EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 4
Issue: 7
541-546
Year: 2017

'ASSESSMENT OF ANTERIOR DENTO-ALVEOLAR HEIGHTS, SYMPHYSEAL DEPTH AND UPPER ANTERIOR ALVEOLAR DEPTH IN DIFFERENT SKELETAL MALOCCLUSIONS'

Dr. M. S. Ravi*[1], Dr. Analini[2] and Dr. Shine Benny[3]

[1]HOD, Department of Orthodontics, A.B.Shetty Memorial Institute of Dental Sciences, Deralakatte; Mangalore, India - 575018.
[2]Former PG Student, A.B.Shetty Memorial Institute of Dental Sciences, Deralakatte; Mangalore, India – 575018.
[3]Former PG Student, Department of Orthodontics, A.B.Shetty Memorial Institute of Dental Sciences, Deralakatte; Mangalore, India – 575018.

***Corresponding Author: Dr. M. S. Ravi**
HOD, Department of Orthodontics, A.B.Shetty Memorial Institute of Dental Sciences, Deralakatte; Mangalore, India - 575018.

Article Received on 07/05/2017 **Article Revised on 28/05/2017** **Article Accepted on 19/06/2017**

ABSTRACT
Background & Aim: Adolescents undergo dramatic changes in maxillary and mandibular dentoalveolar heights that hold important clinical implications. Due to greater vertical growth potential, dentoalveolar heights of adolescents can be easily manipulated and corrected. Determining how much dentoalveolar modifications might be necessary during treatment requires reference data (ie, growth standards) and an understanding of how the heights are interrelated. Hence this study was planned and designed for the assessment of upper and lower anterior dento alveolar heights, symphyseal depth and upper and anterior alveolar depth in different skeletal malocclusions. **Materials and methods:** A total of 150 individuals (75 males and 75 Females) in the age groups of 18to 25 years were classified into 3 groups of 50 subjects each as per their skeletal relationship in sagittal plane. Lateral cephalograms were made for each selected individuals under standard conditions. 11 linear and 04 angular parameters were measured. Data was analysed using ANOVA. **Results:** Lower incisor dental height was significantly different in different types of malocclusions. Maxillary depth on the palatal side showed a significant difference. Mean symphyseal depth showed a highly significant difference between the groups. Symphyseal depth had a very highly significant difference in males and highly significant difference was seen in females. The lower dento-alveolar height was significantly different in females. **Conclusion:** Significant differences in the **lower anterior dento-alveolar heights, maxillary depths and symphyseal depths** were found in different skeletal malocclusions.

KEY WORDS: Symphysis depth, Dento-alveolar heights, skeletal malocclusion.

INTRODUCTION
Symphysis morphology was found to be associated with the direction of mandibular growth, especially in male subjects with symphysis ratio having the strongest relationship. A mandible with an anterior growth direction was associated with a small height, large depth, small ratio, and large angle of the symphysis. Conversely, a posterior growth direction was associated with a large height, small depth, large ratio, and small angle of the symphysis. Symphysis dimensions continued to change until adulthood with male subjects having a greater and later occurring change compared with female subjects.[1]

Adolescents undergo dramatic changes in maxillary and mandibular dentoalveolar heights that hold important clinical implications. Due to greater vertical growth potential, dentoalveolar heights of adolescent scan be easily manipulated and corrected. For instance, open and deep bite malocclusions, as well as hyperdivergent or hypodivergent facial types are typically treated by inhibiting or stimulating dentoalveolar growth. Determining how much dentoalveolar modifications might be necessary during treatment requires reference data (ie, growth standards) and an understanding of how the heights are interrelated. To be clinically applicable, reference data must be population-specific, unbiased, and, perhaps most importantly, precise enough to estimate extreme percentiles.[2]

Maxillary anterior depth, distance between frontal point of shortest line above apex of maxillary central incisors between maxillary midsagittal labial and palatal alveolar cortical bone and dorsal point of shortest line above apex

of maxillary central incisors between maxillary midsagittal labial and palatal alveolar cortical bone.[3]

With these backgrounds, the present study was planned and designed to assess the dento-alveolar height and width as well as symphyseal depth in individuals with different types of skeletal malocclusions.

