SOFT- AND HARD-TISSUE CHANGES FOLLOWING TREATMENT OF CLASS II DIVISION 1 MALOCCLUSION WITH TWIN BLOCK- A RANDOMIZED CONTROL TRIAL

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ABSTRACT :

Background : The purpose of this study was to examine change in soft tissue and hard tissue profile of class II div 1 malocclusion patients. Lateral cephalogram of the patients were obtained at the time interval of T1 and T2.Material method- 30 class II div 1 patients were examined. Out of which 17 were girls and 13 were boys. Skeletal, dentoalveolar and soft tissue were analysed using lateral cephalogram of the patient.

Result : Pre and post treatment cephalogram analysis show a significant change in SNB, ANB, Z angle and upper lip measurement.

INTRODUCTION :

Kingsley was the first to use the appliance for forward positioning of mandible in the year of 1879. Appliance introduced by Kingsley consist of clasps on molars, labial wires and a bite plane extending posteriorly[1]. Myofunctional appliance was introduced by Robin 1902 and Andresen 1908. Myofunctional appliance enhances the mandibular growth in class II patient. Large scale of functional appliances has been put forward to amplify the mandibular growth and correct bite by forward positioning of mandible[2-6]. Refinement of facial aesthetic is a key to success of orthodontic practice. The contemporary paradigm of soft tissue enhancement underlines the importance of this issue[7]. One of the most frequently occurring orthodontic condition is class II div 1 malocclusion. This particular malocclusion is about 20%-30% of all orthodontic patients[8]. Class II malocclusion is characterised by retrognathic mandible, anterior displacement of the maxilla, increased vertical dimension of posterior maxilla, mandibular fossa in posterior position, maxillary constriction and a combination of factors. In general, maxillary and mandibular incisors are well-positioned, differently from maxillary incisors which tend to be protrusive [9-12]. Characteristic features of class II div 1 malocclusion includes retrusive chin, convex profile, incompetent lips and deep mentolabial sulcus[13]. Such condition leads to negative psychological consequences and reduced self-confidence of patient[14]. Some published article

suggests that myofunctional appliances are considered to be effective in improving overjet [15-18]. According to some authors treatment timing plays a significant role in supplementary lengthening of mandible when functional appliance is opted at pubertal growth spurt [19,20].

MATERIALS AND METHODS :

The sample size consists of 30 patients. Out of which 17 were girls and 13 were boys. Mean age was 9.8 years + 14 months and 11.2 years +14 months respectively. Twin block appliance was fabricated using adams clasps on upper first molar labial bow in the upper arch. In the lower arch adams clasp was fabaricated on premolar and ball end clasp was given in between lower central incisor and between canine and lateral incisor on both the quadrant. The active phase of the treatment lasted about 14 + 2 months.

Inclusion criteria

- Class II molar relation

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- Class II canine relation
- Class II skeletal pattern
- Reterognathic mandible
- Orthognathic maxilla
- Overjet more than 4mm

Exclusion criteria

- Craniofacial syndrome
- Congenitally missing tooth
- Lower incisor protrusion
- No history of previous orthodontic treatment

Patients were instructed to wear the appliance full time except for meals and brushing. Bite registration at the start of treatment was kept with 4mm advancement, further increments were added depending on the overjet. Amount of vertical opening was according to the freeway space i.e., 2-4mm beyond it. Treatment was continued till the time patients achieved class I molar relationship and overjet of 2mm. upper inclined plane was given post twin block appliance.

Standardized lateral cephalogram, dental cast and photograph were obtained twice at T1 before the start of the treatment and T2 after the treatment. Various skeletal, dental and soft tissue measurements were taken. Lateral cephalometric radiographs taken at T1 & T2 were traced and the values were measured. In order to evaluate various soft tissue and hard tissue landmarks.

Measured data were analyzed using SPSS software version 22 (SPSS Inc, Chicago, IL, USA). P value <0.5 was considered to indicate statistical significance.

RESULT :

In this research, 30 patients treated with twin block were evaluated pretreatment and posttreatment. The paired t- test is used evaluation of pretreatment and posttreatment cephalometric measurements. Table 1 and tale 2 shows soft tissue and hard tissue change before and after the treatment respectively.

