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Evaluation of possible reasons for asymmetries associated with Class II subdivision, Class II division 1 and normal malocclusion

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ABSTRACT

Objectives: To evaluate and compare the asymmetries in subjects with two malocclusions that is Class II subdivision, Class II div 1 and normal occlusion.

Materials and Methods: 90 subjects ranging from 15 to 30 years divided into 3 groups A, B, C. Group A – Class II subdivision, Group B – Class II division I, Group C – Normal Class I occlusion. Angular, linear paired, linear unpaired measurements were calculated based on the Van De Coppell analysis using PA views.

Results: Asymmetry was found in all the three groups where Group A patients showed greater degree of asymmetry near maxillary buttress and piriform aperture areas compared to the three groups. Group C patients showed greater degree of asymmetry in the occlusal plane angle.

Conclusion: All the three malocclusions that is Class II div 1 Subdivision, Class II div 1 and Class I malocclusions showed equal amounts of asymmetry. Class II subdivision patients showed greater asymmetry near maxillary buttress area and piriform aperture. Class I malocclusion showed deviation in occlusal plane angle. Along with the lower third involving mandible, maxillary area also can equally show asymmetry in both skeletal and dental parameters.

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1. Introduction

Perfect symmetry is largely a theoretical concept that seldom exists in living organisms. Variations in size, shape and relationship of dental, skeletal and soft tissue facial structures are important in providing each individual with his or her own identity.¹ Stedman's medical dictionary defines symmetry as "Equality or correspondence in form or parts distributed around a center or an axis at the two extremes or poles, or on the two opposite sides of the body."² Symmetry when applied to facial morphology refers to the correspondence in size, shape

and location of facial landmarks on the opposite sides of the median sagittal plane.³ Asymmetries can be classified according to the structures involved into dental asymmetries, skeletal asymmetries, muscular asymmetries and functional asymmetries.⁴ Asymmetry of craniofacial skeleton is most readily diagnosed in frontal view than from any other view.⁵ The etiology of asymmetries include:¹

1. Genetic or congenital malformation. Eg: Hemifacial microsomia, unilateral clefts of lip and palate.
2. Environmental factors. Eg: Habits and trauma.
3. Functional deviations. Eg: Mandibular shifts as a result of tooth interferences.

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The present study is therefore based on the orthodontist's need to know the skeletal asymmetries due to dental malocclusions, which may lead to functional deviations such as shifts as a result of tooth interferences etc. The malocclusions taken in this study are Angle's Class I, Class II div 1, Class II subdivision. The dental and skeletal asymmetries will be compared in subjects with these malocclusions.

2. Materials and Methods

Posteroanterior cephalometric radiographs were taken for 90 volunteers included in the study. Their consent was taken before taking the radiographs. Subjects with all permanent teeth present (third molars presence was not compulsory) were taken into the study. Subjects with facial trauma, previous orthodontic treatment, medical conditions that could have altered the growth of apical bases like hormonal imbalances were excluded from the study. The 90 subjects included in the study are divided into 3 groups. Group A: Subjects with Angle's Class II subdivision malocclusion. Group B: Subjects with Angle's Class II div 1 malocclusion. Group C: Subjects with Angle's Class I malocclusion.

The cephalograms were traced manually on cellulose acetate paper using 0.5mm lead. The tracings of postero-anterior cephalograms included the following structures (Figures 1 and 2).



Fig. 1:

1. Orbits
2. Contours of nasal cavity
3. Crista galli
4. Anterior nasal spine

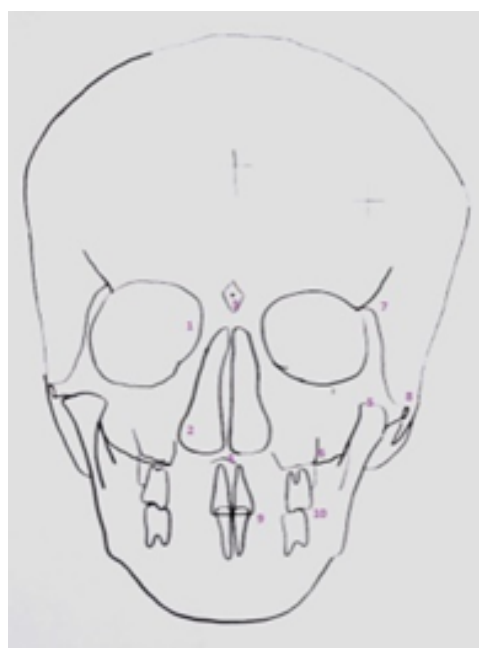


Fig. 2:

