Treatment Changes of Chin Position in Class-II Division 1 Patients - A Cephalometric Study

Atul Singh, Kishore M.S.V.**, Shetty K.S. ****

The present study is designed to evaluate the changes of chin position in class- II division 1 growing patients, treated with Activator-headgear (ActHg) and Herbst appliance and attempt is made to ascertain the most important determinants of AP (anteroposterior) chin position.

Sample of 28 growing individuals with skeletal and dental Class II was divided in to three groups, (Activator headgear (ActHg) group 10, Herbst group 10 and a control group of 8 patients). Pre (T1) and post (T2) growth modulation/observation standardized lateral cephalograms were traced, horizontal and vertical movements of selected landmarks were described based on Reference grid, a rectangular coordinates (X, Y). Condylar growth and true rotation of the mandible were calculated by mandibular superimpositions.

Reduction in ANB was mainly due to mandibular growth with no significant change in SNA value. Schudy's pogonion formula was not supported by the results. The most important determinant of anterior chin movements during growth and treatment was true rotation.

Methods commonly used to correct Class II skeletal malocclusions produce no significant improvements in anteroposterior chin position. Skeletal Class II correction in growing adolescents results primarily from mandibular growth.

Anteroposterior changes in chin position cannot be accurately predicted by Schudy's pogonion formula, instead approximately 70% of the variability in anteroposterior movement of the chin can be explained by true rotation, horizontal and vertical condylar growth, and remodeling of the glenoid fossa.

Keywords: Activator headgear, Herbst, Chin position, True rotation.

Factors influencing the esthetics of the face have attracted the interest of orthodontic profession virtually from its inception. Straighter profile and more prominent chins are preferred esthetically over retruded chin positions. Alteration of the patient's facial profile has been a challenge for orthodontists over the years. Many investigations have been carried out to evaluate the possibilities of growth modification with orthopedic appliances. However, the results have generally been a subject of debate till today.

A large number of functional appliances of different designs, fixed and removable, have been used to correct Class II division 1 malocclusions. Among this pool of functional appliances two commonly used devices are the Herbst appliance — a fixed functional appliance (Pancherz, 1979), and the activator headgear (AHg) — a removable functional appliance (van Beek, 1982).

Possible mechanisms for improving AP chin position include (1) increase in mandibular size, (2) repositioning of the glenoid fossa, and (3) counterclockwise or forward rotation of the mandible.

Because of the lack of studies comparing matched samples, the purposes of this study were-

(1) To determine how Class II treatment affects anteroposterior (AP) chin position in growing subjects.

(2) To ascertain the most important determinants of AP chin position.

**Post Graduate Student*
***Professor*
****Professor and Head, Department of Orthodontics and Dentofacial Orthopedics, Bapuji Dental College & Hospital, Davangere, Karnataka.*

METHODOLOGY

Lateral cephalograms of 28 patients with Class II, Division 1 malocclusion which includes groups treated with headgear activator and Herbst appliance(10 each) and control group of untreated patients (8 in number) taken from the Department of Orthodontics, Bapuji Dental College and Hospital, Davangere. The primary selection criteria were: a) Class II Division 1 malocclusion with end-on to Class II molar relationship. b) Class II skeletal relationship(ANB>5degree). c) Growing children. d) Mandibular deficiency. (Table-1)

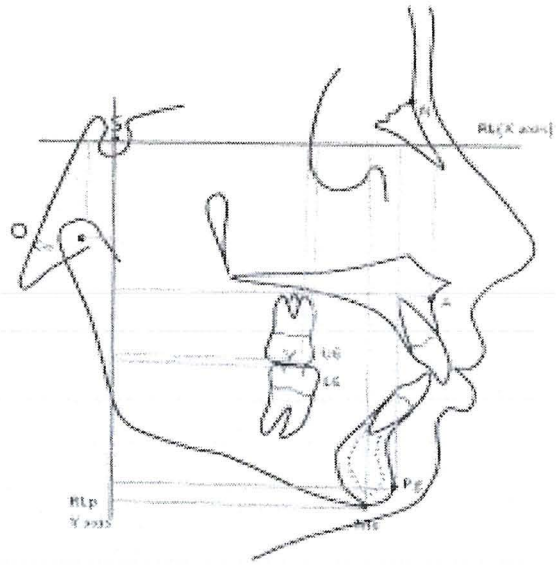
1. ANALYSIS OF LATERAL CEPHALOGRAMS

Standardization was done with the cephalograms taken in the same machine. The linear measurements were adjusted to eliminate magnification.

