Original Article

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Dentistry Section

Evaluation of Hard Tissue, Soft Tissue and Airway Changes Post Twin Block Therapy: An In-vitro Study

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ABSTRACT

Introduction: Aesthetic improvement happens to be one of the main reasons for seeking orthodontic treatment in patients with Angle's Class II malocclusion. Prognathic maxilla, retrognathic mandible or a combination of both are the main aetiological factors for this malocclusion. Growth modification treatment with different methods can be performed in order to correct skeletal class II malocclusion. Appliance therapy to correct similar malocclusions should immaculately be directed towards addressing the dentoskeletal discord, in order to gain a favourable facial aesthetic result.

Aim: To assess the effects of twin block on mandibular length, soft tissue profile and Oropharyngeal Airway (OAW) dimensions in skeletal class II malocclusion patients.

Materials and Methods: An in-vitro study was carried out in the Department of Paedodontics in collaboration with Department of Orthodontics and Dentofacial Orthopaedics at Sardar Patel Postgraduate Institute of Dental and Medical Sciences, Lucknow, from June 2018 to March 2021. Study was done on lateral cephalograms of 15 growing children with Angle's Class II Division 1 malocclusion in the age group of 9-12 years, who had undergone functional appliance therapy with twin block appliance. Standardised lateral cephalograms were evaluated at pretreatment (0 month) and postactive phase of twin-block therapy (9-12 months). Selected hard tissue, soft tissue and airway landmarks were marked and traced to evaluate hard tissue, soft tissue and airway changes. The data was analysed using Statistical Package for Social Sciences (SPSS) version 21.0.

Results: There was a statistically significant increase in effective mandibular length (Condyle-Gnathion) and mandibular base length Gonion-Pogonion (Go-Pog) values (p-value <0.001). Significant decrease in the facial convexity Glabella-Soft tissue Nasion (G-Sn) Soft tissue Nasion-Soft tissue Pogonion (Sn-Pog) was observed and airway dimensions showed significant increase after twin block therapy.

Conclusion: Correction of Class II malocclusion by twin block appliance resulted in significant cephalometric changes in the hard tissue profile (increase in mandibular length), together with clinically favourable soft tissue changes and OAW dimensions.

Keywords: Facial profile, Malocclusion, Pharyngeal airway passage, Skeletal class II Division I

INTRODUCTION

Aesthetic improvement happens to be one of the main reasons for seeking orthodontic treatment in patients with Angle's Class II malocclusion. Prognathic maxilla, retrognathic mandible or a combination of both are the main aetiological factors for this malocclusion, amongst which retrognathic mandible is considered to be the major factor as compared to prognathic maxilla [1,2]. Retrognathic mandible not only affects the aesthetics and profile but, it also leads to deficient chin prominence, crowding and even reduction in airway dimensions [3]. The specific clinical characteristics of subjects with Class II division 1 malocclusion are convex profile, an increased overjet and incompetent lips leading to an unpleasant facial appearance and may produce negative feelings of self-image and esteem [4].

Growth modification treatment with different methods can be performed in order to correct skeletal class II malocclusion [2]. Favourable facial aesthetics can be achieved in similar malocclusions using appliance therapy which immaculately directs towards addressing the dentoskeletal discord. One of the effects of functional appliance, it induces supplementary elongation of the mandible which thereby stimulates increased growth at the condylar cartilage. The effect of functional appliance treatment on mandibular growth firmly depends on the biological response of the condylar cartilage, which eventually depends on the growth rate of the mandible [1]. Twin-block appliance, developed by Dr. Williams J. Clark in 1977 is the most favoured type of functional appliance for the correction of Class II malocclusions and it has become gradually more popular due to its convenient design and ease of use [5].

