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RELATIONSHIP BETWEEN LOWER ANTERIOR CROWDING WITH FACIAL HEIGHT AND DEPTH IN BENGALEE POPULATION - À CEPHALOMETRIC STUDY

Dental Science

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ABSTRACT

INTRODUCTION- A study of head and face presents a multidimensional problem which includes height, depth and width dimension and esthetics. The head and face is not spherical with qual radius in all directions. It is rather an irregular polygon and could not be measured by simple geometrical and mensurational methods. Malocclusion and dentofacial deformity arise through variations in normal developmental process and so must be evaluated against a perspective of normal development of the craniofacial morphology like facial height and depth.

AIMS AND OBJECTIVES- The basic aim of this study was to find the co-relation between lower anterior crowding with facial height and depth in Bengalee population by the lateral cephalometrics.

MATERIALS AND METHODS- The present study was conducted on thirty young Bengalee subjects comprising of males and females of fourteen to twenty years of age. Fifteen subjects were selected with noncrowded normal class - 1 cases and fifteen with crowded mandibular incisors. The purpose of this study was to evaluate the relationship between facial height, facial depth and lower anterior crowding among the two above mentioned groups.

RESULT AND CONCLUSION- Both linear dimensions and angular values were compared between the two sample groups. The measurements were taken from lateral cephalograms. The parameters used were Anterior facial height, Posterior facial height, mandibular length, Facial depth (SN length), 'e' and 'f' values (linear dimensions). The angular values compared were SN-MP angle, SN-Occlusal plane angle and SN-Endognathion angle. For each measurement the mean, standard deviation and standard error were established. Correlation were made by comparing the different parameters between the crowded and non-crowded sample group.

KEYWORDS

INTRODUCTION

Face is the most unique and dependable identifying part of the human body and is the critical landmark to recognise one individual from another. The face of man is the aggregate sum of many balanced and imbalanced craniofacial parts combined into composite whole. The craniofacial complex consists numerous constituent parts, the orientation of these parts and gentle touch of nature have imparted perfection to the face. Anatomically the human face shows an unique structural and functional balance of the craniofacial complex consisting of many hard and soft tissue components. There are several art and sciences that are directly or indirectly concerned with construction of the face and the orthodontists are concerned about it.

A study of head and face presents a multidimensional problem which includes height, depth and width dimension and esthetics. The head and face is not spherical with qual radius in all directions. It is rather an irregular polygon and could not be measured by simple geometrical and mensurational methods. The craniofacial structures may vary according to geographic distributions, racial variations and environmental alterations, along with the genetic and inheritable factors. Malocclusion and dentofacial deformity arise through variations in normal developmental process and so must be evaluated against a perspective of normal development of the craniofacial morphology like facial height and depth. For evaluation of facial type and calculation of various craniofacial indices, these two parameters of facial height and depth are highly essential.

Dental crowding can be defined as disparity in the relationship between tooth size and jaw size which results in rotation and imbrication of teeth. In the modern era the increase in lower anterior crowding with age · has been a prominent finding in orthodontic diagnosis and case analysis.The reason behind the increase in lower anterior crowding with age is not fully understood. There are many factors which may contribute including physiologic mesial drift and the anterior component of force of occlusion.

The other factors include the presence of developing third molar, mesial vectors of muscular contraction and soft tissue maturation. The other causes of lower anterior crowding include the periodontal forces, acclusal factors, the amount and direction of late mandibular growth and different connective tissue changes. The description of the relationship of various craniofacial components with that of malocclusion among individuals with normal and abnormal facial morphology is one of the most frequently addressed subject in the orthodontic literature.

AIMS AND OBJECTIVES

The basic aim of this study was to find the co-relation between lower anterior crowding with facial height and depth in Bengalee population by the lateral cephalometrics. From the cephalometric tracings of all the individuals used in this cross-sectional study different parameters (linear measurements and angular values) were compared between crowded and non-crowded samples and statistically derived inferences.

MATERIALS AND METHODS

The subjects for this study were Bengalee males and females between 14 to 20 years of age. The sample consisted of 30 subjects, the screening method was such that out of the total sample half of the samples was of non-crowded class I cases and the rest half included crowded cases.

The Following Were The Criteria For Sample Selection :

1. The sample was collected on random sampling basis.
2. The age group was between 14 to 20 years as per chronological age
3. The sample subjects had no history of previous orthodontic treatment.
4. Subjects having normal health and adequate stature and fit mentally and physically.
5. They had no history of previous tooth extraction or major surgical intervention in the orofacial region.
6. The periodontal condition of the selected subjects was good.
7. Teeth selected for the sample study were fully erupted and free from caries.
8. None of the teeth were missing from the arch (third molars were not considered) and there was absence of any supernumerary teeth.

