Original Research Paper

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EVALUATION OF DENTOALVEOLAR COMPENSATION IN DIFFERENT SKELETAL MALOCCLUSIONS IN BENGALEE POPULATION- A CEPHALOMETRIC STUDY

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ABSTRACT **Introduction:** Humans have been aware of facial esthetics from prehistoric times. An 'esthetically pleasing face' is described as one in which various facial features are well proportioned and balanced from both 'frontal and profile' view. Evaluating the face in profile is an integral part of a complete orthodontic diagnosis. The labiolingual inclination and anteroposterior (AP) position of maxillary incisors have a crucial effect on the appearance of the smiling profile. Aims: To evaluate and compare dentoalveolar compensations in various skeletal malocclusions. **Materials and methods:** The Cross sectional study, this Study was conducted from January 2018 to June 2019 at Guru Nanak Institute of Dental Sciences and Research, panihati, Kolkata- 7 00114. 120 patients were taken in our study. **Result:** In the present study mandibular central incisor to SN shows statistically significant difference in mean value when intergroup comparison were made between control group with group-II, and group-III, between group- Mandibular incisors are proclined labially in skeletal class- II malocclusion, while mandibular incisors were found upright or retroclined in skeletal class-III malocclusion. **Conclusion:** In Group-II (skeletal Class- II malocclusion) upper incisors are proclined in the upper jaw, and lower incisor proclined in lower jaw.

KEYWORDS : Dentoalveolar compensation, anteroposterior, vertical, skeletal malocclusions and Cephalometry.

INTRODUCTION

Humans have been aware of 'facial esthetics from prehistoric times. An "esthetically pleasing face' is described as one in which various facial features are well proportioned and balanced from both frontal and profile view. Evaluating the face in profile is an integral part of a complete orthodontic diagnosis. The labiolingual inclination and anteroposterior (AP) position of maxillary incisors have a crucial effect on the appearance of the smiling profile. Growth is a process requiring intimate morphogenic interrelationship among all of its components. This means that the various parts developmentally merge into a functional whole, with each part complementing the other as they all grow and function together complementing the other as they all grow and function together. During growth, the vertical and sagittal relationship of the jaws is not always perfect. In cases where imperfections exist, the relationship between the jaws is secured through the eruption and positioning of the teeth along their own basal arches [1] Normal growth and development of face can attain and maintain normal occlusion and esthetics because oro-facial equilibrium is maintained. Normal growth and development of jaws can be affected by various And upper hereditary and environmental factors. The development of lower arches are not always compatible. Some physiological process is needed to co-ordinate the eruption and position of the teeth relative to their basal bones in order to achieve normal relationship between the upper and lower dental arches. This mechanism is known as dentoalveolar compensation. For existing sagittal jaw discrepancy, compensatory inclination of the maxillary and mandibular incisors results in compromised dentoalveolar and incisor relationship. The compensatory inclination of the maxillary and mandibular incisors tries to attain in normal incisor relationships in some cases despite some variation in sagittal jaw relationship. Subjects with anterior deep bite or open bite often deviate in the underlying skeletal pattern. In such patients, a surgical approach must be considered that requires presurgical decompensation. Alternatively, a nonsurgical treatment option would include further dentoalveolar compensation. The determination of the suitable option must be based on the feasibility of dentoalveolar compensation. [2]

MATERIALS AND METHODS

The present study was conducted in the Department of Orthodontics and Dentofacial Orthopedics, Guru Nanak Institute of Dental Sciences and Research, panihati, Kolkata- 700114

The study was done on each sample by taking lateral Cephalogram with standard setting and using valid tools. The analysis of the variables as mentioned was performed by a single observer.

Period of study:

From January 2018 to June 2019 an approximate period of one and a half years.

Study population:

The population represented adolescent & young Bengalee patients having orthodontic problem visiting to the OPD of department of Orthodontics, GNIDSR with an age range of 14 years to 25 years. were selected from The subjects of control groups of normal occlusions were selected from the students of Guru Nanak Institute of Dental Sciences and Research, Panihati, Kolkata- 700114

Sample size:

To draw inference from the study, the sample size of one hundred and twenty (120) was taken and each group consisted of 30 samples.

