analysis of the data was done using SPSS program for windows. Student's t-test was used to check the significance of the data. A p-value less than 0.05 was predefined as statistically significant.

RESULTS:
In the present study we viewed the records of 20 patients. **Table 1** show mean changes of various parameters of soft tissues over 1 year of twin block appliance usage. We observed that there was definite improvement in the soft tissue parameters in patients leading to improved aesthetics. The patients exhibited statistically significant ($P < 0.05$) changes in all the studied parameters, namely, middle 1/3rd of face height, soft tissue LAFH, soft tissue profile angle, Holdaway angle, nasolabial angle and mentolabial sulcus angle. The change in chin thickness was seen as statistically non-significant ($p<0.05$) **[Fig 1].**

Table 1: Mean changes of various parameters of soft tissues after twin block appliance usage- pre & post treatment comparison

Parameters	Pre-treatment value (Mean)	Post-treatment value (Mean)	p-value
Height middle 1/3 face (mm)	53.22	55.02	0.001*
LAFH (mm)	49.2	55.1	0.003*
Soft tissue profile angle	154.2	159.3	0.02*
Holdaway angle	19.8	14.2	0.001*
Chin thickness (mm)	9.5	9.5	0.31
NL angle	103.22	108	0.002*
Mentolabial sulcus angle	88.21	105.2	0.005*

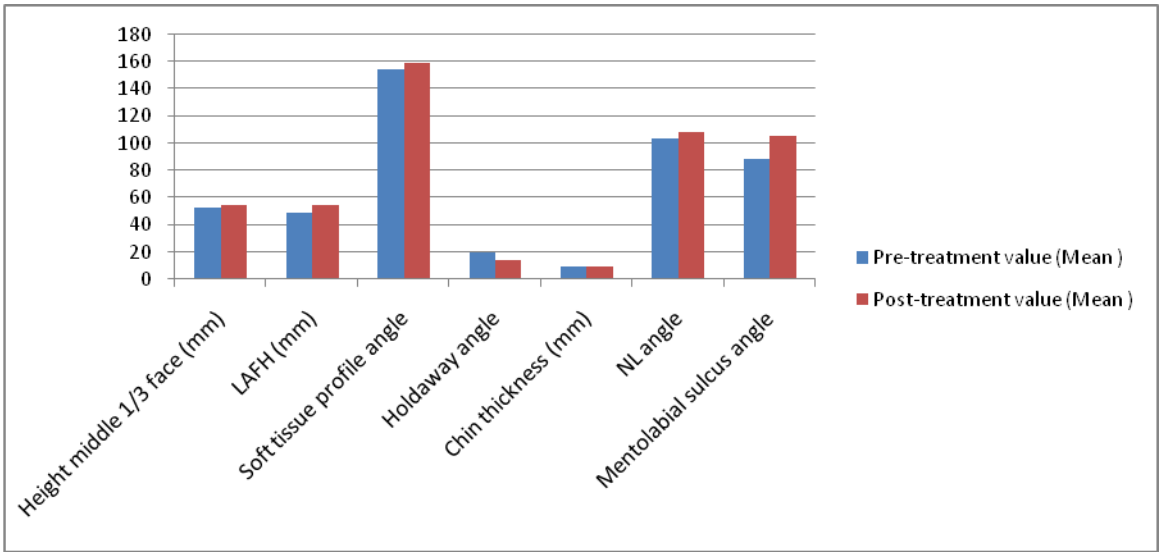

Figure 1: Mean changes of various parameters of soft tissues after twin block appliance usage- pre & post treatment comparison.