This study required comparative cephalometric analysis of different parameters (both linear measurements and angular values) between

fifteen crowded sample and fifteen subjects with non-crowded class I normal occlusion. Comparisons were made between the crowded and non-crowded sample and statistical co-relations were drawn accordingly.

MATERIALS - Equipment's Used For This Study :

1. Gateway tracing paper.
2. Kristeel scale - To measure linear dimensions.
3. Camel Protractor - To measure angular values.
4. Camlin 4H Hard Pencil - 0.5 mm.
5. Lateral Cephalometric Radiographs.

METHOD

Lateral Cephalogram For Calvaria And Face :

The lateral cephalogram was taken for each sample in SIEMENS ROENTGENOGRAPHIC CEPHALOSTAT .

Cephalometric Variables That Were Used For This Study :

Cephalometric Landmarks : **A. POINTS**

1. S (Sella) : The centre of the Hypophyseal fossa (Sella Turcica)
2. N(Nasion) : The most anterior point on the frontonasal suture in the mid-sagittal plane.
3. Me *(*Menton): The lower most point on the symphyseal shadow.
4. Go (Gonion): The point in which the jaw angle is most inferiorly, posteriorly and outwardly directed.
5. Eg (Endognathion)(8) : The most lingual point on the internal aspect of the bone of mandibular symphysis (This point was used in preference to Pogonion in order to avoid confusion caused by variable growth of mental process).

B. CEPHALOMETRIC PLANES (linear Dimensions Were Used For This Study)

A. POINTS

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B. CEPHALOMETRIC PLANES (linear Dimensions That Were Used For This Study)

1. S-N Plane : Anterior cranial base, this is considered as facial(13) depth in linear dimension.
2. N-Me : Anterior facial height.
3. S-GO : Posterior facial height.

4. M (mandibular Length) :

This is measured from gonion to the projectionm of endognathion on mandibular plane.

5.'e' :The distance from sella along S-N to the projection perpendicular to S-N plane fromendognathion.

6. 'f ':The distance from sella along S-N to perpendicular projection of most labially placed lower incisal edge.

The A*ngle*s Which Were Measured For This Study :

1. "<SN-MP" : The angle formed by sella-Nasion line and mandibular plane (Gonion-Menton).
2. "<SN-OCC." : The angle formed by Sella-Nasion line and functional occlusal plane.
3. "<SN-Endog.": The angle formed at the centre of sella by the S-N line and the line connecting sella to endognathion.

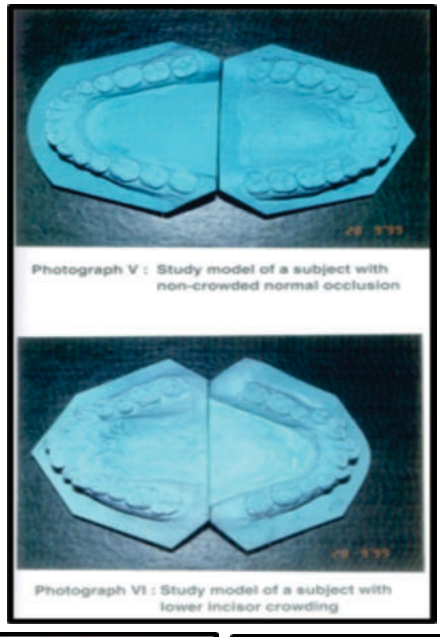
Cephalometric tracings of the total thirty samples was done twice and the average values *w*ere taken. The values of the different parameters (both linear dimensions and angular measurements) wascompared between the fifteen crowded sample and the fifteen subjects with non-crowded class i normal occlusion and statistical co-relation *w*as derived accordingly. Means, the standard deviations and 95% to 98*%* confidence levels *w*ere computed statistically. (35) All the measured values of the different parameters were collected, arranged properly and computed for suitable statistical analysis to obtain the results. There-after based on these calculations the inference of this cephalometric study was derived.

Photograph I : Rotograph 230 'X'ray unit with subjects head positioned in cephalostat

Photograph II : Lateral cephalometric 'X'ray

Photograph III : Measuring Scale

Photograph IV : Tracing Pencil & Protractor



Photograph V : Study model of a subject with non-crowded normal occlusion

Photograph VI : Study model of a subject with lower incisor crowding

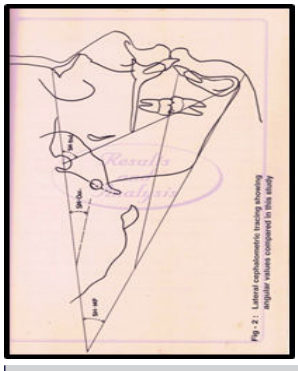


Fig - 2 : Lateral cephalometric tracing showing angular values compared in this study