Midpoints of right and left images were used for bilateral landmarks. Angular measurements were recorded with a protractor to a nearest of 0.5^0 and linear measurements were made with a ruler to a nearest of 0.5mm. All tracings were rechecked to verify the accuracy. Traditional measurements were used to determine anteroposterior changes in the maxilla and the mandible (SNA, SNB, ANB, and SN-Pg angles) and changes in the mandibular plane angle (SN-GoGn).

Anterior and posterior stable reference landmarks were marked on the pretreatment (T1) tracing. The posttreatment (T2) tracing was superimposed on the stable bony structure of the anterior cranial base, and the reference structures were transferred to the second, superimposed tracing. The horizontal and vertical movements of selected landmarks were described based on Reference grid, a rectangular coordinates (X, Y). A horizontal reference line (RL), was oriented based on the T1 sella-nasion plane minus 7°, registering on T1 sella. This line corresponds to the X-axis of the grid. RLp is a line perpendicular to the RL through the sella point. This line corresponds to the Y-axis of the grid. RL/RLp reference grid was defined on pretreatment cephalogram and transferred on the posttreatment cephalogram after superimposing on the stable bony structure of the anterior cranial base.[6] **(Fig 1)**

Fig. 1: LINEAR PARAMETERS FOR HARD TISSUE EVALUATION ON LATERAL CEPHALOGRAM



S	Sella
N	Nasion
A	A Point
Pg	Pogonion
Me	Menton
Co	Condylion
U6	Maxillary 1st Molar
L6	Mandibular 1st Molar
RL	Reference Line
RLp	Perpendicular toReference Line passing through

As accurate location of condylar head on lateral cephalogram is extremely difficult in many situations. Hence in this study an arbitrary point, condylion (Co) was taken on the pretreatment cephalogram in the center of condylar head region, as explained by Creekmore(1967)[7] **(Fig 2).** This point was transferred on posttreatment cephalogram after superimposing on the stable bony structure of the anterior cranial base. Change in position of this point was measured by superimposition of the head films on the stable bony structures of the mandible. The position change of

Fig 2: Arbitrary point in area of condylar head is marked on first head film (shown with dotted line) and then transferred to second head film (continuous line) after superimposition of the films on the stable anterior cranial base bone structures.

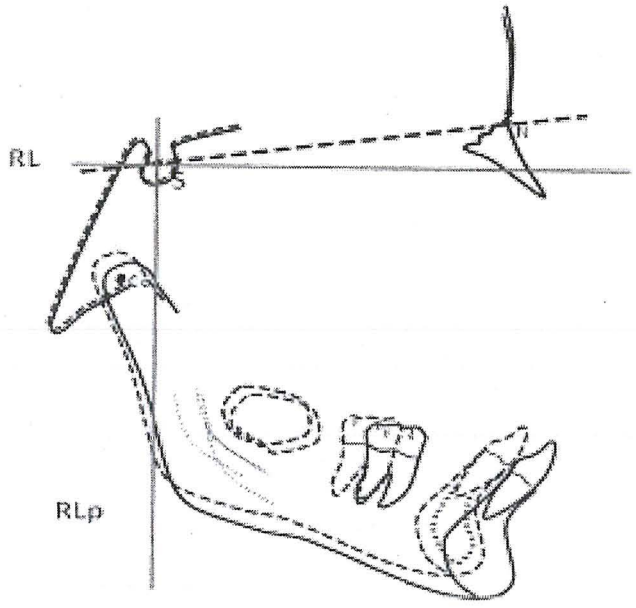


Fig 3: Measurements of effective condylar growth (Co point changes) in relation to the RL/RLp reference grid (defined on the first head film). Superimposition of the second head film (continuous line) on the first head film (shown with dotted line) with stable mandibular bone structures used for orientation.