MATERIALS AND METHODS

A total of 150 individuals (75 males and 75 Females) in the age groups of 18 to 25 years were included in the study.They were classified into 3groups of 50 subjects each asper their skeletal relationship in sagittal plane. [Table 1].

Individuals with abraded, restored, attrited incisors, external root resorption, missing permanent teeth with exception of 3rdmolars, poor incisor visibility, incisor rotations and crowding were excluded from the study. Subjects with history of prior orthodontic, surgical and cosmetic treatment as well as individuals with Oro-facial cleft / craniofacial syndromes were also excluded.

After obtaining the written informed consent and the study cleared by the Institutional Ethical Committee, the lateral cephalograms were made for each selected individuals using the Plammeca PM 2002 cc Proline machine (Planmecca OY Helsenki, Finland**)** under standard conditions with the Frankfort horizontal plane kept parallel to the floor and the midfacial plane kept in a vertical position. All linear parameters were measured up to an accuracy of 1mm. [Fig-1&2]. A total of 11 linear and 04 angular parameters were used. [Table 2]

Analysis of variance (ANOVA) was used to statistically determine significant differences between the 3 classes of skeletal malocclusions.

RESULTS

Lower incisor dental height was significantly different in class I, class II and class III skeletal malocclusions (p=0.013) .Whereas the upper incisor dental height was not significantly different. Mean Maxillary depth on the palatal side between class 1, class II and class III skeletal base showed a significant difference (p=0.013).But there was no significant difference on the labial side. Mean symphyseal depth showed a highly significant difference (p=0.001) between the groups. [Table3][Fig3]

Comparison of each parameters between different groups in males and females showed that the Symphyseal depth had a very highly significant difference (p=0.001) in males and highly significant difference (p=0.004) was seen in females. The lower dento-alveolar height was significantly different (p=0.02) in females. The maxillary depth on palatal side showed a significant difference (p=0.002) in males. [Table 4, 5&6] [Fig 4&5]

Table1: Classification of subjects based on skeletal relationships

Group	Malocclusion	Sub-group	N
Group 1 Skeletal class I	ANB angle $\leq 4^{\circ}$	$1A_1$ Males	15
		$1A_2$ Females	15
Group 2A Skeletal class II Prognathic Maxilla	ANB angle $>4^{\circ}$ Maxillary excess, normal Mandible	$2A_1$ Males	15
		$2A_2$ Females	15
Group 2B Skeletal class II Retrognathic Mandible	ANB angle $> 4^{\circ}$ Maxilla normal, Mandible deficient	$2B_1$ Males	15
		$2B_2$ Females	15
Group 3A Skeletal class III Prognathic Mandible	ANB angle < 0 Maxilla normal, Mandible excess	$3A_1$ Males	15
		$3A_2$ Females	15
Group 3B Skeletal class III Retrognathic Maxilla	ANB angle < 0 Maxilla deficient Mandible normal	$3B_1$ Males	15
		$3B_2$ Females	15

Table 2: Linear and Angular parameters measured in the study

Linear Measurements	
1	Long axis of the crown of UI
2	Long axis of the root of UI
3	Long axis of the crown of LI
4	Long axis of the root of LI
5	Upper dentoalveolar height
6	Lower dentoalveolar height
7	Palatal depth
8	Symphyseal depth
9	Lip thickness
10	Linear distance between UI to NA plane

11	Linear distance between LI to NB plane
Angular Measurements	
1	Angle between UI to NA
2	Angle between lower incisor to mandibular plane
3	UL to palatal plane
4	Angle between LI to NB

Table 3: Comparison between Different skeletal bases

Parameters	Groups	N	Mean	Std. Deviation	F	P
U1 dental height (mm)	Class I	30	29.0862	3.42801	2.692	.071
	Class II	60	30.2583	3.41419		
	Class III	60	28.9083	3.24754		
L I dental height (mm)	Class I	30	43.4310	3.96801	4.474	0.013 sig
	Class II	60	45.6083	3.99586		
	Class III	60	43.5167	4.59639		
Maxillary depth-L (mm)	Class I	30	5,8828	1.75928	2.149	.120
	Class II	60	5.2931	1.60600		
	Class III	60	5.2167	1.16578		
Maxillary depth-P (mm)	Class I	30	9.2414	3.13568	3.167	0.045sig
	Class II	60	7.8000	2.73428		
	Class III	60	8.1500	1.98148		
Symphyseal depth (mm)	Class I	30	14.5690	1.95815	16.485	0.001vhs
	Class II	60	14.2083	1.68817		
	Class III	60	12.7333	1.53067		