Along with the hard tissue changes, twin block also brings about pleasant changes in soft tissue profile as well. The forward movement of mandible and the lower dentition furthermore, results in an increase in the lower lip prominence and a reduced interlabial gap which inturn reduces the upper lip strain and the nasolabial angle after treatment with twin block functional appliance [6]. Twin block appliance is not only used for correction of mandibular retrognathia, but, is also recommended as one of the treatment options for Obstructive Sleep Apnoea (OSA), which is caused due to the reduction in space present between the mandibular body and the cervical column thereby, resulting in posterior positioning of the tongue and soft palate, leading to deterioration in the airway passage. Enhancement in respiration is seen gradually as the shape and size of the nasopharyngeal space enlarges with the use of functional appliances [7].

There are numerous former studies which have assessed the skeletal, dental, soft tissue and airway dimension due to the use of twin block functional appliance individually or in one or two combinations, but as far as we know, no similar studies were conducted to investigate the effects of twin block (functional appliance) in Class II Division I malocclusion patients on hard tissues, soft tissues and airway changes altogether [1,6,7]. Hence, the present study was designed to assess the effects of twin block on hard tissue, soft tissue and OAW dimensions on lateral cephalograms in patients with Skeletal Class II Division 1 malocclusion.

MATERIALS AND METHODS

The present in-vitro study was conducted in the Department of Paedodontics and Preventive Dentistry in collaboration with Department of Orthodontics and Dentofacial Orthopaedics at Sardar Patel Postgraduate Institute of Dental and Medical Sciences, Lucknow, from June 2018 to March 2021 to evaluate the pretreatment and post-treatment lateral cephalograms of 15 growing children amongst which eight were males and seven were females. The study was approved by the Institutional Ethical Committee of Sardar Patel Postgraduate Institute of Dental and Medical Sciences, Lucknow, Uttar Pradesh, India, with approval Number: PEDO/02/521920.

Sample size calculation: Sample size was calculated by using Gpower software (version 3.0). Sample size was estimated for t-test and means: difference between two dependent means (matched pairs i.e., pre and post) was chosen. A minimum sample size of 10 was found to be sufficient for an alpha of 0.05, power of 80%, 1.0 as effect size with Class II division 1 malocclusion aged 9-12 years in terms of their hard tissue, soft tissue and OAW dimension changes post-twin block therapy [1].

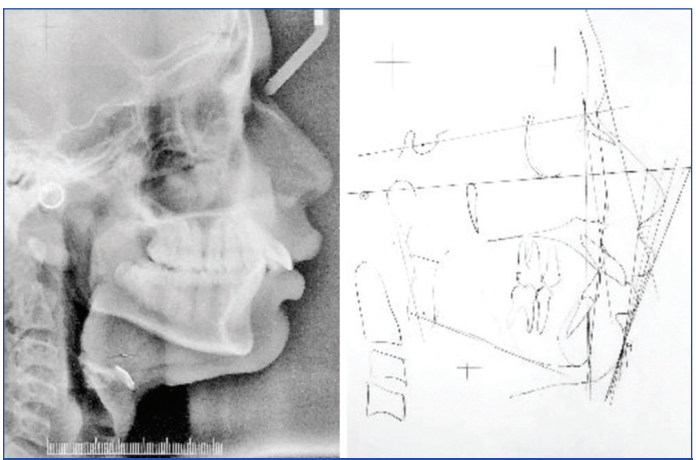
Inclusion criteria: Good quality standardised lateral cephalograms of children within age group of 9 to 12 years having skeletal Class II condition with Angle between A point–N–B point (ANB) ≥4 degrees, overjet ≥5 mm, crowding ≤4 mm. Children showing horizontal growth pattern and children treated with twin block were included in the study.

Exclusion criteria: Lateral cephalograms of un-cooperative children, mentally challenged children, children with craniofacial syndromes/ congenital maxillofacial deformity, children previously treated orthodontically, severe facial asymmetry and with other chronic disease or syndromes were excluded from the study. However, records of the five out of twenty subjects, who were non compliant during the functional treatment phase were withdrawn from the study.