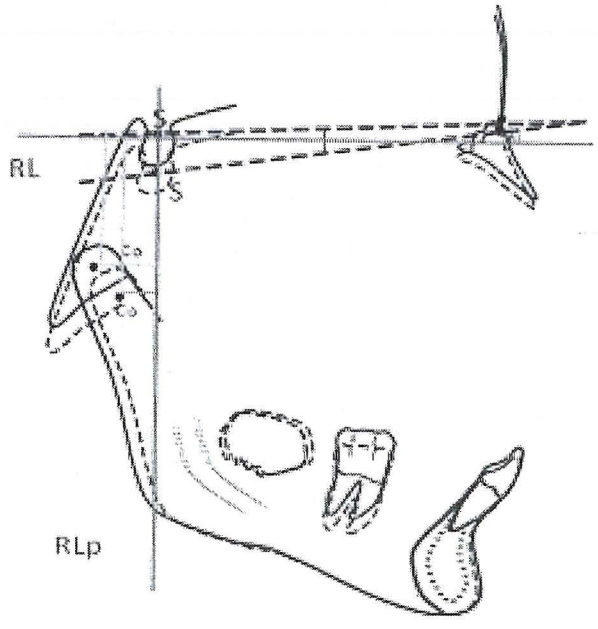
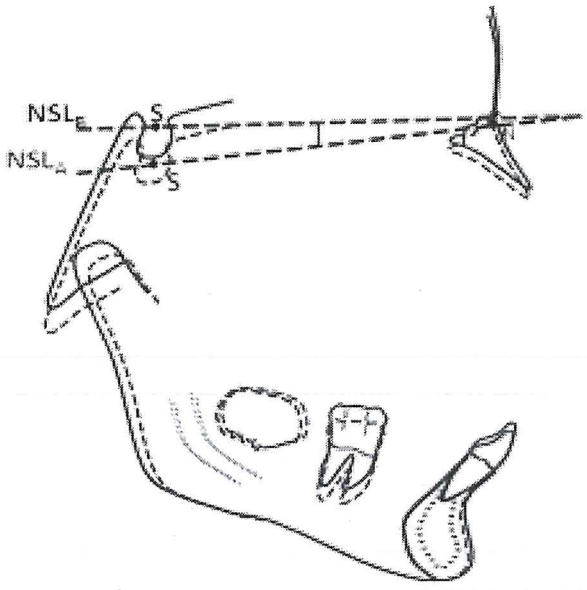


Fig. 4: Mandibular true rotation measured from the angle between the nasion-sella lines, at two stages (A and B) after superimposition of the mandible on the natural reference structures.



the Co-point represents the *effective condylar growth*. This can be defined as a summation of (1) condylar remodeling, (2) glenoid fossa remodeling, and (3) condylar position changes in the fossa. Co/RLp implies sagittal effective condylar growth and Co/RL implies vertical effective condylar growth **(Fig 3).**

To evaluate condylar growth and true rotation of the mandible, mandibular superimpositions were performed by using natural reference structures. The radiographic tracings were oriented based on the following structures: (1) anterior contour of the chin, (2) inner contour of the cortical plate at the lower border of the symphysis, (3) distinct trabecular structures in the symphysis, (4) contour of the mandibular canal, and (5) third-molar tooth germ before root formation.

True rotation was determined from the angle between the nasion-sella lines, at two stages (pretreatment and posttunctional) after superimposition of the mandible on the natural reference structures, as explained by Bjork(1969)[4] **(Fig 4)**. The comparison was thus formulated in degrees and evaluated for all the three groups.

RESULTS

Intra group comparison revealed the following points-

SNA values showed no significant change in all the three groups and the ANB is reduced in both the treatment groups, which is mainly due to mandibular growth evident by increased SNB value in treated groups whereas no significant change is seen in control group. Pogonion moved forward in all the groups but it was significant only in the treatment groups. Mandibular plane angle was closed minimally in both the treatment groups and opened minimally in control but this intragroup difference was insignificant.