Table 4: Comparison of lower dento-alveolar heights between groups

Group	Gender	N	Mean	Std. Deviation	F	P
1A	M	15	44.5667	4.37063	1.000	.414
$2A_1$		15	46.4000	3.43927		
2B1		15	46.4667	4.50185		
3A1		15	46.4333	3.61972		
3B1		15	44.0667	6.23889		
1B	F	15	42.8000	3.83033	5.044	.001 vhs
$2A_2$		15	45.8000	4.12657		
2B2		15	43.8333	3.75912		
3A2		15	42.5333	2.61498		
3B2		15	40.4333	2.09478		

Table 5: Comparison of maxillary depth on palatal side between groups

Group	Gender	N	Mean	Std. Deviation	F	P
1A	M	15	10.5333	3.15926	2.626	0.042 sig
$2A_1$		15	8.8339	3.66288		
2B1		15	7.8667	1.88478		
3A1		15	7.9333	1.94447		
3B1		15	8.2000	2.07709		
1B	F	15	7.8000	2.45531	.646	.631
$2A_2$		15	7.3667	2.40139		
2B2		15	7.2000	2.64440		
3A2		15	8.4000	2.61315		
3B2		15	8.0000	1.25367		

Table 6: Comparison of Symphyseal depth between groups

Group	Gender	N	Mean	Std. Deviation	F	P
1A	M	15	15.7667	1.08342	9.72	0.001 vhs
$2A_1$		15	14.9333	1.83095		
2B1		15	14.3667	1.42009		
3A1		15	13.4333	1.80145		
3B1		15	12.8667	0.74322		
1B	F	15	13.3333	1.82900		

$2A_2$		15	13.8333	1.43510		
2B2		15	13.7333	1.89799		
3A2		15	12.7333	1.79151		
3B2		15	11.7333	1.03280	4.22	0.004 vhs

Legend for Figures

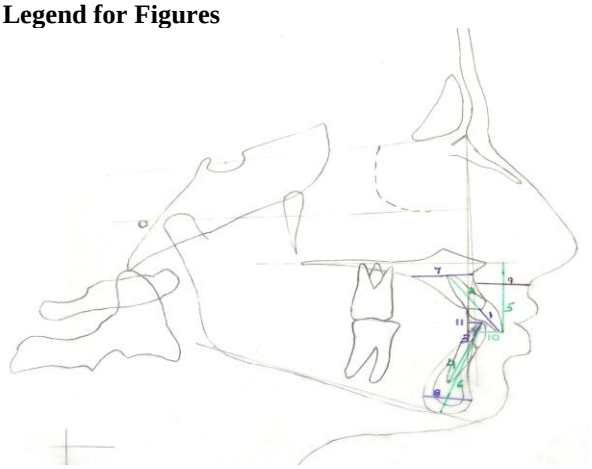

Figure1: **Illustration of linear measurements**

1) Long axis of the crown of UI
2) Long axis of the root of UI
3) Long axis of the crown of LI
4) Long axis of the root of LI
5) Upper dentoalveolar height
6) Lower dentoalveolar height
7) Palatal depth
8) Symphyseal depth
9) Lip thickness
10) Linear distance between UI to NA plane
11) Linear distance between LI to NB plane

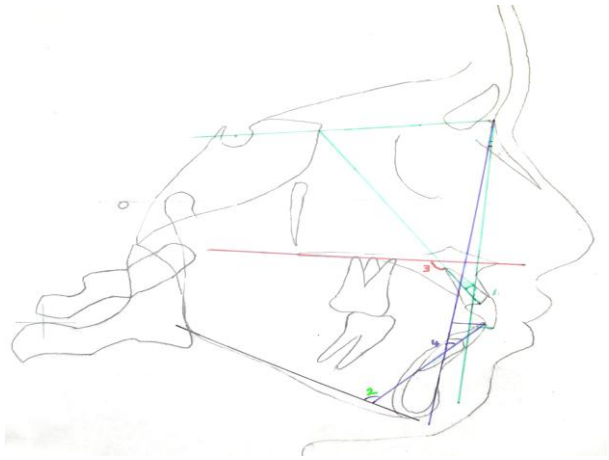

Figure2: Illustration of angular measurements

1) Angle between UI to NA plane
2) Angle between lower incisors to mandibular plane
3) UI to palatal plane
4) Angle between LI to NB plane

