

Soft tissue cephalometric changes after correction of skeletal class II with Twin block functional appliance therapy: A pilot study

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ABSTRACT

Background: The correction of skeletal class II malocclusions when the patient is in growing stages by functional appliances is most favorable option, since a normal path of mandibular growth can be achieved at this stage. This article aims at determining the effects of Twin block functional appliance on the facial soft tissues. **Materials and Methods:** Changes in soft tissue after the correction of skeletal class II with Twin block were measured using lateral cephalometric radiographs. **Results:** Significant soft tissue changes have been found after treatment with Twin block functional appliance. **Conclusion:** Twin block functional appliance in skeletal class II patients with retrognathic mandible is also capable of producing significant and favorable soft tissue changes in addition to its skeletal and dental effects.

Key words: Skeletal class II, soft tissue, Twin block

INTRODUCTION

Skeletal class II malocclusions are one among the most common orthodontic problems seen in daily orthodontic practice. The correction of skeletal class II malocclusions when the patient is in growing stages by functional appliances is most favorable option since a normal path of mandibular growth can be achieved at this stage. A skeletal class II base with a posterior positioning of fossa which is not compensated by an increase in the length of the mandible is an ideal indication for a functional appliance therapy.^[1]

According to the soft tissue paradigm; the primary goal of treatment is to obtain the best possible adaptation and proportions of soft tissues of the face and mouth and the secondary goal is functional dental occlusion.^[2] This implies that a thorough knowledge on the effects of soft tissue by the commonly used functional appliances is necessary in clinical situations. There are many previous studies which have evaluated the skeletal and dental effects of Twin block functional appliance,^[3-5] but there are only a very few studies which have evaluated its effects on soft tissues.^[6,7]

Aim of the study

The aim of the study is to evaluate the changes in the facial soft tissues in skeletal class II patients with retrognathic mandible after treatment with the Twin block functional appliance therapy.

MATERIALS AND METHODS

Sampling


Five skeletal class II patients treated with Twin block functional appliance therapy were randomly selected from the Department of Orthodontics and Dentofacial Orthopedics.

Inclusion and exclusion criteria

Skeletal class II pattern with retrognathic mandible and an ANB angle of 4-6 degrees with a class II molar and canine

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relation were selected for the study. Patients having previous orthodontic treatment history, severe vertical or horizontal growth pattern, and proclined lower incisors were omitted for the study.

Materials used

Lateral cephalogram were taken for each patient at two intervals namely T1, taken before functional appliance treatment and T 2, taken after functional appliance treatment. Thirteen soft tissue parameters [Figure 1] were compared between the pre- and posttreatment lateral cephalograms as follows:

1. Nasofacial angle: It evaluates the nasal projection. It is the angle formed by the intersection of a line drawn from glabellas to soft tissue pogonion with a line drawn along the axis of the radix. Normal is 30-35 degrees.
2. Inclination of nasal base: The angle formed between true vertical (SnV) and the long axis of the nostril varies from about 90 degrees in men to as much as 105 in women.
3. Nasomental angle: It is constructed by a line drawn along the axis of the radix and a line drawn from the tip of the nose to soft tissue pogonion. It ranges between 120 and 132 degrees.
4. Nasolabial angle: It is formed by the intersection of columella tangent and an upper lip tangent. It ranges from 90 to 120 degrees.
5. Upper lip prominence: A line is drawn from subnasale to soft tissue pogonion. The most prominent point of upper lip is measured.
6. Lower lip prominence: A line is drawn from subnasale to soft tissue pogonion. The most prominent point of lower lip is measured.
7. Cervicomental angle: It is formed by intersection of E-line and a tangent to the submental angle. Ranges from 110 to 120 degrees.
8. Upper lip strain: Difference in upper lip thickness at point A and at vermilion border.
9. Merrifield's Z angle: A profile line established by drawing a line tangent to the soft tissue chin and to the



Figure 1: Soft tissue parameters used for the study

most anterior point of either the lower lip or upper lip, whichever is most protrusive. The angle formed by the intersection of Frankfort horizontal line to this profile line is Z angle. Average is 80 ± 9 degrees.

10. Soft tissue chin thickness: Thickness of soft tissue at the bony and soft tissue pogonion region.
11. H-line angle: The H-line is tangent to the chin point and the upperlip. The H-line angle is the angle formed between this line and the soft tissue nasion-pogonion line. Average is 7-15 degrees.
12. Steiner's S-line: Soft tissue pogonion to midpoint of subnasale.
13. Rickett's E-line: Soft tissue pogonion to tip of nose.