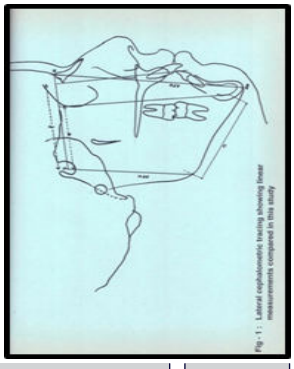
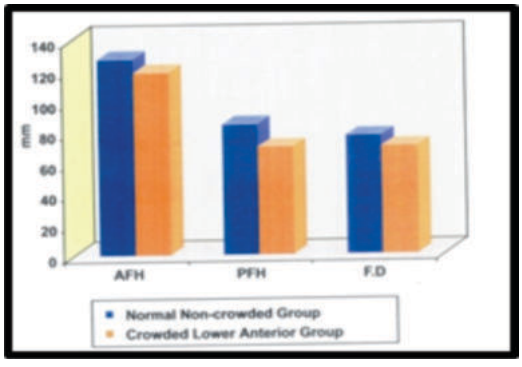


Fig - 1 : Lateral cephalometric tracing showing linear measurements compared in this study

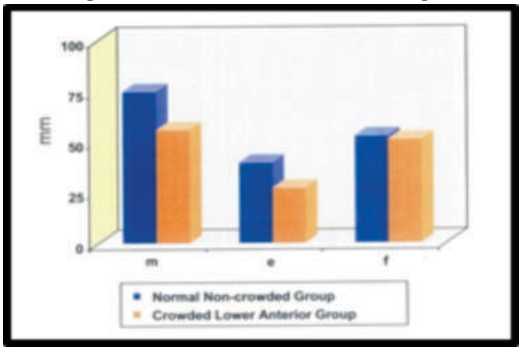
RESULTS AND ANALYSIS

In this cross-sectional study random sample of thirty subjects were taken of which fifteen sample had lower anterior crowding and they were compared with fifteen subjects with non-crowded normal Class-locclusion. For the present study the datas were collected from measuring dental and skeletal landmarks on lateral cephalograms. Both linear dimensions and angular values were measured. To achieve the permissible accuracy of the result, tracing is done twice on each cephalogram. The average of the two measurements for each parameter is accounted as the data of primary collection.

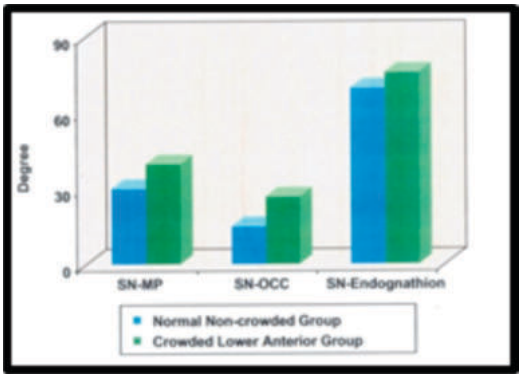
Comparison Of The Linear Dimentions Between Non-crowded Normal Group And Crowded Lower Anterior Group



Comparison Of The Linear Dimentions Between Non-crowded Normal Group And Crowded Lower Anterior Group



Comparison Of The Angular Values Between Non-crowded Normal Group And Crowded Lower Anterior Group



DISCUSSION

Orthodontic case analysis is a procedure which includes the study of relationship of the component parts of the face in order to appraise their status of balance and harmony. Considerable variations in size, position, form, dimension and proportion of facial skeletal components exists in the craniofacial complex. This study is an attempt to evaluate the relationship between craniofacial dimension like facial height and facial depth with lower incisor crowding.

The study was carried out on adult Bengalee subjects to evaluate the facial height, facial depth and other skeletal measurements of the craniofacial region. The main objective of the study was to find whether any relationship existed between facial height, facial depth with lower anterior crowding in normal occlusion group and malocclusion group comprising of mandibular incisor crowding. For the fulfilment of this objective of the present study, the results were statistically compared with the results of other research workers who had worked on same subjects for different races. The datas were collected from lateral cephalographs, statistical analysis were done and discussed here under the following heads :

1) Anterior facial height : The comparitive analysis of this linear dimension between the non crowded normal group and crowded lower incisor group (refer to table - 5) shows that the normal non-crowded group has higher value of AFH than the crowded group and thedifference is statistically highly significant with 't' value 4.72 and 'p' value < 0.001.

Leighton and Hunter(8) in their study of relationship between lower arch spacing crowding and facial height and depth tried to establish the part played by skeletel morphology on the origin of lower incisor crowding. They found that the metric evaluation of Anterior facial height does not vary much between crowded and non-crowded sample but the value was little more in the normal non-crowded group.

Sakuda and Matsumoto(9) investigated the relationship between skeletal craniofacial dimensions and increased lower incisor crowding. They found significant correlation between an increase in lower incisor crowding and lesser anterior face height and small vertical dimensions in upper posterior segment. Thus their result of statistical correlation of Anterior face height between the crowded and non-crowded group is similar as that found in this present study.