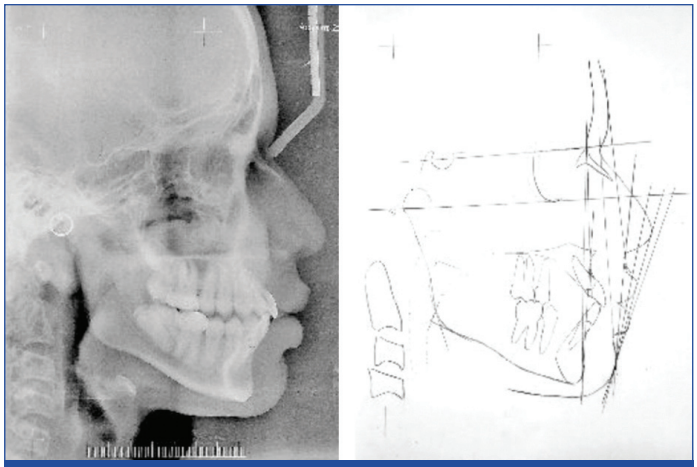
Study Procedure

Cephalometric records (pretreatment and post twin block phase) were manually traced. The tracing was done on tracing sheet of 8"×10" size (inches) 0.003" (inches)" thickness made of cellulose acetate. Backlight LED and light source, 3H pencil, protractor and metallic scale were used to mark the selected cephalometric landmarks [8]. Both angular and linear measurements were recorded by the investigator with least count of 0.5° and 0.5 mm respectively. The following cephalometric landmarks were used for the study [Table/Fig-1a,b,2a,b].

Hard tissue parameters: The following angular and linear measurements were recorded to analyse the antero-posterior (sagittal) relation of maxilla and mandible [9]:



[Table/Fig-1]: a) Pretreatment lateral cephalogram; b) Pretreatment tracing of lateral cephalogram. (Images from left to right)



[Table/Fig-2]: a) Post-treatment lateral cephalogram; b) Post-treatment tracing of lateral cephalogram. (Images from left to right)

Angular measurements:

- S-N-A
- S-N-B
- A-N-B
- Facial convexity- (N-A-Pog)
- Facial angle- {(N-Pog)-FH}

Linear measurements:

- Effective Mandibular length- (Co-Gn)
- Mandibular base length- (Go-Pog)

Soft tissue parameters: were measured as angles, linear dimensions from soft tissue landmarks [9].

Angular measurements:

- Facial convexity- {(G-N')-Pog'}
- Facial angle- {FH plane- (N'-Pog')}
- Z-angle {FH-Profile line}

Linear measurements:

- Upper lip E-line
- lower lip E-line
- Upper lip S-line
- Lower lip S-line
- Lower lip H-line

Oro-pharyngeal airway dimensions:

- Upper pharyngeal width: It was measured from a point on the posterior outline of the soft palate to the closest point on pharyngeal wall.
- Lower pharyngeal width: It was measured from the point of intersection of the posterior border of the tongue and the inferior border of the mandible to the closest point on the posterior pharyngeal wall [10].

Various landmarks (pretreatment and post-treatment), linear and angular parameters, reference planes were used for the evaluation of hard tissue, soft tissue and airway changes were measured thrice and their mean was subjected for statistical analysis.

Measurement of cephalometric error:

- Error due to fatigue: Two cephalograms in a day were analysed on an average to eliminate the error due to fatigue of the investigator.
- Intra-observer error: The intra-observer variability and reproducibility of landmark location and its assessment along with measurement errors were analysed by retracing the randomly selected cephalograms within a gap of 15 days. Dahlberg formula was used to calculate the method error [1].

The pretreatment and post-treatment lateral cephalograms of selected samples were traced and the values were recorded for each patient. All the values were further compiled and subjected to statistical analysis.

STATISTICAL ANALYSIS

Microsoft Excel spreadsheet was used to enter the data, using SPSS version 21.0. As all the variables were continuous, thus summarised as standard and mean deviation. Graphs were prepared on Microsoft Excel. Normality of the continuous data was checked by Shapiro-Wilk test. Data was found to be normal. Inferential statistics were performed using parametric tests of significance (paired t-test and independent t-test).

RESULTS

In the present study, the mean age of males and females were 10.88±1.35 and 11.14±1.34 years, respectively. No statistically significant difference was found in the mean age of both the groups (p-value=0.47) [Table/Fig-3]. The pre and post-treatment cephalometric values for all the parameters have been tabulated in [Table/Fig-4].