Justification:

A similar study was done by Avesh Sachan et al in 201032 and he achieved statistically significant results with 100 samples, (25 in each group).

Inclusion criteria:

The subjects were taken within age range of 14-25 years.
The subjects of control groups were selected on the bases of clinical

Examination And Cephalometric Analysis:

1. Skeletal Class-I Pattern
2. Class-I Molar Relationship,
3. Class-I Canine Relationship.
4. Normal Overjet and Overbite,
5. No Permanent Teeth Missing Except Third Molar,
6. No History of previous Orthodontic Treatment.

The subjects of malocclusion groups were screened after clinical examination and following cephalometric parameter.
Group-I: Skeletal class I malocclusion subjects having
Wit's appraisal (between 0-1 mm)
APP-BPP (2-8 mm)
Beta angle (between 27-35 degree)
Group II: Skeletal class II malocclusion subjects having

. Wit's appraisal (more than 1 mm)
APP-BPP (more than 8mm)
Beta angle (less than 27 degree)
Group III: Skeletal class III malocclusion subjects having
Wit's appraisal (less than 0mm)
APP-BPP (less than 2mm)
Beta angle (more than 35 degree)

Exclusion Criteria -
No previous orthodontic treatment, orthognathic surgery done.
No history of trauma to craniofacial region.
Any perceived growth retardation or craniofacial anomalies.
Temporomandibular joint abnormality.
No permanent teeth missing except third molar.

RESULT AND DISCUSSION

Evaluation of dentoalveolar compensation in different seletal patterns is important, since knowing the limits of the dentoalveolar compensation may help in treatment planning, predicting treatment success and post- treatment stability. Skieller1972 [3], Ishikawa found that malocclusions result from insufficient dentoalveolar compensation to variations in facial patterns. The age group considered in this study was from 15-24 years with the mean age 19.5 years, which represented a stable period in the growth and development of craniofacial complex development of craniofacial complex.

In the investigation undertaken by Nanda and Merrill in (1994) [4], the distance between the projections from points A and B on the palatal plane was found to be the best indicator of sagittal jaw relationship. Now Beta angle (Chong Yol Baik and Maria Ververidou.2004 is used for assessment of skeletal dysplasias with great success as it does not depend on dental occlusion. The present study shows that the maxillary central incisor to NA (U1 to NA Angle) increased in group-III (skeletal class-III) when compared with control group and skeletal class-I malocclusion group.

Bibby (1980) [5] reported that to reduce the anteroposterior discrepancy between maxillary and mandibular apical bases, class-III cases tried to achieve proclined maxillary incisors. As opposed to the present study the inclination of maxillary incisors decreased in class-III malocclusion as reported by Denovan's study (1954) [6].

In the present study for maxillary central Incisor to SN, (angle) highly significant difference in mean value were found between control group with group-III and group-II.

According to this study skeletal class III and skeletal class II malocclusions have relatively proclined upper incisors. Clinical significance of this result is that dentoalveolar compensation has been taken place in class III group but no dento alveolar compensation has occurred in class II malocclusion group.

Similarly, Antonija and Varga (2003)[7] also suggested that upper incisors protrusion in relation to maxillary base in subjects with mandibular prognathism. These findings suggested that the proclination of upper incisors as a result of dentoalveolar adaptation, which is characteristic for class-III relationship also supports the present study.

In the present study statistically significant difference were found for maxillary central incisor to NA (linear) measured when comparison made between control group with group-II, and between control group with group-III.

The findings of present study indicates that upper incisors are positioned forward in relation to N-A line in skeletal class- II and skeletal class- III malocclusion as compared to control group, which shows the protrusion of maxillary incisors in these groups.

In the present study no significant difference was found in mean value of Ho maxillary central incisor to NA (Linear) between group-II and group-III, which indicated that maxillary incisors are positioned forward in both class- II and class- III malocclusion in relation to N-A line in maxilla.

In class II malocclusion maxilla is positioned forward while in class-III malocclusion maxilla is positioned backward in relation to cranial base but linear distance between upper incisors and NA line shows no statistically difference in mean value between class- II and class III malocclusion, that proves dentoalveolar compensation have taken place in class- III malocclusion.