2) *Posterior Facial Height:* The comparitine analysis of this linear measurement between the non-crowded and crowded lower incisor group shows that the crowded lower incisor group has much lower value of posterior facial height than the non crowded normal group and the difference is statistically highly significant with 't' value 11.28 and 'p' value < 0.001.

Hunter and Leighton in their longitudinal cephalometric study of relationship between facial height and depth and lower arch crowding found similar results with the crowded samples having shorter posterior face height.

Ronnerman and Thilander(10) in their study of relationship between the craniofacial morphology and dental development founded that subjects with crowded lower incisors have shorter posterior facial height when compared with normal non-crowded group. Their finding are similar to what found in this present study with crowded incisorgroup having shorter posterior face height.

Bjork and Skieller(79) in their study of mandibular growth rotation by means of implants have found that growth related rotation of the mandible affects the crowding status of lower incisors. They stated that persons with decreased posterior face height have a clockwise or forward or posterior pattern of mandibular rotation and due to dentoalveolar adaptation, the lower incisors tip back by lip pressure, although, the posterior buccal teeth will have posteriorly directed path of eruption, shortening of the arch length again tends to occur and crowding of lower incisors results. Their finding are similar to what that is found in the present study with the crowded lower incisor group having shorter posterior face height as compared to the non-crowded normal group .

SUMMARY AND CONCLUSION

The present study was conducted on thirty young Bengalee subjects comprising of males and females of fourteen to twenty years of age. Fifteen subjects were selected with noncrowded normal class - 1 cases and fifteen with crowded mandibular incisors. The purpose of this study was to evaluate the relationship between facial height, facial depth and lower anterior crowding among the two above mentioned groups.

Both linear dimensions and angular values were compared between the two sample groups. The measurements were taken from lateral cephalograms. The parameters used were Anterior facial height, Posterior facial height, mandibular length, Facial depth (SN length), 'e' and 'f' values (linear dimensions). The angular values compared were SN-MP angle, SN-Occlusal plane angle and SN-Endognathion angle. For each measurement the mean, standard deviation and standard error

were established. Correlation were made by comparing the different parameters between the crowded and non-crowded sample group.

Student 't' test was used for each of the correlations to ascertain their level of significance. (The 95% level was accepted as significant).

Linear Measurements :

1) *Anterior facial height(AFH):* The value of AFH was found higher in non-crowded normal group when compared with the crowded group and the difference was statisticaly highly significant with 't' value 4.72 and 'p' value < 0.001.
2) *Posterior facial height (PFH):* The PFH measurement was much lesser in the crowded lower anterior group when compared with the non-crowded class I group and the difference was statistically highly significant with 't' value 11.28 and 'p' value < 0.001,
3) *Facial Depth (F.D.) :*The value of F.D. was found to be higher in non-crowded class I group when compared with the crowded sample and the difference was statistically highly significant with 't' value - 6.17 and 'p' value <0.001.
4) *Mandibular length 'm*': The value of 'm' was much lesser in the crowded lower anterior group when compared with the non-crowded class i group and the difference in value was statistically highly significant with 't' value : 12.72 and 'p' value <0.001.
5) 'e*′ value :* The measured value of 'e' was higher in non-crowded class I group when compared with the crowded lower anterior group and the difference was statisticaly highly significant with 't' value 6.18 and 'p' value <0.001.
6) *'f' value :* The measured value of 'f *w*as higher in non-crowded class I sample in comparison to the crowded lower anterior sample and the difference was statistically highly significant with 't' value 6.04 & 'p' value <0.001. The linear measurements were all higher in the non-crowded normal class I group with statistically high significant differences.

Angular Measurements :

1) *Angle SN-MP :*This angular value was higher in crowded lower anterior group in comparison to the non-crowded class I group and the difference was statistically highly significant with 't'value - 10.6 and 'p' value <0.001
2) A*ngle S*N-*Occlusal :* This angular value was greater in crowded lower incisor group when compared with the non-crowded Class I group and the difference was statistically highly significant with 't' value 5.6 and 'p' value - <0.001
3) *Angle SN-Endognathion :* This angular value was higher in the crowded sample when compared with the non crowded class I sample and the difference was statistically highly significant with 'p' value - 5.13 & 'p' value <0.001. The angular measurements were all higher in the crowded lower anterior group with statistically high significant differences.

For standardization of accumulated norms and to establish the feasibility of the same for clinical application further experiments are required through meticulous screening procedure, considering health status and facial form of the subjects. Moreover lateral cephalograms used in the study has certain limitations in reproducing head posture, difficulty in identifying landmarks because of superimposed structures. Thus more intensive study involving larger number of samples will enable us to reach to a more comprehensive and conclusive results.

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