Gender	N	%	Age (years)		p-value
			Mean	Std. Deviation	
Males	8	53.3%	10.88	1.35	0.47
Females	7	46.7%	11.14	1.34	

[Table/Fig-3]: Gender wise age (years) distribution of study population.

		Mean	N	Std. Deviation	Minimum	Maximum
Hard tissue parameters						
Maxilla-Mandible (Angular parameter)		Degree (°)				
SNA	Pretreatment	81.20	15	3.36	76	87
	Post-treatment	80.93	15	3.21	76	87
SNB	Pretreatment	74.33	15	2.94	71	80
	Post-treatment	77.36	15	2.84	74	84
ANB	Pretreatment	6.87	15	2.23	4	13
	Post-treatment	3.63	15	2.10	0.5	10
Facial convexity {(N-A)-(A-Pog)}	Pretreatment	12.07	15	5.31	6	26
	Post-treatment	7.96	15	6.26	-0.5	24
Facial angle {(N-Pog)-FH}	Pretreatment	80.63	15	5.43	67	88
	Post-treatment	83.73	15	5.40	69	92
Mandible (Linear parameter)		Millimetre (mm)				
Effective mandibular length {(Cd-Gn)}	Pretreatment	107.27	15	7.71	91	120
	Post-treatment	112.73	15	8.59	97	127
Mandibular base length {(Go-Pog)}	Pretreatment	69.87	15	5.90	62	81
	Post-treatment	73.47	15	5.70	65	85
Soft tissue parameters						
Angular parameter		Degree (°)				
Facial convexity {(G-Sn)-(Sn-Pog)}	Pretreatment	23.16	15	5.27	16	37
	Post-treatment	20.07	15	5.97	12	35
Facial angle {(FH-N-Pog)}	Pretreatment	84.67	15	4.85	74	91
	Post-treatment	87.87	15	3.75	81	94
Z-angle {(FH-Profile line)}	Pretreatment	61.53	15	9.61	43	73
	Post-treatment	66.07	15	7.93	50	76
Linear parameter		Millimetre (mm)				
E-line upper lip	Pretreatment	3.13	15	2.66	-2	8
	Post-treatment	2.33	15	2.66	-1	7
E-line lower lip	Pretreatment	1.63	15	2.78	-2	8
	Post-treatment	3.40	15	2.97	0	12
S-line upper lip	Pretreatment	5.73	15	1.58	2	9
	Post-treatment	4.33	15	2.84	1	10
S-line lower lip	Pretreatment	3.47	15	2.90	0	10
	Post-treatment	4.13	15	3.44	0	15
H-line lower lip	Pretreatment	1.80	15	2.36	-2	5
	Post-treatment	2.96	15	2.63	0	9
Airway parameters						
		Millimetre (mm)				
Upper pharynx	Pretreatment	9.53	15	1.35	8	12
	Post-treatment	12.27	15	1.62	10	15
Lower pharynx	Pretreatment	8.40	15	2.97	4	13
	Post-treatment	12.13	15	2.23	8	15

[Table/Fig-4]: Pretreatment and post-treatment descriptives of hard tissue, soft tissue and airway parameters.

The paired differences mean values of SNB (-3.03°±0.85), facial angle {(N-Pog)-FH} (-3.10°±0.96), effective mandibular length (Cd-Gn) (-5.46 mm±2.94), base length (Go-Pog) (-3.60 mm±1.68), facial angle {(FH-(N-Pog)} (-3.20°±1.69), Z-angle (FH-Profile line) (-4.53°±2.82), E-line lower lip (-1.76 mm±2.12), H-line lower lip (-1.16 mm±1.53), Upper pharynx (-2.73 mm±1.03) and Lower pharynx (-3.73 mm±1.28) increased significantly from pretreatment to post-treatment [Table/Fig-5].