Horizontal linear measurements suggested:- Pogonion and Menton moved forward in all the three groups but were only significant in treatment groups. Point A showed minimal change in AHg group but moved forward in Control and Herbst groups, but the values were not significant. Condylion point showed more horizontal growth in treatment groups compared to control but the values were statistically insignificant. Upper and lower molars moved mesially in control group, but upper molars were held in place and lower molars moved mesially significantly in treatment groups.

Vertical linear measurements suggested :- Pogonion and Menton moved vertically downward in all the groups but values were highly significant in treatment groups. Point A moved downward in control and Herbst group but was held back in same position in AHg group. Upper and lower molars moved downward in all the three groups. Condylion point

Table 1. Pretreatment skeletal relationships of Untreated control groups, Activator- headgear and Herbst group.

	Control		Act-Hg		Herbst		
Parameters	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**P* Value**
SNA	**80.88**	2.85	**80.90**	2.08	**80.10**	2.77	0.74 NS
SNB	**74.50**	3.07	**73.10**	2.08	**73.90**	2.88	0.54 NS
ANB	**6.38**	1.30	**7.80**	1.81	**6.20**	0.79	0.03 S
SN-Pg	**75.25**	2.85	**74.15**	1.94	**75.20**	2.70	0.56 NS
SN-GoGn	**32.63**	6.82	**31.40**	3.53	**28.85**	2.65	0.2 NS

* Oneway ANOVA test

Inter group Comparison

Table 2: Angular changes

	Control		Act-Hg		Herbst			
Parameter	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**P* Value**	**Significant Pairs**
SNA	0.63	2.13	0.70	1.64	0.35	2.36	0.92 NS	-
SNB	0.00	1.98	-2.05	1.42	-1.70	1.70	0.042 S	1&2 , 1&3
ANB	0.63	0.95	2.75	0.86	2.05	1.07	P<0.001 HS	1&2 , 1&3
SN-Pg	0.13	2.08	-1.90	1.66	-1.90	1.71	0.043 S	1&2 , 1&3
SN-GoGn	-0.81	2.31	0.50	2.32	1.65	1.67	0.066 NS	-
True rotation	1.25	2.25	2.10	3.03	1.85	2.00	0.76 NS	-

*Oneway ANOVA test

** Scheffe's test

showed upward growth in all the three groups but was highly significant in treatment groups.

Inter group comparison revealed

Angular values suggested SNB, SNPg increased sufficiently in treatment groups to show significant group difference. (Table-2). ANB was reduced in all the groups and showed group difference between treatment and control group. SNA, mandibular plane angle and true rotation did not show any group difference. Horizontal linear movement showed group difference between control and AHg group for movement of upper molar, and between control and Herbst group for movement of lower molar. No group difference was found for the movement of pogonion, menton, Point A and Condylion. (Table-3). Linear movement in vertical direction showed group difference between control and AHg only for movement of Condylion, no other parameters showed any group difference. (Table-3)

The regression analysis showed that true rotation of mandible was most closely associated with the AP movements of pogonion. The regression indicated 1.4 mm of anterior movement of pogonion for every 1 degree of true rotation. True rotation alone explained 50% (R= 0.71) of the variation in the AP movements of pogonion. Horizontal condylar growth, vertical maxillary, vertical upper molar, vertical condylar growth and vertical lower molar were the second, third, fourth, fifth and sixth variables to enter the regression, respectively. They produced a multiple regression of 0.84, which accounted for 70% of the variation in AP chin movement. The standard error of the estimate indicated that these 6 variables predicted the AP movements of pogonion within ±1.5 mm (Table-4).

