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Evaluation Of Treatment Effects Of Fixed Anterior Bite Plane- A Prospective Cephalometric Study

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Abstract:
Background: *Increased overbite is a relatively common condition and a removable biteplane is often used as therapy for bite opening. An advantage of the simple fixed bite plane is in retention. Deep bites have a strong disposition to relapse soon after treatment is completed and during retention. This undesired eruption of the incisors, with or without a partial intrusion of the molars, is often responsible for other types of relapse, such as lower crowding, increase in overjet, and loss of Class II correction. The concept of unlocking the mandible was introduced by the bioprogressive School, proves has shown forward sliding of mandible during bite opening. Concerning deep bite and considering quick unravelling of the anterior bite issues anterior bite plane plays a major role. The aims of the present investigation were to study whether the bite-opening effect caused by the fixed maxillary lingual arch appliance with anterior biteplane was accompanied by changes in the antero posterior position of mandible, changes in inclination of upper and lower incisor and change in the vertical dimension and mandibular plane angle*
Materials And Methods: *10 patient aged 12-22 who met up with inclusion criteria were included in the study. All the participants of the study were treated using 0.022 MBT bracket system along with fixed anterior bite plane that was inserted on the day of bonding. The bite plane was placed in occlusion to the lower incisors and the bite plane was designed in such a way to produce 3- 4 mm of seperation between the upper and lower molar and the treatment progress was continued and a lateral cephalogram was obtained after 4 months of treatment with the anterior bite plane in place when occlusal contact between the upper and the lower molars was established.*
Result: *The given post and pretreatment values were subjected to descriptive analysis followed by hypothesis testing using paired t test with a p value of 0.005 being statistically significant using spss software 21.0 and the results showed that there was statistically significant forward movement of B point and increase in lower incisor inclination.*
Conclusion: *The B point has moved forward which is statistically significant with an increase in the mandibular plane angle but adversely causes more lower incisor flaring .There is upward and forward eruption of mandibular molar improving the degree of class II that is statistically significant*
Keywords: *anterior bite plane, growth pattern, cephalometric changes*

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I. Introduction:

In an orthodontist perspective among various malocclusion the stability of treatment of malocclusion in vertical plane always remains questionable since changing the direction of growth has less stability of which deep bite management shows greater relapse rates [1]. The concept of unlocking the mandible was introduced by the bioprogressive School, proves has shown forward sliding of mandible during bite opening. Concerning deep bite and considering quick unravelling of the anterior bite issues anterior bite plane plays a major role. With deep bite, orthodontics treatment can not proceed as bonding the lower incisors becomes difficult

The two common treatment options used to correct deep bite are maxillary

Incisor intrusion using any of the intrusion mechanics and posterior tooth eruption using an fixed anterior bite plate. Both of these, either intrusion mechanics or bite plane treatment modality is considerred effective to reduce deep bite over a relatively short period of time. eventhough mechanisms of correction are different in the these two treatment procedures, with the intrusion mechanics demonstrating significant maxillary incisor intrusion accompanied by a greater decrease in maxillary anterior tooth display (lip to tooth) and bite plate patients exhibit more lower incisor intrusion, significant flaring of the lower incisors and a small increase in the mandibular plane angle[2]. Patients in both the intrusion arch and bite plate treatment modalities may experience flattening of the smile arc during the overbite correction phase of treatment.

The criteria that is used for bite correction depend upon the
1.Incisal Show At Rest And Smile
2.The Curve Of Spee In Lower Arch
3.The Posterior Dental Height
4.Growth Pattern

An ideal candidate for bite plane modality of treatment for deep bite correction
1. Horizontal growth pattern
2. Reduced lower anterior facial height
3. Average incisal show
4. Deep bite with upright lower incisors

II. Material And Methods:

This study was conducted on 10 patient who were undergoing fixed orthodontic treatment in CSI COLLEGE OF DENTAL SCIENCES AND RESEARCH and had fixed anterior bite plane as a part of treatment in correction of deep bite

Sample Size Calculation: This study was conducted as a pilot study with total 10 patients. The sample size was calculated from the reference article [9] with 90% power and 95% confidence interval.

Sampling Method

The sampling method used was purposive sampling and the sample were selected such that the patient who require and would be benefitted through this intervention

Inclusion Criteria:
- Patients with horizontal or normal growth pattern
- Patient who give consent for the study
- Patients between 12- 22 yrs of age
- Both male and females are included

Exclusion Criteria:
- Patients with vertical growth pattern
- Patients with periodontal complaints.
- Mutilated malocclusion

All the participants of the study were treated using 0.022 MBT bracket system along with fixed anterior bite plane that was inserted on the day of bonding and the Bite plane was designed to prevent anterior pressure over the upper anteriors. The acrylic surface which was in contact to palatal mucosa was trimmed and polished to diminish the potential risk of gingival irritation. The bite plane was placed in occlusion to the lower incisors and the bite plane was designed in such a way to produce 3- 4 mm of seperation between the upper and lower molar and the treatment progress was continued and a lateral cephalogram was obtained after 4 months of treatment with the anterior bite plane in place when occlusal contact between the upper and the lower molars was established. The appliance was then removed, and permanent overbite reduction was secured with an edgewise appliance.