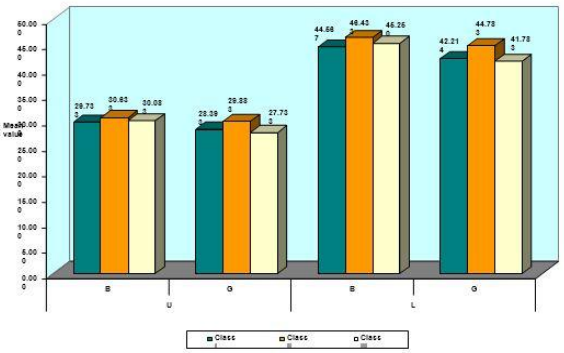

Figure3: **Upper and Lower Dental Height**

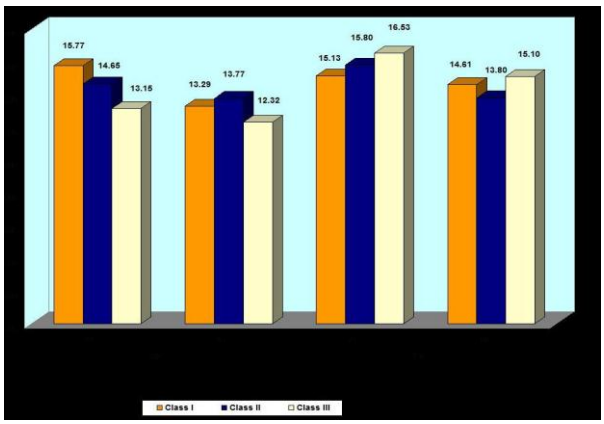

Figure4: **Symphyseal Width & Lip Thickness**

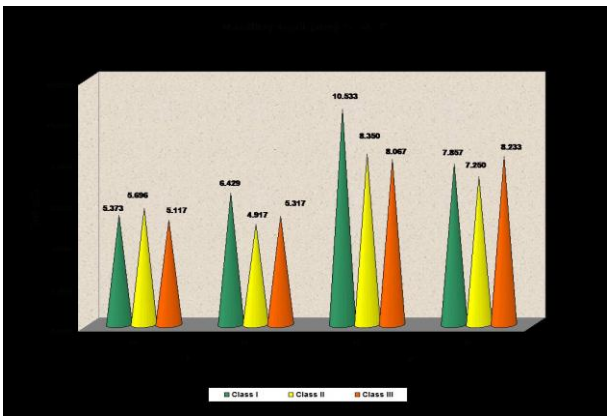

Figure5: **Maxillary Depth**

DISCUSSION

The dento alveolar heights, alveolar bone width and Symphyseal width are few of the factors that influence the decisions regarding the orthodontic diagnosis and treatment planning. Hence this study is designed to assess these factors in different skeletal malocclusions so that the findings could be considered during the clinical evaluation and treatment planning for Orthodontic and/or Orthognathic surgery therapy. Each group of skeletal malocclusions is considered separately because of

variations in morphological features as well as vast difference in the principles of clinical management.

The maxillary and mandibular anterior dento-alveolar heights were larger for male patients in all the groups. However the mean difference between male and female subjects was not statistically significant except for group 3A and group 3B. Janson et al[2] also reported a higher value in malescompared to females.

The lower anterior dento-alveolar height was significantly different in 3 groups of skeletal malocclusions. The individuals with class II skeletal base had increased dento-alveolar heights compared to individuals with class I and III skeletal bases. There was no significant difference between the sub groups of class II and class III skeletal relationships. The class I skeletal base subjects had the least dento-alveolar height. However the upper anterior dento-alveolar height was not significantly different in three groups of individuals. These findings are in partial agreement with that of Janson et al who concluded that dento-alveolar heights are similar in skeletal class I and class II malocclusions.