The paired differences mean values of ANB (3.23°±0.86), facial convexity {(N-A)-(A-Pog)} (4.10°±1.92), facial convexity {(Glabella-Soft tissue Nasion)-(Soft tissue Nasion- Soft tissue Pogonion)} (3.10°±2.86) and S-line upper lip (1.40 mm±2.19) decreased significantly from pretreatment to post-treatment. No significant change was found in the paired differences mean values of SNA (0.26°±0.70), E-line upper lip (0.80 mm±1.78) and S-line lower lip (-0.66 mm±2.12) from pretreatment to post-treatment. Mandibular length (hard tissue) is denoted by effective mandibular length (Cd-Gn) and mandibular base length (Go-Pog) parameters. The present showed a statistically significant increase in effective mandibular length (Cd-Gn) and mandibular base length (Go-Pog) values [Table/Fig-5].

Soft tissue profile is denoted by facial convexity {(G-Sn)-(Sn-Pog)}, Facial angle {FH-(N-Pog)}, Z-angle {FH-Profile line)}, E-line lower lip, S-line upper lip and H-line lower lip parameters. In the present study, a statistically significant increase in the facial angle {(FH-(N-Pog)}, Z-angle {(FH-Profile line)}, E-line lower lip and H-line lower lip values and statistically significant decrease in the facial convexity {(G-Sn)-(Sn-Pog)} and S-line upper lip values were found. OAW dimensions are denoted by upper pharynx and lower pharynx parameters. A statistically significant increase in upper pharynx and lower pharynx dimensions were noted in the present study.

DISCUSSION

A pleasing and an aesthetic facial appearance occur when a proportionate relationship among different facial structures exists. Along with various physical, psychological, and social factors, perceptions of dentofacial attractiveness also affect the development

Variables	Paired differences from pretreatment to post-treatment					t	df	p-value
	Mean difference	Std. Deviation	Std. Error mean	95% Confidence interval of the difference				
				Lower	Upper			
SNA	0.26°	0.70	0.18	-0.12	0.65	1.46	14	0.164
SNB	-3.03°	0.85	0.22	-3.50	-2.55	-13.74	14	<0.001
ANB	3.23°	0.86	0.22	2.75	3.71	14.50	14	<0.001
Facial convexity {(N-A)-(A-Pog)}	4.10°	1.92	0.49	3.03	5.16	8.23	14	<0.001
Facial angle {(N-Pog)-FH}	-3.10°	0.96	0.24	-3.63	-2.56	-12.41	14	<0.001
Effective mandibular length {(Cd-Gn)}	-5.46 mm	2.94	.76	-7.10	-3.83	-7.18	14	<0.001
Mandibular base length {(Go-Pog)}	-3.60 mm	1.68	0.43	-4.53	-2.66	-8.29	14	<0.001
Facial convexity {(G-Sn)-(Sn-Pog)}	3.10°	2.86	0.74	1.51	4.68	4.18	14	0.001
Facial angle {(FH-(N-Pog)}	-3.20°	1.69	0.43	-4.14	-2.25	-7.29	14	<0.001
Z-angle {(FH-Profile line)}	-4.53°	2.82	0.72	-6.09	-2.96	-6.21	14	<0.001
E line upper lip	0.80 mm	1.78	0.46	-0.18	1.78	1.74	14	0.104
E line lower lip	-1.76 mm	2.12	0.54	-2.94	-0.58	-3.21	14	0.006
S line upper lip	1.40 mm	2.19	0.56	0.18	2.61	2.46	14	0.027
S line lower lip	-0.66 mm	2.12	0.54	-1.84	0.51	-1.21	14	0.245
H line lower lip	-1.16 mm	1.53	0.39	-2.01	-0.31	-2.95	14	0.011
Upper pharynx	-2.73 mm	1.03	0.26	-3.30	-2.16	-10.25	14	<0.001
Lower pharynx	-3.73 mm	1.28	0.33	-4.44	-3.02	-11.29	14	<0.001

[Table/Fig-5]: Pretreatment to post-treatment paired differences of all hard tissue, soft tissue and airway parameter.
p-value <0.05 considered significant

and maintenance of self-image [11]. Class II malocclusion manifests in a wide variety of skeletal and dental configurations. Amongst the possible causative factors, maxillary protrusion and mandibular retrognathism, McNamara JA et al., reported that mandibular retrognathism is the most consistent diagnostic finding in skeletal Class II malocclusions [12].