DISCUSSION

Prior to the impact of head measure-ment with X-ray, the orthodontist was prone to take full credit for all the changes occurring during treatment. All favorable changes were thought to be due to the beneficial influence of his appliances while poor results were often passed off as a result of poor

Table 3: Linear changes

HORIZONTAL CHANGES

	Control		Act-Hg		Herbst			
Parameter	Mean	SD	Mean	SD	Mean	SD	P* Value	Significant Pairs
Pg	-1.88	2.96	-4.00	2.33	-4.30	2.41	0.12 NS	-
Me	-1.63	2.76	-4.15	2.40	-4.55	2.73	0.06 S	-
Point A	-1.38	2.28	-0.90	1.60	-1.10	1.51	0.85 NS	-
U6	-3.31	3.53	0.45	2.86	-1.00	2.20	0.03 S	1&2
Co	-0.13	2.22	-1.00	2.39	-2.40	1.70	0.08 NS	-
L6	-2.50	2.39	-4.10	2.37	-5.70	1.55	0.014 S	1&3
VERTICAL CHANGES								
Pg	-4.88	3.55	-5.50	2.94	-3.65	1.84	0.34 NS	-
Me	-4.44	2.18	-5.55	2.33	-3.85	1.08	0.15 NS	-
Point A	2.25	2.00	-1.00	1.39	-1.45	1.14	0.23 NS	-
U6	-3.19	1.53	3.00	2.09	-2.25	2.31	0.58 NS	-
Co	3.18	3.45	7.95	3.77	5.40	2.47	0.01 S	1&2
L6	-3.06	1.45	-3.90	1.79	-3.30	2.25	0.68 NS	-

*Oneway ANOVA test

** Scheffe's test

co-operation or failure to carry out in-structions. Later histologic studies suggested that or-thopedic forces affected growth at the mandibular condyle[1].

The direction of condylar growth was noted to influ-ence the swing of the chin just opposite to that often described in the literature as the resultant of intermaxillary pull. Methods of directing mandibular be-havior by mechanical manipulation of the teeth were therefore sought.[10] Changes observed in the con-vexity of the face were greater than growth could correct even if all man-dibular growth was expressed in a for-ward direction. Around the same time Schudy did study to emphasis the relation between the vertical growth and the anteroposterior growth and its consideration on orthodontic treatment. To predict the change in position of chin he gave a mathematical formula known as "Pogonion formula". C — (N to ANS + 6 + 6) = P. Where C equals the growth of the condyle in mm, N-ANS (nasion to anterior nasal spine) is the vertical growth of the maxilla, 6 is the vertical growth of the maxillary first molar, 6 is the verti-cal growth of the mandibular first mo-lar, P equals anteroposterior change of pogonion in mm with relation to nasion[2].

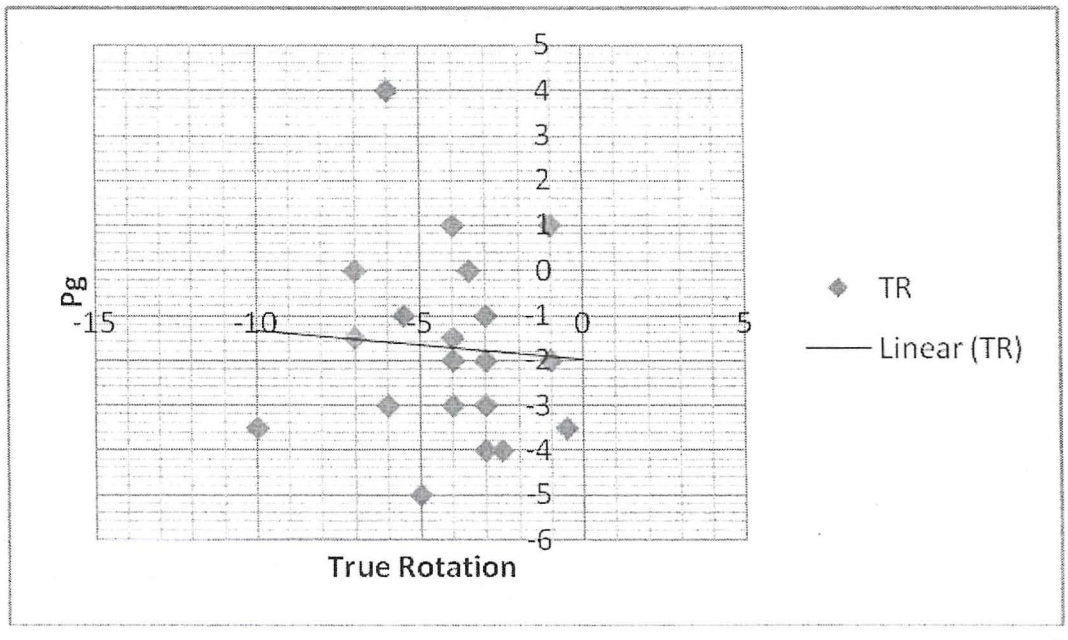
A retrospective study that compared the treatment outcome of the Herbst appliance and the Andresen activator (HAA) in terms of effective TMJ growth changes and their influence on the position of the chin (Baltromejus *et al.*, 2002) found that effective TMJ and chin changes were greater with both activator and Herbst treatment than in the control subjects. However, the Herbst appliance produced more favorable sagittally orientated treatment effects in a much shorter time than the activator[11]. Our results showed that ANB is reduced in both the treatment groups, which is mainly due to mandibular growth evident by increased SNB values in treated groups. This finding was in accordance with previous studies[5,8]. There was no significant change seen in SNA value.