Statistical analysis

Paired *t*-test was used for the comparison of results between the pre- and posttreatment values. A *P*-value of 0.05 was considered to be statistically significant.

RESULTS

The results indicate significant soft tissue changes are produced by Twin block functional appliance therapy in skeletal class II patients with retrognathic mandible. The results showed that there is an increase in nasomental angle, reduction in nasolabial angle, decrease in cervicomental angle, forward movement of the lower lip, and a reduction in the upper lip strain. No significant changes have been noted in the nasofacial angle, inclination of nasal base, upper lip prominence, Merrifield's Z angle, soft tissue chin thickness, and the H-line angle. Comparison of the pre-and post treatment values with Twin block functional appliance therapy are shown in Table 1.

DISCUSSION

The correction of skeletal class II by growth modification is one of the most common and important treatment modalities in the field of orthodontics and dentofacial orthopedics. Most of the cephalometric diagnostic criteria for patients requiring functional appliance therapy are usually based upon hard tissue factors.^[1] But the pre- and posttreatment parameters should also be evaluated in order to find out whether a particular case can have favorable soft tissue changes after a functional appliance therapy and also a great importance should be given to the soft tissue examination during clinical diagnosis and planning according to Ackerman *et al.*^[8] The present study was undertaken to evaluate the changes in soft tissue after treatment with the most commonly used functional appliance, the Twinblock in skeletal class II patients with retrognathic mandible.

In this study, the treatment changes were evaluated using lateral cephalograms taken before and after treatment. Even though the cephalometric investigations are two-dimensional

Table 1: Comparison of pre-and post treatment results of Twin block

Parameter	Prefunctional		Post functional		Difference	
	Average	SD	Average	SD	Average	SD
Nasofacial angle	38.75°	3.59	37.25°	3.30	-1.5°	0.52
Inclination of nasal base	122.75°	3.59	121.50°	6.19	-0.75°	1.5
Nasomental angle	116.75°	3.0	122.00°	4.24	+5.5°*	2.30
Nasolabial angle	115.75°	11.32	105.50°	7.72	-10°*	5.61
Upper lip prominence	7 mm	2.16	6.8 mm	3.68	-0.2 mm	0.81
Lower lip prominence	4 mm	0.81	6.75 mm	0.50	+2.75 mm*	2.38
Cervicomental angle	120.5°	1.73	101.5°	14.08	-19°*	12.82
Upper lip strain	5 mm	1.63	2.5 mm	0.85	-2.5 mm*	0.95
Merrifield's Z angle	60°	4.32	58°	3.36	-2°	0.95
Soft tissue thickness	10.8 mm	0.97	9.5 mm	1.48	-1.3 mm	0.94
H-line angle	22.30°	3.30	20.75°	2.75	-1.55°	0.57
Steiner's S-line						
U-lip	5.25 mm	1.25	5 mm	1.41	-0.25 mm	0.12
L-lip	2.5 mm	1.0	5.75 mm	1.50	+3.25 mm*	1.25
Rickett's E-line						
U-lip	3.75 mm	2.5	2.75 mm	1.70	-1 mm	0.81
L-lip	2.3 mm	2.13	5 mm	2.16	+2.7 mm*	0.47

*Indicates that statistically significant changes are present. U: Upper; L: Lip; SD: Standard deviation

(2D), Ferrario *et al.*,^[9] have given that 3D soft tissue measurements can be correlated with cephalometric data.

After treatment with Twin block functional appliance there has been an increase in the nasomental angle and a decrease in the cervicomental angle which is probably due to the significant forward movement of mandible. The forward movement of mandible and the lower dentition also resulted in the increase in prominence of lower lip and a reduction in the interlabial gap which in turn had reduced the upper lip strain and the nasolabial angle. Previous studies by Baysal and Uysal^[6] have evaluated the soft tissue changes after Twin block and Herbst appliances and concluded that there is a greater advancement of soft tissue pogonion and lower lip were observed in Twin block group. Another study on the soft tissue effects of Twinblock by Singh and Clark has shown that treatment with Twin block appliances have provided a more effective lip seal.^[7]

CONCLUSION

1. Treatment with Twin block functional appliances in skeletal class II patients with retrognathic mandible has shown significant and favorable soft tissue changes.
2. Significant changes were found in the nasomental angle, nasolabial angle, cervicomental angle, and movement of lower lip and in the upper lip strain.

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