5. Mandibular contour from one condyle to another
6. Left and right maxillary buttress
7. Lateral aspects of frontal bone
8. Maxillary and mandibular central incisors
9. Maxillary and mandibular first molars

The angular measurements (Figure 3) taken are from 1-4.

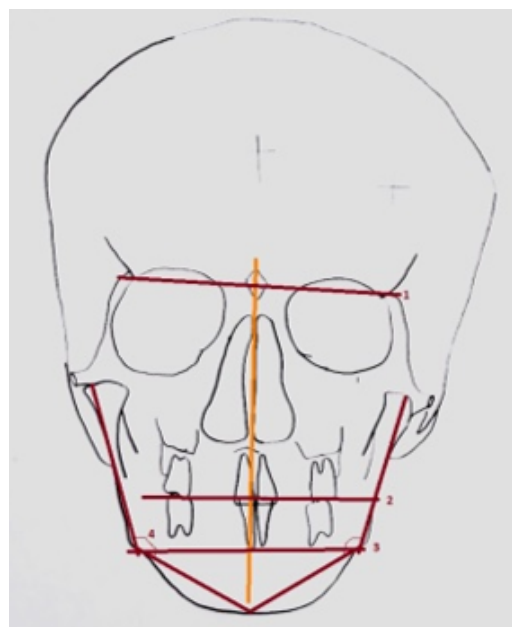


Fig. 3:

1. Z plane angle formed by intersection of Z plane and Cg-ANS line.
2. Occlusal plane angle formed by intersection of occlusal plane and Cg-ANS line.
3. Antegonial plane angle formed by intersection of antegonial plane and Cg-ANS line.
4. Antegonial angle formed by intersection of mandibular ramus and mandibular body.
5. Anterior nasal spine deviation
6. Mandibular deviation
7. Maxillary midline deviation
8. Mandibular midline deviation
9. Frontozygomatic suture (Z) to X-line distance e
10. Condylion (Cd) to X-line distance
11. Zygoma (ZA) to X-line distance
12. Piriform aperture to X-line distance
13. Maxillary buttress to X-line distance
14. Antegonial notch to X-line distance
15. Maxillary first molar height
16. Condylion to Antegoinal notch distance (Cd-Ag))
17. Condylion to Menton distance (Cd-Me))
18. Menton to Antegonial notch distance (Me-Ag)

The unpaired linear measurements (Figure 4) taken are from 5-8.

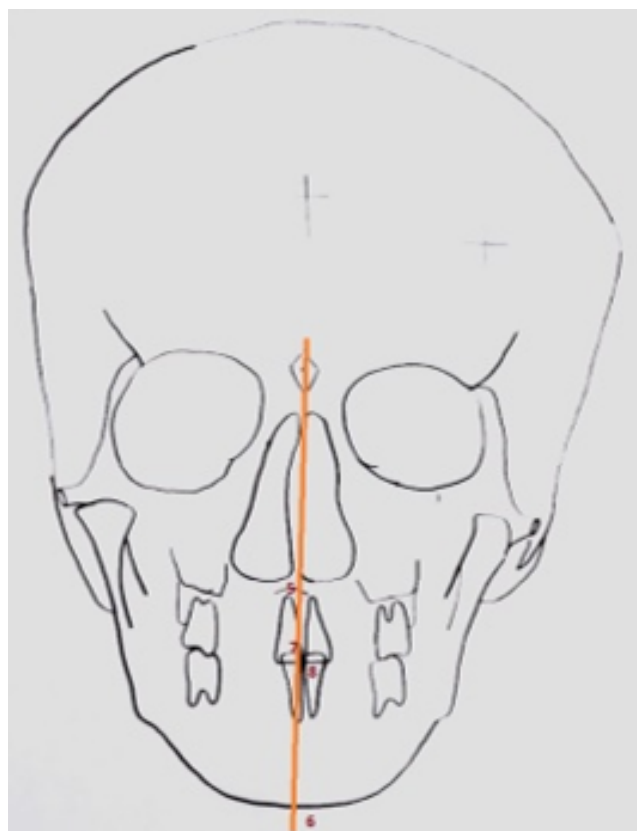


Fig. 4:

The paired linear measurements (Figure 5) taken are from 9-18.