As illustrated in table 1 it signifies significant change from pre posttreatment values of upper lip -E line, lower lip- E line and Z - angle (P<0.001) was seen .

Variables	Pretreatment (T1)	Posttreatment (T2)	P Value
Upper lip thickness	12.6 ± 1.8	14.8 ± 1.4	3.388-E05
Lower lip thickness	13.6 ± 1.4	15.1 ± 1.2	.0004
Pog-Pog'	11.8 ± 1.5	13.5 ± 2.3	.0086
Me- Me'	7.4 ± 1.6	8.8 ± 1.3	.0019
Nasolabial angle	103.5 ± 6.8	106.4 ± 7.7	.1937
Interlabial gap	3.3 ± 1.3	2.4 ± 1.1	.0214
Upper lip -E line	-0.72±2.12	-2.37±2.32	0.000*
Lower lip- E line	0.01±2.96	-1.38±2.82	0.001*
Z-angle	66.44±7.63	70.60±6.47	0.001*

Table 1- soft tissue result of pretreatment and post-treatment.

Variables	Pretreatment	Posttreatment	P value
SNA	81.64±2.31	81.84±2.19	0.632
SNB	76.20±2.48	78.12±2.59	0.000*
ANB	5.48±1.71	3.72±1.65	0.000*
Incisal inclination	85.92±2.29	85.72±3.06	0.664
Overjet	6.42±2.42	3.72±1.57	0.000*
Overbite	4.26±1.95	3.11±1.63	0.007*
IMPA	94.22±6.67	95.92±7.35	0.089
N-Pog	9.64±4.42	6.96±4.25	0.000*

Table 2:- Hard tissue result of pretreatment and post treatment

DISCUSSION :

Using functional appliances therapy not only bring about skeletal and dental changes but it also brings about change in soft tissue profile of the patient. At the same time opting functional appliance eliminates the need of extraction. The aim of this research was to evaluate the effect of myofunctional appliance on soft issue and hard tissue in growing individuals. Facial appearance plays a major role in social well- being of individuals. Many researchers shows that the stretch of the muscles and the adjacent soft tissues of the facial skeleton leads to repositioning of the forward shift of mandible to its original place also causing headgear effect on maxilla[21,22]. In our research it was observed that a significant change was noted in upper lip to E line, lower lip to E line and Z angle. Hard tissue evaluation states significant change in SNB, ANB, overjet, overbite and N-Pog. Illing et al [23] in his study rooted that there is more pronounced reduction in the inclination of maxillary incisors with twin block group compared to that of bass and bionator group.

In our research upper incisor to palatal plane, showed

significant reduction from pretreatment to post treatment.

CONCLUSION :

The conclusion of our research is myofunctional appliance (twin block) bring about change in hard tissue and soft tissue. Patient''s facial esthetics improves. Since, treatment was started at the growing phase so, change in mandibular length was observed . which was also due to true mandibular growth anf repositioning of mandible also.

REFERENCE :