The outcome variable that were measured includes
1. Antero posterior position of maxilla and mandible
2. Changes in inclination of upper and lower incisor
3. Change in the vertical dimension with respect to dental height
4. Mandibular plane angle

Fig 1 And Fig 2: pre operative photographs of the patient and the mid operative photographs with fixed anterior bite plane just before removal showing contacts of upper and lower posteriors in contact with each other.

Cephalometric Measurement

Two cephalograms were taken one at the start of treatment and one 4 months post insertion of fixed anterior bite plane. The measurement used can be broad classified as linear and angular measurements. We use nasion perpendicular as the vertical reference plane from which the linear measurements in antero posterior variables are measured which includes distance between A point, B point , mesiobuccal cusp of maxillary and mandibular molar to nasion perpendicular. Angular measurement includes the angle between gonion gnathion plane and sella nasion plane, inclination of maxillary incisors with respect to palatal plane and inclination of mandibular incisors to mandibular plane. Maxillary and mandibular posterior dental heights are measured from the mesiobuccal cusp tip of maxillary molar to palatal plane and mesiobuccal cusp tip of mandibular molar to mandibular plane drawn a tangent to lower border of mandible.

III. Results:

The given post and pretreatment values were subjected to descriptive analysis followed by hypothesis testing using paired t test with a p value of 0.005 being statistically significant using spss software 21.0 and the results showed that the B point moved forward with a statistical significance of 0.039 and lower incisor inclination increased with a statistical significance of 0.000. there was a increase in the posterior mandibular dental height with a statistical significance of 0.000.

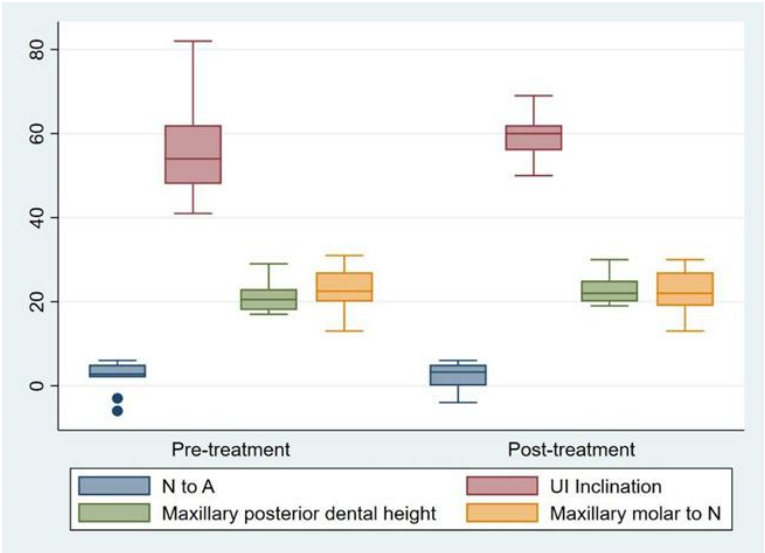

Figure -3 whisker plot showing showing changes in the maxillary unit

Figure 4 whisker plot showing changes with respect to mandibular unit

Table 1: Descriptive statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
1	N to A pre	2.050	10	3.7892	1.1983
	N to A post	2.650	10	3.2150	1.0167
2	N to B pre	-3.800	10	5.2926	1.6737
	N to B post	-2.500	10	4.9216	1.5563
3	LI Inclination pre	96.40	10	8.656	2.737
	LI Inclination post	105.00	10	8.340	2.637
4	UI Inclination pre	55.40	10	11.664	3.688
	UI Inclination post	59.10	10	5.971	1.888
5	Maxillary posterior dental height pre	21.40	10	3.921	1.240
	Maxillary posterior dental height post	23.00	10	3.559	1.125
6	Mandibular plan angle pre	26.40	10	4.195	1.327
	Mandibular plan angle post	30.60	10	4.502	1.424
7	Mandibular posterior dental height pre	24.00	10	4.522	1.430
	Mandibular posterior dental height post	27.40	10	4.061	1.284
8	Maxillary molar to N pre	22.80	10	5.329	1.685
	Maxillary molar to N post	22.20	10	5.051	1.597
9	Mandibular molar to N pre	22.40	10	5.103	1.614
	Mandibular molar to N post	20.60	10	4.789	1.514