Activator- headgear treatment produced reductions in ANB angle (average 2.75°) compared to 0.63° in the control group as previously reported for comparable treatments. The SNB was increased (average 2.05°), and SNPg by (1.9°) suggesting mandibular growth and mandibular plane angles were relatively maintained; this is consistent with previously reported changes[5]. These results confirm that AHg treatment, when used with proper mechanics, does not cause undesirable mandibular rotation. The mandibular plane angle was held relatively constant throughout treatment.

The sagittal correction in the Herbst group was similar to previously reported changes. The amount of SNA angle changes compared favorably with amounts previously reported. ANB angle reduced average by 2.05° compared to 0.63° in the control group. In concordance with previous studies, SNB angle increases by 1.7° and SNPg by (1.9°) suggestive of mandibular growth and mandibular plane angles were relatively maintained. In fact mandibular plane angle was closed by 0.50° in AHg group, and 1.65° in Herbst group while it opened by 0.81° in control group but this difference was statistically insignificant[9].

Table 4- Regression analysis

	True rotation	CoH	Pt A	U6	CoV	L6V				
Constant	Beta 1	Beta 2	Beta 3	Beta 4	Beta 5	Beta 6	R	R^2	P	SEE
-2.8	-0.71	-	-	-	-	-	0.71	0.5	<0.001	1.67
-1.4	-1	0.51	-	-	-	-	0.82	0.68	<0.001	1.4
-1.04	-1	0.52	0.12	-	-	-	0.83	0.69	<0.001	1.39
-1.1	-1	0.51	0.14	-0.04	-	-	0.83	0.69	0.001	1.43
-1.5	-1.1	0.52	0.18	0.007	0.19	-	0.84	0.7	0.002	1.45
-1.6	-1.1	0.52	0.18	0.09	0.17	-0.1	0.84	0.7	0.006	1.5



Graph 1- Linear regression relating horizontal movement of pogonion (Y) with true mandibular rotation (X)

Data suggest Pogonion moved forward by 1.88 mm, 4 mm, and 4.30 mm in Control, AHg and Herbst group respectively. Pogonion moved in vertical direction by 4.88 mm, 5.50 mm and 3.65 mm in Control, AHg and Herbst group respectively. This shows Pogonion moved in vertical direction more than double of horizontal movement in Control group whereas it moved slightly more than horizontal in AHg group and vice versa in Herbst group. Linear movement of pogonion was highly significant in both the treatment group (P value <0.001) in comparison to Control group where only vertical movement was significant (P value 0.006).

Schudy's pogonion formula was not supported by the results. Putting the values in formula for example in AHg group, the difference between condylar and maxillary vertical changes {7.95mm – (1+3+3.9) } = 0.95mm, i.e. according to formula the horizontal movement of Pogonion must be 0.95mm but actual movement occurred was = 4mm. Although significant amounts of vertical maxillary and condylar growth occur during facial development, it appears that they might play a more secondary role in anteroposterior positional changes of the mandible. Because this study does not support the notion that vertical growth of the maxilla as well as vertical maxillary and mandibular dentoalveolar growth are primary determinants of AP chin position, investigators should be cautious when making inferences about the determinants of forward mandibular movement.