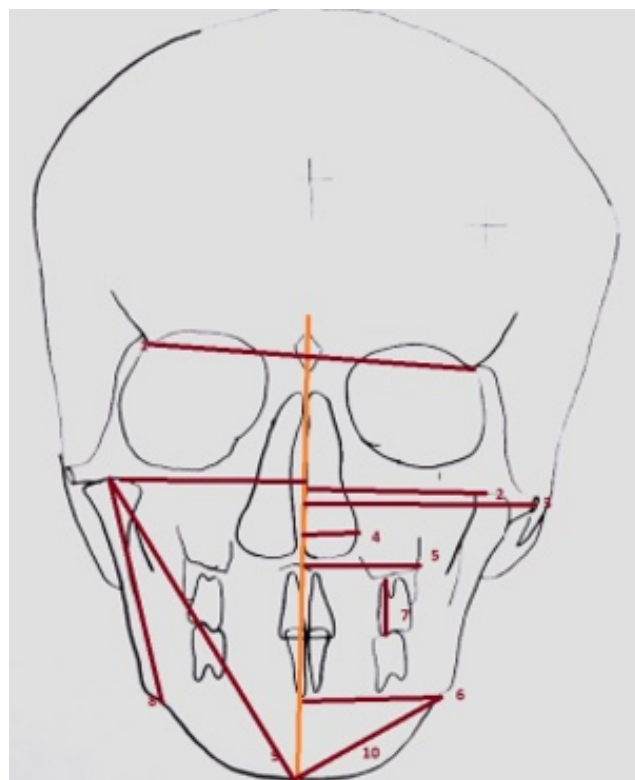


Fig. 5:

3. Results

Comparison between right and left side measurements of the angular, linear paired and unpaired measurements between the groups was done using ANOVA test. Comparison between the angular, linear paired and unpaired measurements within the groups was done using t- test. Independent t-test was used to compare the results between males and females.

Highly significant differences between the malocclusions were observed in measurements like NC to X line and significant differences were observed in Cd to Ag and Cd to Me measurements. Within the groups no significant differences was observed in linear unpaired measurements.

Comparison of linear unpaired measurements between the malocclusions (Figure 6).

4. Discussion

Significant structural facial asymmetries are not easily amenable to orthodontic treatment. These problems may require orthopaedic correction during the growth period and/or surgical management at a later point.¹ The present study analyzed the degree of facial asymmetry associated

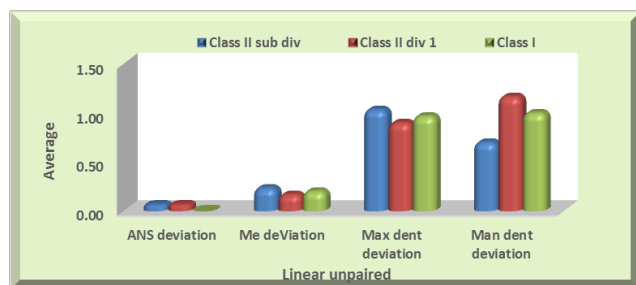


Fig. 6:

with Angle's class II subdivision, Angle's class II div 1 and Angle's class I malocclusions. The postero-anterior cephalograms were obtained in centric occlusion for the elimination of postural asymmetries and to ensure accuracy in the evaluation of mandibular asymmetry in relation to the maxilla and the cranial base. Grayson et al., Grummons and Kappeyene Van de Coppello, Proffit, Ricketts et al., Owen, Fish and Epker, Williamson and Mongini, Sollar, Svanholt and Solow, Moyers et al, Athanasiou et al, Solow, Ingerslev and Solow, Nakasima and Ichinose, Droschl have evaluated and analyzed the symmetries of craniofacial skeleton using PA cephalograms.^{6,7} The present study was done based on the analysis proposed by Grummons and Kappeyene Van de Coppello in which, the angular, linear and linear unpaired measurements were compared within the study groups.