Table 2: Hypothesis testing using paired t test for cephalometric variables

Paired Samples Test									
		Paired Differences					t	df	Sig. (2tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			

1	N to A pre - N to A post	-.6000	1.3499	.4269	-1.5657	.3657	-1.406	9	.193
2	N to B pre - N to B post	-1.3000	1.7029	.5385	-2.5182	-.0818	-2.414	9	.039*
3	LI Inclination	-8.600	4.926	1.558	-12.124	-5.076	-5.521	9	.000**
	pre - LI Inclination post								
4	UI Inclination pre - UI Inclination post	-3.700	9.592	3.033	-10.562	3.162	-1.220	9	.254
5	Maxillary posterior dental height pre - Maxillary posterior dental height post	-1.600	.516	.163	-1.969	-1.231	-9.798	9	.000**
6	Mandibular plan angle pre - Mandibular plan angle post	-4.200	1.874	.593	-5.540	-2.860	-7.088	9	.000**
7	Mandibular posterior dental height pre - Mandibular posterior dental height post	-3.400	.843	.267	-4.003	-2.797	-12.750	9	.000**
8	Maxillary molar to N pre - Maxillary molar to N post	.600	1.174	.371	-.240	1.440	1.616	9	.140
9	Mandibular molar to N pre - Mandibular molar to N post	1.800	1.549	.490	.692	2.908	3.674	9	.005**

* P < 0.05 is statistically significant

** P < 0.005 is statistically highly significant

IV. Discussion

To effectively treat children with deep bite malocclusions, a maxillary *fixed* lingual arch appliance with anterior biteplane was used by Forsberg and Hellsing[3]**.** Different opinions prevail as to the effect of an anterior bite plane on dentofacial morphology. However, with regard to den to-alveolar changes, most authors agree that there is usually no actual depression of the lower incisors, whilst the posterior teeth that are separated from occlusion, will continue to develop vertically until they occlude (Bahador and Higley, 1944; Belger, 1956; Atherton, 1963; Richardson and Adams, 1963; Menezes, 1975). By comparing the pre and post treatment values there was high statistical significance in relation to nasion perpendicular to B point Lower incisor inclination, mandibular plane angle, mandibular posterior dental height and distance between Nasion perpendicular to mesio buccal cusp of mandibular molar.

The reason for increase in the mandibular plane angle could be attributed to eruption of mandibular molar that is evident from the observed value that could have wedge opened the mandibular plane angle. The increase in molar height is associated with an increase in the vertical dimension of the face (Richardson and Adams, 1963; Menezes, 1975)[4].The decrease in the distance between the mesio buccal cusp of the mandibular molar to the nasion perpendicular may be attributed the concept of direction of growth of the mandibular molar. Forseberg et al in his study showed significant differences between the group treated with anterior bite plane and a control group were found in the direction of growth of the jaws. The angle between the maxilla and the mandible

(ML/ NL) increased by 1 degree in the treated group and decreased by 0.5 degrees in the untreated group with increase in the mandibular plane angle upto 5 degree . The total face height (N-Gn) did not increase significantly more in the treated group. The growth of the upper and lower face heights was, however, significantly different in the two groups. The vertical development of the upper face (N-Sp) was retarded in the treated individuals, whereas the lower face height showed an increased rate of growth which correlate with the result of this study even though facial heights were not measured in this study we measured mandibular and maxillary posterior dental height.[5] With this respect as the mandibular posterior dental height is increased and Since it is said that the mandibular molar always erupts in upward and forward direction and when the bite plane causes posterior separation the mandibular molar erupts forward and upward direction to occlude with the opposing teeth there is decrease in the distance between the nasion perpendicular to mesio buccal cusp of mandibular molar.[6]

Parker et al[7] in his study showed that in The Class II, Division 1 group had an average increase in the IMPA of 5.02 °, the mandibular incisor to NB increased 5.05 ° and 0.80 mm, and the mandibular incisor to A-Pogonion decreased 0.42 mm. The Class II, Division 2 group showed the largest average increase in the IMPA of 7.91 °, the mandibular incisor to NB an average increase of 7.57 ° and 1.48 mm, whereas the mandibular incisor to A-Pogonion decreased by 0.89 mm. Another factor that should be considered for achieving deep bite correction stability is the position of the mandibular incisors. The mandibular incisors should be positioned upright in relation to the basal bone.[8] Excessive labial tipping of the mandibular incisors should be avoided to minimize the risk of root resorption and bone dehiscence. But the results of this study showed statistically significant increase in the inclination of lower incisors.