The findings of study of Ismail Ceylan (2003)[8] also supported the results I of present study. According to him maxillary central incisor to N.A. (mm) measurement showed statistically significant difference among the different overjet (positive and negative overjet) groups.

In the present study maxillary central incisor to N-Pog (linear) value between control group and malocclusion groups were found very highly significant between control group with group-II, between control group with group-III, between group-I with group-II, between group I with group-III, between group-II with group III. Clinical significance of this result is that in class III malocclusion maxillary incisors are positioned far behind the facial plane and in class II malocclusion maxillary incisors are placed far ahead to the facial plane.

Similarly, Riedel (1952) [9] measured the anteroposterior position of the upper incisor to the facial plane. That was recorded with an average of between 5.5 and 6.5 mm in patient exhibiting normal occlusion. In class III malocclusion maxillary incisors were found far behind this point. Maxillary incisors were found about twice the distance anterior to the facial plane in the patients having class-II, div 1 malocclusion.

In the present study when intergroup comparison were made between control group (normal occlusion) and various malocclusion groups .The differences in mean value of mandibular central incisor to NB angular variable found were significant between control group with group-III, between group-II with group-III. The difference in mean value of mandibular central incisor to NB angular variables were also significant between group-1 with group-III.

The study of Bibby R.E. (1980) [5] also supported the present study, according to him lower incisors are retroclined in the protrusive mandible of class- III types.

Ismail Ceylan (2003)[8] who proved in their studies that mandibular central incisors to MP angle statistically significant different among different overjet pattern.

Similar results were found by Antonija & Vorga (2003)[7], they stated that IMPA angle represents the degree of protrusion and retrusion of lower incisors in relation to mandibular base. In relation to eugnathic patient (92), patients with mandibular prognathism have statistically significant value of decreased for this angle (83.54°) as a result of dentoalveolar adaptation.

Tweed (1954) [10] stated that the position of the lower incisor is vertical for a stable maxillo-mandibular relationship and their position in relation to the mandibular base which should be 90°, is of great importance.

In the present study mandibular central incisor to SN shows statistically significant difference in mean value when intergroup comparison were made between control group with group-II, and group-III, between group- Mandibular incisors are proclined labially in skeletal class- II malocclusion, while mandibular incisors were found upright or retroclined in skeletal class-III malocclusion, which was similar to the results found by Ohyama (1978), [11] R.B. Bibby (1980)28, Sebata et al,(1969) [11] who proved in their studies that lower incisors are relatively upright or retroclined in class- III malocclusion due to dentoalveolar compensation.

Ishikawa and Nakamura (2000) [11] evaluated the dentoalveolar compensation in negative overjet cases by measuring SN-L1 angle. The SN-L1 angle for normal overjet group were (56.30°±6.30°) while for negative overjet were (60.40°±9.20°). Shim H_Y. and Chang Y.I (2004) [12] also found increased L1 to SN angle in mandibular prognathism which is caused due to retroclined lower incisors. These results are in accordance with this present study.

Significant difference in Md. 1 to NB (linear) were found, when group II. comparison of group III mm were made with control group, and While significant difference were found between control group with Group II. Group II. These findings indicated forward positioning of mandibular incisors in skeletal class II malocclusion and backward positioning in skeletal class III malocclusion.

This was supported by Antonija and Vorga (2003)[7], who found that the value of Md. I to NB linear (3.35 mm) suggest the retrusion of mandibular incisors in relation to mandibular apical base, in mandibular prognathic patients, because the value for eugnathic patients is 4.5 mm. It is also a part of dentoalveolar compensation.

The present study showed significant difference in mandibular central D Incisor to N-Pog(linear), when comparison were made between group-II with Group III, while significant differences were found in mean value between control Group with Group-II; between Control Group with Group-III; and between Group-I with Group-III. Findings suggested the forward positioning of mandibular incisors in Class- II malocclusion and backward positioning of mandibular incisors in Class- III malocclusion as a dental compensation.

In the present study, significant difference in the mean values of Maxillary central Incisor to Mandibular central Incisor (interincisal angle) was found when Group-1 was compared with Control group, Group-I and Group-III.