1. Wahl N. Orthodontics in 3 millennia. Chapter 9: functional appliances to midcentury. Am J Orthod Dentofacial Orthop. 2006;129(6):829-833.
2. Stockfisch, H. (1995) (ed.), The Principles and Practice of Dentofacial Orthopedics. Quintessence Puplishing Co, Inc., New Malden, United Kingdom.
3. Fränkel, R. (1971) Possibilities of a late basal development of the mandible through the rearrangement of the bite by means of a functional regulator. Deutsche Stomatologie, 21, 198-202.
4. Clark, W.J. (1988) The twin block technique. A functional orthopedic appliance system. American Journal of Orthodontics and Dentofacial Orthopedics, 93, 1-18.
5. Pancherz, H. (1982) The mechanism of Class II correction in Herbst appliance treatment. A cephalometric investigation. American Journal of Orthodontics, 82, 104- 113.
6. Cozza, P., Baccetti, T., Franchi, L., De Toffol, L. and McNamara, J.A., Jr. (2006) Mandibular changes produced by functional appliances in Class II malocclusion: a systematic review. American Journal of Orthodontics and Dentofacial Orthopedics, 129, 599.e1-12; discussion e1.
7. Sarver DM. Special considerations in diagnosis and treatment planning. In: Graber LW, Vanarsdall R, Vig KW, et al. Orthodontics current principles and techniques. St.louis: Mosby; 2017. pp. 245-246.
8. Proffit WR. Malocclusion and dentofacial deformity in contemporary society. In: Proffit WR, Fields HW, Sarver DM, et al. Contemporary Orthodontics. 5th edn., St Louis: Mosby; 2013. p.8.
9. McNamara J, Peterson J, Alexander R. Three-dimensional diagnosis and management of class II malocclusion in the mixed dentition. Semin Orthod. 1996;2(2):114-137.
10. Vargervik K, Harvold E. Response to activator treatment in Class II malocclusions. Am J Orthod. 1985;88(3):242-251.
11. McNamara JA., Jr Components of Class II malocclusion in children 8-10 years of age. Angle Orthod. 1981;51(3):177-202.
12. Marsico E, Gatto E, Burrascano M, Matarese G, Cordasco G. Effectiveness of orthodontic treatment with functional appliances on mandibular growth in the short term. Am J Orthod Dentofacial Orthop. 2011;139(1):24-36.
13. Rego MV, Martinez EF, Coelho RM, et al. Perception of changes in soft-tissue profile after Herbst appliance treatment of class II division 1 malocclusion. Am J Orthod Dentofacial Orthop 2017;151(3):559-564. DOI: 10.1016/j.ajodo.2016.08.028.
14. Tung AW, Kiyak HA. Psychological influences on the timing of orthodontic treatment. Am J Orthod Dentofacial Orthop 1998;113(1):29-39. DOI: 10.1016/S0889-5406(98)70274-4.
15. Pacha, M.M., Fleming, P.S. and Johal, A. (2016) A comparison of the efficacy of fixed versus removable functional appliances in children with Class II malocclusion: a systematic review. European Journal of Orthodontics, 38, 621-630. 11.
16. Cacciatore, G., Ugolini, A., Sforza, C., Gbinigie, O. and Plüddemann, A. (2019) Long-term effects of functional appliances in treated versus untreated patients with Class II malocclusion: a systematic review and metaanalysis. PLoS One, 14, e0221624. 12
17. Santamaría-Villegas, A., Manrique-Hernandez, R., Alvarez-Varela, E. and Restrepo- Serna, C. (2017) Effect of removable functional appliances on mandibular length in patients with class II with retrognathism: systematic review and meta-analysis. BMC Oral Health, 17, 52. 1
18. Perinetti, G., Primoži?, J., Franchi, L. and Contardo, L. (2015) Treatment effects of removable functional appliances in pre-pubertal and pubertal Class II patients: a systematic review and meta-analysis of controlled studies. PLoS One, 10, e0141198.
19. Franchi, L., Pavoni, C., Faltin, K. Jr, McNamara, J.A. Jr and

Cozza, P. (2013) Long- term skeletal and dental effects and treatment timing for functional appliances in Class II malocclusion. The Angle Orthodontist, 83, 334-340

20. Pavoni, C., Lombardo, E.C., Lione, R., Faltin, K. Jr, McNamara, J.A. Jr, Cozza, P. and Franchi, L. (2018) Treatment timing for functional jaw orthopaedics followed by fixed appliances: a controlled long-term study. European Journal of Orthodontics, 40, 430-436.
21. Jena AK, Duggal R, Parkash H. Skeletal and dentoalveolar effects of Twin-Block and bionator appliances in the treatment of Class II malocclusion: a comparative study. American journal of orthodontics and dentofacial orthopedics. 2006;130:594-602.
22. Proffit WR, Fields Jr HW, Sarver DM. Contemporary orthodontics: Elsevier Health Sciences; 2006.
23. Illing HM, Morris DO, Lee RT. A prospective evaluation of Bass, Bionator and Twin Block appliances. Part I-The hard tissues. The European Journal of Orthodontics. 1998;20:501-16