The most important determinant of anterior chin movements during growth and treatment was true rotation. As seen in data the greater the counterclockwise or forward true rotation of the mandible, the greater the anterior movement of pogonion (Table 2 and 3). Conversely, if the mandible rotates backwards, indicated by a positive value of true rotation, pogonion shows unfavorable posterior movement. The cases described by Björk and Skieller showed that anterior movements of the chin were strongly related with true rotation of the mandible[12]. This suggests that compensatory changes in condylar and dentoalveolar development can occur secondarily to mandibular rotation, a notion that is supported by morphologic studies evaluating patients with airway restrictions and muscular deficiencies[13,14].

The multivariate models showed that accurate predictions of chin movements require additional information beyond true rotation. As previously shown, the multiple regressions showed that true rotation,

when combined with horizontal and vertical changes in the glenoid fossa and condyle, and the vertical maxillary changes also accounted for approximately 70% of the variation of AP chin position.

Inter group comparison revealed that ANB was reduced by both treatment modality, mostly by increase in SNB, and also improvement in SNPg in comparison to control group (Table 2). Although linear movement of the chin was more in both the treatment groups than the control, but it failed to produce any inter group difference. Upper molar was held or minimally distalized in AHg group (-0.45mm) in comparison to control group (3.31mm) hence creating group difference. Mesial movement of lower molar was seen in all the groups, but it was more with Herbst appliance (5.70mm) creating a group difference with control group (2.50mm) (Table 3). Vertical growth was evident in all three groups but AHg group (7.95mm) only was able to produce group difference with control group (3.18mm). (Table 3)

Together, these studies suggest that an optimal skeletal Class II correction will result from a treatment approach that provides the greatest amount of forward mandibular rotation, which effectively allows for anterior movement of the chin point while controlling undesirable inferior movement of the chin. If the rotation of the mandible plays the primary role, with or without treatment, then it becomes clear that true rotation must be addressed when attempting to produce greater anterior chin projection. By focusing Class II correction on methods that control eruption and intrude teeth, greater amounts of true mandibular rotation and greater improvements in chin projection might be expected. Studies showed that chewing exercises, performed from approximately 4 weeks to 2 years, can produce 2° to 2.5° of mandibular plane closure[15,22] similar with posterior bite blocks[16] and removable molar intrusion appliances[17,19]. Vertical chincups, with or without headgear, can redirect condylar growth, increase posterior facial height, and reduce the mandibular plane angle[18,19].

In the future, implants could provide orthodontists a predictable, compliance–free method of inhibiting or reducing dentoalveolar development and thus closing the mandibular plane, rotating the mandible forward, and improving the profile[20,21]. The future offers great promise for a compliance-free, predictable method of producing true forward mandibular rotation and improvements in chin projection.

CONCLUSION

In this study evaluating the effect of Activator-headgear, and Herbst treatment, we made the following conclusions.

1. Methods commonly used to correct Class II skeletal malocclusions produce no significant improvements in anteroposterior chin position. Skeletal Class II correction in growing adolescents results primarily from mandibular growth.

2. AP changes in chin position cannot be accurately predicted by Schudy's pogonion formula[2] (i.e. based on condylar growth, vertical growth of the maxilla, and vertical maxillary and mandibular dentoalveolar growth).

3. Validating previously established mathematical models, approximately 70% of the variability in anteroposterior movement of the chin can be explained by true rotation, horizontal and vertical condylar growth, and remodelinng of the glenoid fossa. True mandibular rotation is the most important determinant of anteroposterior changes of chin position.

References

1. Robert Murray Ricketts. "The Influence of Orthodontic Treatment On Facial Growth And Development". Angle Orthod ; 1960; 30(3): 103-133.
2. F.F.Schudy. Vertical Growth versus Anteroposterior Growth As Related to Function and Treatment. Angle Orthod ; 1964; 34(2): 75-93.
3. F.F.Schudy. The Rotation of the Mandible Resulting From Growth: Its Implications In Orthodontic Treatment. Angle Orthod ; 1965; 35(1): 36-50.
4. A.Bjork. Prediction of mandibular growth rotation. Am J Orthod Dentofacial Orthop; 1969; 55: 585-599.
5. Hakan Turkkahraman and M. Ozgur Sayýn. Effects of activator and activator headgear treatment:

comparison with untreated Class II subjects. European Journal of Orthodontics2006, 28 : 27 – 34.