As the interincisal angle shows a decrease value in Group-II (skeletal Class-II malocclusion) and increase in Group- III (Skeletal Class- III malocclusion) as compared to Control Group and Group-I (skeletal Class- I malocclusion).

This was supported by Ismail Ceylan (2003) [8], who found that measurements of interincisal angle showed statistically significant, decrease in positive overjet groups and increase of interincisal angle in negative overjet groups.

S-N-Id angle shows statistically significant difference in mean value when comparison is made between control group with group-II, between group-I with group-II between group-I with group-III, between group- II with group-III.

In skeletal class- II malocclusion S-N-Id. angle is smaller as compare to control group and class-I malocclusion group due to retrognathic mandible as compare to cranial base. In skeletal class- II malocclusion very much positive overjet indicates inadequate dentoalveolar compensation.

Infradentale, the alveolar point which is present in mandible in severe skeletal class- II malocclusion, mandible is positioned far behind in relation to Nasion point. So, S-N-Id angle is small in Class- II malocclusion and dento-alveolar compensation is not properly attained. In skeletal class- III malocclusion S-N-Id. is large, which is due to forward position of mandible as compare to cranial base. In skeletal class- III malocclusion there are chances of edge-to-edge bite or negative overjet presence and alveolus (Infradentale) placed forwardly. So, increased S-N- Id angle in Class-III malocclusion indicate inadequate dento-alveolar compensation.

When the mean and standard deviation values of maxillary alveolar depth were compared in present study between control group with Group-1, group-II with group-III the results were found to be significant in group II and group -III. When inter group comparison were made for Mandibular alveolar depth in present study between control group, group I group II and group III. The mean value of Mandibular alveolar depth shows statistically significant difference in Group-III (skeletal Class-III malocclusion) at a level of as compared to Control group and Group- I.

The significant difference in mean value of Mandibular alveolar depth in Group-III, Control Group was supported by Nojima K. (1998)[13].

The present study was cross-sectional and soft tissue compensation was not considered. A further study with separate male and female samples may be more informative for both sexes. Abnormal Muscle activities and functions like, mouth breathing, tongue thrust, short lips and lip trap etc. should be investigated during development of skeletal dysplasias and malocclusion.

CONCLUSION

From this study, following conclusions may be drawn:

1. Dentoalveolar compensatory changes in the position and axial inclination of the upper and lower incisors were found in Group-II (skeletal Class- II malocclusion) and Group-III (skeletal Class III malocclusion).
2. In Group-II (skeletal Class- II malocclusion) upper incisors are proclined in the upper jaw, and lower incisor proclined in lower jaw.
3. In Group-III (skeletal Class- III malocclusion) a consistent pattern appears to be operating which retroclined the lower incisors and at the same time proclined the upper incisors as a compensatory mechanism.
4. Maxillary alveolar depth (Mx AD) found to be less in Group-11 and Mandibular alveder der Md AD) found to be more in Group-III as Compared with Control Group.
5. In group II (skeletal Class- II malocclusion) increased IMPA angle in patients having mandibular retrognathism and in group III (skeletal Class- III malocclusion) decreased IMPA angle in patients having mandibular prognathism.

Table: Distribution of mean S-N-Id vs Group

		Number	Mean	SD	Minimum	Maximum	Median	p-value
S-N-Id	Class I Malocclusion	30	80.7667	4.6954	72.0000	91.0000	81.5000	0.0001
	Class II Malocclusion	30	79.7833	3.8432	71.0000	87.0000	79.5000	
	Class III Malocclusion	30	84.7000	3.8965	75.0000	93.0000	85.0000	
	Control	30	82.8500	4.5108	78.0000	99.0000	81.2500	

Table: Distribution of mean Mand1 to NB vs Group

		Number	Mean	SD	Minimum	Maximum	Median	p-value
Mand 1 to NB	Class I Malocclusion	30	35.0333	7.7169	19.0000	50.0000	35.5000	0.0005
	Class II Malocclusion	30	32.4000	7.4399	15.0000	47.0000	32.0000	
	Class III Malocclusion	30	29.9333	5.6136	19.0000	42.0000	30.0000	
	Control	30	28.1333	4.7086	20.0000	37.0000	29.0000	

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