Reduced OAW dimensions are also associated with severe mandibular deficiency. Functional appliance therapy also shows its effectiveness in OSA by increasing the posterior airway space. Ozbek MM et al., were the first to evaluate the effects of functional appliance therapy on the OAW in patients with deficient mandible with skeletal Class II morphology [13].

Hence, our present study aimed to assess the effects of twin block on mandibular length, soft tissue profile and OAW dimensions in patients with skeletal Class II malocclusion by evaluating the pretreatment and post-treatment lateral cephalograms of 15 growing children with Class II division 1 malocclusion aged 9-12 years.

Primary change post twin block therapy is mostly in mandibular length and subsequently the other cephalometric skeletal and soft tissue profile parameter changes are seen corresponding to it. Thus, for the mandibular length measurements and soft tissue profile, the following landmarks were used for the study [14]. The mandibular length (hard tissue) was denoted by effective mandibular length (Cd-Gn) and mandibular base length (Go-Pog) parameters [15]. The soft tissue profile was denoted by facial convexity {(G-Sn)-(Sn-Pog)}, facial angle {Frankfort Horizontal Plane-(Nasion-Pogonion)}, Z-angle {FH-Profile line)}, E-line lower lip, S-line upper lip and H-line lower lip parameters [16]. The OAW dimensions were denoted by upper pharynx and lower pharynx parameters. To minimise the cephalometric errors, precautions were taken and their mean was subjected for statistical analysis [14].

The results of the present study revealed that the effective mandibular length and the mandibular base length increased after twin block therapy. Increased effective mandibular length, enhanced soft tissue profile and increase in OAW dimensions of the present study were in accordance with previous studies done [Table/Fig-6] [1,5,13,17-21].

Thus, the finding of the present study suggested that, twin block therapy could be used effectively in growing children with retrusive mandible to achieve positive changes not only in skeletal hard tissue profile but, also in soft tissue profile and OAW dimensions.

S. No.	Author's name and year	Place of study	No. of subjects	Age of children considered	Parameters assessed	Conclusions
1.	Khoja A et al., (2016) [5]	Karachi, Pakistan	65	Males: 11.4±1.71 years Females: 11.8±1.62 years	**Skeletal variables** • Co-A • Co-Gn • Go-Gn • SNB • SNA • ANB • GoGn-SN **Dentoalveolar variables** • UI-SN • IMPA • Overjet **Soft tissue variables** • UL-E-line • LL-E-line • N-L angle • Z-angle • H-angle	Normal craniofacial growth along with Twin Block improves facial aesthetics in Class II, Division 1 malocclusion by changing the underlying skeletal and dentoalveolar structures. The favourable mandibular growth occurs around the cervical vertebral maturation stages, with pronounced effect during CS-3 stage.
2.	Dhingra A et al., (2018) [1]	Jammu and Kashmir, India	15	10-14 years	S-N-A, S-N-B, A-N-B, Wits Appraisal, SN-MP, U1-NA, Co-Point A, Max-M, L1-NB, U1-L1, Co-Gn.	Twin Block is effective in increasing the effective mandibular length in patients with skeletal Class II Division I malocclusion.