According to dawlatly et al [8] systematic review states "Mandibular unlocking" is considered one of the clinical practices done by some orthodontists to treat mandibular retrognathism in growing patients with Class II deep bite. This is usually accomplished through opening of the bite anteriorly using anterior bite plates or other appliances that work on intruding the anterior segment. This unlocking procedure takes place at an early age, which is the exact time of growth modification.[9] Accordingly, it takes up the period during which functional appliance therapy could be accomplished . This long-established clinical procedure, however, claimed to be clinically effective in gaining a more advanced mandibular position, yet this philosophy needs to be supported by solid evidence. Accordingly, a systematic review of orthodontic literature was mandatory to answer this question. From the pre and post treatment value of nasion perpendicular to B POINT there is an decrease in the distance is evident in the study and can be explained may be explained as when we unlock the mandible which was hindered by the deep bite has translated forward when we remove the hindrance.[10-13]

In certain cases there is change in the pre and post treatment values of Nasion perpendicular to A point. This can be explained with respect to changes in the nasion point which can be confirmed with the difference observed in superimposition between pre and post treatment with stable reference at se point.[14-16]

In a case we found an increase of 9 degree in the mandibular plane that would have caused the clockwise rotation of mandible resulting an increase in the distance between b point and Nasion perpendicular and the distance between mesiobuccal cusp of mandibular molar to nasion perpendicular worsening the class ii molar.

V. Conclusion

From this study it can be concluded that with an bite plane therapy for deep bite correction there is

1. The B point has moved forward which is statistically significant
2. There is an increase in the mandibular plane angle which is statistically significant
3. There is lower incisor flaring which is statistically significant but lower incior flarring is an detrimental effect of bite plane that should be given importance and corrected by incisal capping or lingual crown torque in lower anteriors
4. There is upward and forward eruption of mandibular molar improving the degree of class II that is statistically significant

References

[1] Proffit WR, Fields HW. Contemporary Orthodontics. St. Louis, MO: C.V. Mosbyco; 2007. P. 3e92.
[2] Al-Khateeb EA, Al-Khateeb SN. Anteroposterior And Vertical Components Of Class II Division 1 And Division 2 Malocclusion. Angle Orthod 2009;79:859e66.
[3] Forsberg C-M And Hellsing E. "The Effect Of A Lingual Arch Appliance With Anterior Bite Plane In Deep Overbite Correction".European Journal Of Orthodontics 6.2 (1984): 107-115.
[4] Richardson A, Adams C P 1963 An Investigation Into The Short And Long Term Effects Of The Anterior Bite Plane On The Occlusal Relationship And Facial Form.Transactions European Orthodontic Society 39: 375383
[5] Woods MG. Sagittal Mandibular Changes With Overbite Correction In Subjects With Different Mandibular Growth Directions: Late Mixed-Dentition Treatment Effects. Am J Orthod Dentofacial Orthop 2008;133:388e94.
[6] Bahador M A, Higley L B 1944 Bite Opening: Acephalometric Analysis. Journal Of The Americandental Association 31: 343-352
[7] Parker CD, Nanda RS, Currier GF. Skeletal And Dental Changes Associated With The Treatment Of Deep Bite Malocclusion. Am Jorthod Dentofacial Orthop 1995;107:382e93.
[8] El-Dawlatly MM, Fayed MM, Mostafa YA. Deep Overbite Malocclusion: Analysisof The Underlying Components. Am J Orthod Dentofacial Orthop 2012;142:473e80.

[9] Belger I 1956 Cephalometric Analysis Of Growth Insubjects Using Bite Plate. Angle Orthodontist 26:42-49
[10] Sieichter C G 1954 Effects Of Maxillary Bite Plane Therapy In Orthodontics. American Journal Of Orthodontics 40: 850-870
[11] Labib A. "Evaluation Of Removable Appliances With Anterior Bite Planes In The Treatment Of Deep Anterior Overbite" (1988).
[12] Fayed M. "Effect Of Fixed Anterior Bite Plane On Condylar Position And Muscle Activity In Adolescents". (2003).
[13] Parker CD., Et Al. "Skeletal And Dental Changes Associated With The Treatment Of Deep Bite Malocclusion". American Journal Of Orthodontics And Dentofacial Orthopedics 107.4 (1995): 316-323.
[14] Hazem K. "A Clinical Evaluation Of Removable Versus Fixed Anterior Bite Plane" (2000).
[15] Fouad ES. "Effect Of Fixed Anterior Bite Plane Thickness On Deep Overbite Treatment" (2005).
[16] Levin RI. Deep Bite Treatment In Relation To Mandibular Growth Rotation. Eur Jorthod 1991;13:86e94.