The Maxillary depth on the palatal side was significantly different in class 1, class II and class III skeletal bases.The skeletal Class I subjects had the highest depth and the class II individuals had the least. It also showed significant difference in the subgroups of skeletal malocclusions in males.The subjects with maxillary excess had a thicker bone on the palatal side when compared to the subjects with mandibular deficiency.

The difference in mean symphyseal depth found to be highly significant between groups of skeletal malocclusions. Mean of Symphysis depth in boys and girls was very highly significantly different in various groups of skeletal malocclusion. Subjects with class I skeletal base had more amount of symphyseal depth than class II and III skeletal bases and class III skeletal base had less amount of maxillary depth.

This study has clearly found significant differences in lower anterior dentoalveolar heights, maxillary depth and symphyseal depth in different types of skeletal malocclusions. This difference in the bone morphology will have to be taken into consideration while planning the extent and type of tooth movement during orthodontic treatment. It is also an indication of the inherent differences present in the dento-facial structure and morphology in subjects with different skeletal patterns. However further studies are required to assess the various features that could significantly influence our decisions regarding the diagnosis and treatment planning in subjects with different types of malocclusions and in individuals with different racial background.

CONCLUSION

- Significant differences in the **lower anterior dento-alveolar heights** were found between the 3 classes of skeletal malocclusions. Individuals with Class II skeletal base had highest dento--alveolar heights while class I skeletal base had shortest dento-alveolar height.

- Significant differences in the **maxillary depths** were found between the 3 classes of skeletal malocclusions. Individuals with Class II skeletal base had least amount of maxillary depth while Class I skeletal base had deepest maxillary depth.

- Significant differences in the **symphyseal depths** were found between the 3 classes of skeletal malocclusions. Individuals with Class I skeletal base had more amount of symphyseal depth than class II and III skeletal bases while Class III skeletal base had least amount of maxillary depth.

ACKNOWLEDGEMENTS

Authors would like to thank
Prof. Dr. U.S.Krishna Nayak, Dean & Principal, A.B.Shetty Memorial Institute of Dental Sciences, Mangalore

BIBLIOGRAPHY

1. Aki T, Nanda RS, Currier GF, Nanda SK.Assessment of symphysis morphology as a predictor of the direction of mandibular growth. AJODO 1994.
2. Solow B. The dentoalveolar compensatory mechanism: background and clinical implications. Br J Orthod.1980; 7: 145–161.
3. S. H. Beckmann. B. Kuitert, DDS, B. Prahl-Andersen, Alveolar and skeletal dimensions associated with lowerface height.Am J OrthodDentofacialOrthop 1998; 113: 498-506.
4. Janson G R P, Metaxas A, Woodside D G. Variation in maxillary and mandibular molar and incisor, Vertical dimension in 12 years old subjects with excess, normal and short lower anterior face height. American Journal of Orthodontics and Dentofacial Orthopedics. 1994; 106: 409- 18.
5. ElcinEsenlik,FidanAlakusSabuncuoglu˙ Alveolar and symphysis regions of patients with skeletal class II division 1 anomalies with different vertical growth patterns.Eur J Dent. Apr 2012; 6(2): 123–132.
6. Delivanis HP, Kuftinec MH. Variation in morphology of the maxillary incisors found in class II div2 malocclusions. Am J OrthodDentofacOrthop 1980; 78: 438-43.
7. Williams A, Wood-house C, The crown to root angle of maxillary central incisors in different incisal class. Br J Orthod 1983 July; 10(3): 159 – 61.
8. Bryant RM, Sadowsky PL, Hazelrig JB. Variability in three morphologic features of the permanent maxillary central incisor. Am J Orthod. 1984 Jul; 86(1): 25-32.
9. Harris EF, Hassankiadeh S, Harris JT. Maxillary incisor crown – root relationships different Angle malocclusions. American Journal of Orthodontics and Dentofacial Orthopedics. 1993; 103: 48-53.

10. McIntyre GT, Orth M, Millett DT, Crown –Root shape of the Permanent maxillary central incisor. Angle Orthod. 2003; 73: 710-715.