3.	Eltabey SA et al., (2019) [17]	Mansoura, Egypt	12	9.8±1.70 years	• Naso-labial angle • Lower lip to E plane • Upper lip to E plane	Twin block appliance along with face-bow was an effective appliance in the treatment of growing patients with Skeletal Class II division 1 patients by producing skeletal and dentoalveolar changes that profoundly enhance soft-tissue profile.
4.	Sumitra and Tandur AP (2019) [19]	Bangalore, India	30	9-13 years	• Soft tissue convexity (N '-No-Pog) • Soft tissue convexity (N '-Sn-Pog) • Mento labial fold (Li-Sl-Pog) • H angle (N'-Pog-ta ngent to upper lip) • Soft tissue facial angle (FH-N'-Pog) • Li to S Vertical • ST total face height. (N'- M e) • Li to E- line Ss to S Vertical • Sn to S Vertical • Ls to S Vertical • Si to S Vertical • ST-Pog- S vertical • Ls to E- line	Nine linear and five angular soft tissue parameters were measured. Increase in angle of soft tissue facial angle, soft tissue facial convexity, mentolabial angle, and decrease in H angle, advancement of soft tissue pogonion, increase in anterior facial height were observed in all the cases. The favourable soft tissue changes could be seen clinically after twin block appliance therapy and was well supported by cephalometric changes.
5.	Shahamfar M et al., (2020) [18]	Tabriz (Iran) University of Medical Sciences	70	10-12 years	**Angular measurements used in the study.** • Lower face-throat angle • Merrifield's Z-angle • Mentolabial angle • Facial convexity angle • Nasolabial angle • Columellar inclination • Inclination of nose **Linear measurements used in the study.** • Lower face protrusion • Upper lip length • Lower lip length • Midface protrusion • Vertical height ratio • Superior labial sulcus depth • Lower lip protrusion • Interlabial gap • Inferior labial sulcus depth • Upper lip protrusion • Nasal projection	Modified form of the Twin block appliance can be very effective in improvement of various aspects of patients' facial profile with minimum un-toward effects.
6.	Yıldırım E et al., (2021) [20]	Gulhane Military Medical Academy in Ankara, Turkey	30	10-12 years	• Superior airway volume (mm^3) • Inferior airway volume (mm^3) • Total airway volume (mm^3) • SNA (°) • SNB (°) • ANB (°) • Co_L-A (mm) • Co_R-A (mm) • Co_L-Gn (mm) • Co_R-Gn (mm) (CI: Confidence interval; Co_L: left condylion; Co_R: right condylion)	Mandible advancement by twin block increases the mandibular length and oropharyngeal airway volume in patients having retrognathic mandible.
7.	Thakur VK et al., (2021) [20]	Pune India	12	10-12 years	• Minimum area (cm^2) • Mean area (cm^2)	Twin block appliance therapy has substantial effect on upper airway and is beneficial in the treatment of sleep-apnoea and related disorders associated with Class II Division 1 malocclusion for achieving positive functional changes, aesthetics and healthier quality of life.
8.	Present study (2021)	Lucknow, Uttar Pradesh, India	15	9-12 years	**Hard tissue parameters** **Angular Measurements** • SNA • SNB • ANB • Facial convexity- {N-A-Pog} • Facial angle-{(N-Pog)-FH} **Linear measurements** • Effective Mandibular length- {Co-Gn} • Mandibular base length- {Go-Pog} **Soft tissue parameters** **angular measurements** • Facial convexity-{(G-N')-POg'} • Facial angle- {FH plane- (N'-Pog')} • Z-angle {FH-Profile line} **Linear measurements** • E-line upper lip • E-line lower lip • S-line upper lip • S-line lower lip • H-line lower lip **Airway linear measurements:** 1. Upper pharyngeal width: 2. Lower pharyngeal width	Twin Block is an effective myofunctional appliance which can be used to increase the effective mandibular and base length in patients with skeletal Class II Division I malocclusion. Soft tissue profiles also improved significantly. Twin block treatment is also effective in improving the oropharyngeal airway passage dimensions as well.

[Table/Fig-6]: Similar studies from the literature [1,5,13,17-20].

Limitation(s)

The limitations of this study were the limited sample size and thus, large study groups should be taken in the future for more precise results and several other analyses (like: COGS analysis, Jarabak index etc.,) should be considered to evaluate the dental and skeletal effects of twin block therapy.

CONCLUSION(S)

Twin Block was an effective myofunctional appliance which was used to increase the effective mandibular and base length in patients with skeletal Class II Division I malocclusion. Soft-tissue profiles also improved significantly, reflecting the changes that took place in the skeletal and dentoalveolar structures. These soft tissue changes help to improve convex facial profiles. Twin-block treatment was effective in improving the OAW passage dimensions as well.

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