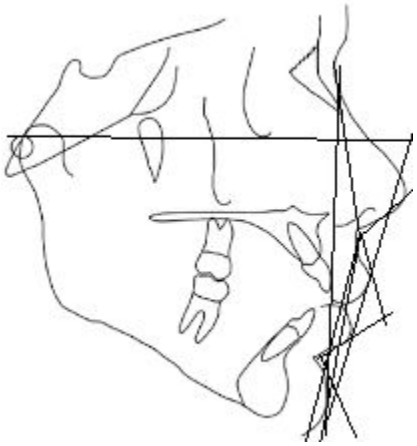

Diagram 1: Parameters used in the study. The parameters evaluated were: middle third of face height (N'-Sn), lower third facial height (Sn-Me'), soft tissue profile angle (N'-Sn-Pog'), Holdaway angle (NB-tangent to upper lip through Pog'), soft tissue chin thickness (horizontal distance between Pog-Pog'), nasolabial angle and mentolabial sulcus angle.

DISCUSSION:

One of the major concerns for functional appliance treatment is the treatment timing. Maximum treatment effects with functional appliances could be achieved when mandibular growth spurt was included in the treatment period.[7] Thus, the treatment of the sample in question was undertaken in the active growth phase to elicit maximum skeletal response for favourable soft tissue adaptation.

The present study was conducted in the department of orthodontics and dento-facial orthopedics of the dental institution and was planned to evaluate soft tissue changes in patients using Twin block appliance for correction of class II malocclusion. We observed that there was definite improvement in the soft tissue parameters in patients leading to improved aesthetics. The patients exhibited statistically significant changes in all the studied parameters, namely, middle 1/3rd of face height, soft tissue LAFH, soft tissue profile angle, Holdaway angle, nasolabial angle and mentolabial sulcus angle. The change in chin thickness was seen as statistically non-significant. The results were consistent as compared to other studies from the literature. Flores-Mir C et al evaluated facial soft tissue changes after the use of the twin block appliance in Class II division 1 malocclusion patients. Several electronic databases were searched with the help of a senior health-sciences librarian. Abstracts that appeared to fulfill the initial selection criteria were selected by consensus, and the original articles were retrieved. The article references were hand-searched for possible missing articles. Clinical trials that assessed facial soft tissue changes with the use of the twin block appliance without any surgical intervention or syndromic characteristics were considered. A comparable untreated control group was required to factor out normal growth changes. Two articles fulfilled the selection criteria and quantified facial soft tissue changes. Although some statistically significant changes in the soft tissue profile were found, the magnitude of the changes may not be perceived as clinically significant. Changes produced in the upper lip seem to be controversial, although the study with sounder methodological quality did not report significant changes. No change in the anteroposterior position of the lower lip and the soft tissue menton or improvement of the facial convexity was found. It was concluded that three-dimensional quantification of the soft tissue changes is required to overcome current limitations in our understanding of the soft tissue changes obtained after the use of the twin block appliance in Class II division 1 malocclusion patients. Varlik SK et al evaluated and compared the effects of activator and Twin Block (TB) appliances on the soft tissue profile. The study included 50 skeletal Class II patients (25 girls and 25 boys, mean age: 11.9 +/- 0.16 years) who were randomly allocated to one of two functional appliance treatment groups. The control group included 25 untreated skeletal Class II patients (13 boys and 12 girls, mean age: 10.11 +/- 0.91 years). Data were obtained from standardized lateral cephalograms taken at the beginning (T0) and end (T1) of appliance wear. The mean treatment time was 9 months for the activator group and 8 months for the TB group. The observation period of the control group was 8 months. Soft tissue profile changes were evaluated by means of 12 linear and five angular measurements. The groups were compared at T0 and T1 using analysis of variance, and treatment/observation differences (T1-T0) were evaluated with the Kruskal-Wallis test. Treatment changes in both appliance groups differed significantly from those in the control group, except for Ss-y, Ls-y, Li-E, and A-y measurements in the TB group and Ls-y, Li-E, nasolabial angle, and A-y measurements in the activator group. When the effects of the two appliances were compared, significant differences were observed only for SS-y, Ss-E, Si-E, and nasolabial angle. The effects of the activator and TB appliances on the soft tissue profile were similar; both significantly changed the soft tissue profile.[8, 9]