No statistically significant difference in Z plane angle was seen in any of the malocclusions which related to findings of Harvold, in which he found that zygomaticofrontal suture and crystal galli are relatively symmetrical structures compared to other facial landmarks that are farther from the cranial base.¹

No statistically significant results in angular measurements was seen which is similar to a posteroanterior cephalometric study conducted by Gerald Letzer and Joseph Kronman in which various angular measurements were compared in patients with excellent occlusion and in patients with malocclusion other than Class III.⁸ Similar results have been observed in the current study in which various parameters such as NC to X and J to X and also Cd to Me showed statistically significant in all the three groups of malocclusions. In Class II subdivision cases the occlusal plane angle, antegonial angle, Cd to Ag distance, Cd to Me distance which represent the ramal length and total mandibular lengths respectively did not show any statistically significant differences which is contrary to a study done by Nazeema Jabeen et al in which they have found differences in Angle's Class II subdivision malocclusion.⁹

Highly significant difference was observed in the parameter Nasal cavity (NC or piriform aperture) to the mid sagittal reference line (MSR) between the three malocclusions. Statistically significant difference was

observed in the parameter Cd (Condylion) to Me (Menton) in the three malocclusions which represents the mandibular length on each side. Linear unpaired measurements showed no statistically significant differences in the three malocclusions. The occlusal plane angle in Class I patients showed a highly significant difference ($P < 0.01$) indicating dentoalveolar asymmetries. This is similar to a study conducted by Vig and Hewitt.¹ Distance from condylion to menton showed statistically significant differences among the three malocclusions ($P < 0.05$) in which left side showed an increase in the distance while the right side showed greater variation in the three malocclusions. The distance between condylion to antegonial notch in the right side also showed greater difference in the three malocclusions. The distance between condylion to menton and occlusal plane measurements were different in Class I malocclusion which is contrary to the study done by Nazeema Jabeen et al in which Class II sub division cases showed such differences.⁹

Highly significant difference in the distance between point J (maxillary buttress) to mid sagittal reference plane was seen which was similar to the study done by Minich et al. but his study was based on CBCT method.¹⁰ In the present study, Class I malocclusion group showed greater symmetry in case of maxillary dental midline which is 56.7%. In the remaining patients in the same group, 16.6% of patients showed maxillary dental midline shift towards left side and the remaining 17.7% showed maxillary dental midline shift towards the right side. Greatest variation in maxillary dental midline shift was observed in Class II div 1 subdivision group patients, where only 46.7% showed no shift while 23.2% of patients showed shift towards left side and 30% of the patients showed shift towards rights side. Mandibular dental midline deviation was greater in Class II div 1 patients where, 36.7% of the patients showed shift towards left side and 30% of the patients showed shift towards right side and only 33.3% of patients showed no deviation of mandibular dental midline shift. Mandibular dental midline deviation was more compared to the maxillary dental midline deviation in the current study which is similar to a study conducted by Paulo Estevao et al in which they evaluated dental arch asymmetry in natural normal occlusion and Class II malocclusion individuals and found that asymmetry degree was higher in the mandibular dental arches than in the maxillary dental arches. Females had higher values of antegonial angles as compared to males

5. Conclusion

From the research following conclusions can be drawn:

1. All the three malocclusions that is Class II div 1 Subdivision, Class II div 1 and Class I malocclusions showed equal amounts of asymmetry.
2. Class II subdivision patients showed greater asymmetry near maxillary buttress area and piriform

aperture

3. Mandibular dental midline deviation was greater in Class II div 1 patients
4. Class I malocclusion showed deviation in occlusal plane angle which infers the alveolar portion asymmetry.
5. Along with the lower third involving mandible, maxillary area also can equally show asymmetry in both skeletal and dental parameters.
6. Various parameters showed statistically insignificant yet variations were found in Class II div 1 Subdivision and Class II div 1 patients.
7. No statistically significant asymmetric variation was seen between males and females in all the parameters, except the distance between condylian to antegonial notch was found to be greater in males

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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