6. Mark B. LaHaye, Peter H. Buschang, R. G. "Wick" Alexander, and Jim C. Boleyb. Orthodontic treatment changes of chin position in Class II Division 1 patients. Am J Orthod Dentofacial Orthop; 2006;130:732-41.
7. Thomas D. Creekmore; Inhibition or stimulation of the vertical growth of the facial complex, Its significance to treatment. Angle Orthod 1967; 37:285–297.
8. John P. DeVincenzo; Changes in mandibular length before, during, and after successful orthopedic correction of Class II malocclusions, using a functional appliance; Am J Orthod Dentofacial Orthop 1991 Mar (241 – 257).
9. John R. Valant and Peter M. Sinclair; Treatment effects of the Herbst appliance: Am J Orthod Dentofacial Orthop 1989 Feb (138 - 147).
10. Ricketts, R. M.: Facial and Denture Changes During Orthodontic Treatment as Analyzed from the Temporomandi-bular Joint, *Am. J. Ortho.* 41:163, 1955.
11. Sandra Baltromejus, Sabine Ruf, and Hans Pancherz. Effective Temporomandibular Growth and Chin Position Changes. Activator versus Herbst Treatment- A Cephalometric roentginographic study. European Journal of Orthodontics2002, 24 : 627 – 637.
12. Björk A, Skieller V. Facial development and tooth eruption. An implant study at the age of puberty. Am J Orthod 1972; 62:339-83.
13. Linder–Aronson S, Woodside DG, Lundstrom A. Mandibular growth direction following adenoidectomy. Am J Orthod 1986;89:273-84.
14. Vargervik K, Miller AJ, Chierici G, Harvold EP, Tower B: Morphologic response to changes in neuromuscular patterns experimentally induced by altered mode of respiration. Am J Orthod 85: 115-124, 1984.
15. Ingervall B, Bitsanis E. A pilot study of the effect of masticatory muscle training on facial growth in long-face children. Eur J Orthod 1987;9:15-23.
16. Todd K. Rowe, and David S. Carlson. The effect of bite-opening appliances on mandibular rotational growth and remodeling in the rhesus monkey (Macaca mulatta); Am J Orthod 1990 Dec (544 – 549).
17. Hakan N. Iscan, , and Lale Sarisoy; Comparison of the effects of passive posterior bite-blocks with different construction bites on the craniofacial and dentoalveolar structures; Am J Orthod 1997 Aug (171 - 178).
18. Buschang PH, Sankey W, English JD. Early treatment of hyperdivergent open–bite malocclusions. Semin Orthod 2002;8:130-40.
19. Stanley Braun; Biomechanical Considerations in the Management of the Vertical Dimension. Semin Orthod 2002;8:149-54.
20. Gurton AU, Akin E, Keracay S. Initial intrusion of the molars in the treatment of anterior open bite malocclusions in growing patients. Angle Orthod 2004;74:454 64.
21. Kuroda S, Katayama A, Takano-Yamamoto T. Severe anterior open bite case treated using titanium screw anchorage. Angle Orthod 2004;74:558-67.
22. Jeryl D. English and Kamrin D.G. Olfert; Masticatory Muscle Exercise as an Adjunctive Treatment for Open Bite Malocclusions. Semin Orthod 2005; 11:164–169

Perio stalwart Dr V.N. Bhatavadekar passes away

Dr V.N. Bhatavadekar (85) left for heavenly abode in the morning hours of September 11, 2012.

Dr Bhatavadekar, an ex-teacher in Periodontology initially at the Sir CEM Dental College (J.J. Hospital) Mumbai and thereafter at the Govt Dental College and Hospital Mumbai was the founder member and president of Indian Society of Periodontology.

Dr Bhatavadekar shall always be remembered for his valuable contributions to ISP, IDA and Dental Education at large.

May God bless an Eternal Peace to departed soul of late Dr. V.N. Bhatavadekar.