Marşan G evaluated skeletal, dentoalveolar, and soft tissue profile changes with activator and high-pull headgear combination therapy in patients with Class II malocclusions caused by maxillary prognathism and mandibular retrognathism. The subjects, all in the mixed dentition, were selected from a single centre and were divided into two groups: 28 patients were treated with an incisor double capping activator and a high-pull headgear combination appliance (13 girls, 15 boys mean chronological age 11.7 +/- 1.2 years, skeletal age 12.1 +/- 1.4 years) and an untreated group of 28 subjects (14 girls, 14 boys mean chronological mean age 11.9 +/- 1.1 years, skeletal age 12.3 +/- 1.3 years). The skeletal, dentoalveolar, and soft tissue profile changes that occurred were compared on lateral cephalograms taken before treatment (T0) and after 1.1 +/- 0.3 years when the combination appliance was removed (T1). In the control group, the radiographs were obtained at the start (T0) and after an observation period 1.2 +/- 0.4 years (T1). Activator and high-pull headgear combination treatment in these growing patients resulted in a correction of the skeletal Class II relationship (ANB -3.4 degrees), a restriction of maxillary growth, an advancement of the mandibular structures, an increase in lower face height, a correction of the overjet (-5.4 mm), an improvement in overbite (-2.2 mm), uprighting of the maxillary incisors, protrusion of the mandibular incisors, and a correction of the dental Class II malocclusion (OLp-L6 +3.5 mm). The soft tissue profile changes were a correction of facial convexity (G'-Sn-Pg' angle 2.3 degrees, Mlf-Li-x-axis angle 9.1 degrees), and an increase in lower antero-posterior (Mlf-y-axis 5.6 mm, Pg'-y-axis 5.3 mm), and lower vertical (Sls-x-axis 3.8 mm, Pg'-x-axis 3.8 mm, Me'-x-axis 5.1 mm) soft tissue dimensions. The mentolabial fold depth (Mlf-E line) also significantly decreased, -0.8 mm in the treated group. The activator and high-pull headgear combination appliance was effective in treating growing patients with maxillary prognathism, mandibular deficiency, and facial convexity by a combination of skeletal and dentoalveolar changes and improvement in the soft tissue facial profile.Sharma AA et al compared the soft tissue effects of Twin-block (TB) and mini-block (MB) functional appliances by using lateral cephalograms and optical surface laser scans and to evaluate the extent of posttreatment relapse with both appliances. Seventy Class II Division 1 patients meeting set inclusion criteria were matched by age and sex. The matched pairs were randomly allocated to treatment with either the TB or the MB appliance. The appliances were worn full time for 9 months (phase I), followed by a 3-month observation phase of no appliance wear (phase II). Lateral cephalograms were taken at the start of treatment and at 12 months, and laser scans were taken at 0, 3, 9, and 12 months. Radiographically, there was a greater advancement of the soft tissue pogonion in the TB group (median, TB: 4.0 mm; MB: 1.8 mm; P = .004), whereas the soft tissue anterior face height increased similarly in both groups (median, TB: 4.4 mm; MB: 4.3 mm). Optical surface scans confirmed the cephalometric changes. There were a greater forward movement of soft tissue pogonion in the TB group during active treatment (median change, TB: 3.2 mm; MB: 3.9 mm) and similar increases in the soft tissue total anterior face height (median change, TB: 3.2 mm; MB: 3.9 mm). There were negative changes of soft tissue pogonion (median, TB: -1.0 mm; MB: -0.9 mm) and vertical face height (median change, TB: -0.7; MB: -0.6) during phase II. The authors concluded that the TB appliance produced the greater overall change in the soft tissue profile. However, there were clinically significant relapse changes in the immediate postfunctional phase.[10, 11]

CONCLUSION:

From the results of present study we conclude that twin-block appliance use provides significant changes in the soft tissues of the patients.

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