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# Evaluation of condylar asymmetry in different skeletal patterns in post- adolescents

Dental Science

KEYWORDS:

| | |
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## ABSTRACT

'Facial asymmetry' refers to disproportion between two normally alike facial landmarks on the opposite sides of median sagittal plane. The aim of this study was to investigate vertical condylar asymmetry in post-adolescents with no clinical signs or symptoms of temporomandibular joint disorders using panoramic radiographs. To determine the effect of sex and angle on the condylar, ramus and condylar plus ramus asymmetry measurements. The study group consisted of 90 subjects with various skeletal patterns and was divided into 3 groups with 30 subjects each according to skeletal pattern. Condylar height, ramus height and total ramus height on both the side were measured for each subject. The vertical condylar, ramus and condylar plus ramus asymmetry index measurements were not affected by the angle. In case of AI of C there is significant difference between Class II and class III only. Other pairs have non-significant differences.

## INTRODUCTION

'Facial asymmetry' refers to disproportion between two normally alike facial landmarks on the opposite sides of median sagittal plane. Mulick1 cited that asymmetry in the craniofacial region was first documented by an artiste Hasse whose investigations of early Greek statuary revealed slight to moderate asymmetries in the creation of artistic works. Although many faces may appear symmetrical and well balanced on clinical soft tissue evaluation, radiographic studies revealed varying degrees of craniofacial asymmetry as a characteristic of all faces. It serves to characterize and to individualize the aesthetically pleasing face rather than to disfigure it.[2]

Asymmetry in the lower third of the face referred as 'mandibular asymmetry' cause aesthetic and functional problems. 'Condylar asymmetry' is the disproportion of vertical condylar height between right and left mandibular condyles. Condylar asymmetries are thought to be one of the most important causes of mandibulofacial asymmetries.3 The mandibular asymmetry was assessed in healthy children and demonstrated its fluctuation during growth.4 Lu5 reported that only facial asymmetries greater than 3% are clinically discernible.

Liukkonen M et al.6 assessed mandibular asymmetry in healthy children. The vertical condylar asymmetry has been investigated in adolescents with no clinical signs or symptoms of temporoman dibular joint disorders.[1]

## AIM & OBJECTIVES

The aim of this study was to investigate vertical condylar asymmetry in post-adolescents with no clinical signs or symptoms of temporomandibular joint disorders using panoramic radiographs.

To determine the effect of sex and β angle on the condylar, ramus and condylar plus ramus asymmetry measurements.

## MATERIALS & METHODS

Case records, models, cephalograms and panoramic radiographs of 90 patients aged 19-30yrs attending Department of Orthodontics and Dentofacial Orthopedics of Kothiwal Dental College and Research Center, Moradabad for seeking orthodontic treatment were used for this study. Ethical clearance were taken from the Institutional ethic and review board. Patient consent were also taken to participate within study. The cephalograms and panoramic radiographs were taken under standardized conditions.

**Inclusion Criteria**

- Patients with proper case records, panoramic radiographs and lateral cephalograms
- No missing teeth except third molars were included in this study.

**Exclusion Criteria**

- Patients with posterior crossbites (unilateral or bilateral),
- mandibular deviation during closure
- any history of jaw trauma
- symptoms of occlusal trauma
- masticatory disharmony,
- pain during jaw movements
- clinically diagnosed temporomandibular joint disorders

The study group consisted of 90 subjects with various skeletal patterns and was divided into 3 groups with 30 subjects each according to skeletal pattern. They were grouped as follows: Group 1: **β angle** = 27°-34°, Group 2: **β** angle > 27° and Group 3: **β angle** < 34°. In addition, each group was divided into subgroups according to sex (15 subjects each). Panoramic radiographic films were traced on matte acetate paper with 3H pencil. Condylar height, ramus height and total ramus height on both the side were measured for each subject . Condylar, ramus and condylar plus ramus asymmetry indexes were estimated using the following formulae: asymmetry index (AI) = | (R-L)/(R+L) | X100.

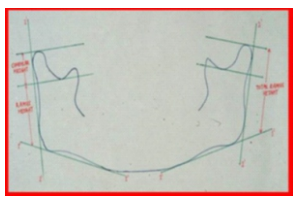

**Figure 1** Tracing Of Panoramic Radiograph Showing Various Anatomical Landmarks and Measurements used in the study.

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**RESULTS**

Data was fed in microsoft excel and analysed using SPSS (Statistical Package for Social Science, Ver.10.0.5) package. The student 't' test was performed to determine whether a statistical difference exists between male and female in the parameters measured. Analysis of variance was used to test the difference between study groups and compare the effect of **β** angle on asymmetry measurements. In all the above test, 'p' value of less than 0.05 was accepted as statistically significant. The mean, standard deviation and range of the right and left condyle, ramus and total ramus heights (in millimetres) of the study groups are presented in table I, II and III. The effect of **β** angle on the asymmetry measurements was investigated by variance analysis. The results of the variance analysis are presented in table IV. Statistically significant difference was found between the groups (p>0.05). The vertical condylar, ramus and condylar plus ramus asymmetry index measurements were not affected by the β angle. In case of AI of C there is significant difference between Class II and class III only. Other pairs have non-significant differences.

**Table I- T-test Group I- Skeletal Class I**

| | Sex | N | Mean | Std. Deviation | t-value | p-value |
|---|---|---|---|---|---|---|
| Beta angle | Male | 15 | 30.36 | 2.10 | 1.21 | 0.237 |
| | Female | 15 | 31.50 | 2.94 | | |
| rt condyle | Male | 15 | 20.57 | 2.34 | 0.25 | 0.807 |
| | Female | 15 | 20.31 | 3.26 | | |
| rt ramus | Male | 15 | 47.29 | 5.57 | 1.26 | 0.217 |
| | Female | 15 | 44.69 | 5.68 | | |
| rt C+R | Male | 15 | 67.86 | 5.36 | 1.27 | 0.215 |
| | Female | 15 | 65.00 | 6.77 | | |
| lt condyle | Male | 15 | 20.71 | 1.82 | 0.29 | 0.777 |
| | Female | 15 | 20.50 | 2.22 | | |
| lt ramus | Male | 15 | 47.21 | 5.70 | 0.88 | 0.387 |
| | Female | 15 | 45.38 | 5.73 | | |
| lt C+R | Male | 15 | 67.93 | 5.38 | 1.05 | 0.305 |
| | Female | 15 | 65.75 | 5.95 | | |
| AI OF C | Male | 15 | 2.48 | 2.08 | 0.39 | 0.697 |
| | Female | 15 | 2.79 | 2.23 | | |
| AI OF R | Male | 15 | 0.95 | 0.85 | 0.18 | 0.861 |
| | Female | 15 | 1.01 | 0.82 | | |
| AI OF C+R | Male | 15 | 0.89 | 0.58 | 0.40 | 0.695 |
| | Female | 15 | 0.99 | 0.76 | | |

**Table II T test Group II- Skeletal Class II**

| | Sex | N | Mean | Std. Deviation | t-value | p-value |
|---|---|---|---|---|---|---|
| Beta angle | Male | 15 | 23.47 | 2.13 | 0.54 | 0.596 |
| | Female | 15 | 23.07 | 1.94 | | |
| rt condyle | Male | 15 | 21.27 | 2.81 | 0.16 | 0.873 |
| | Female | 15 | 21.47 | 3.87 | | |
| rt ramus | Male | 15 | 45.33 | 4.85 | 0.45 | 0.655 |
| | Female | 15 | 46.07 | 3.99 | | |
| rt C+R | Male | 15 | 66.60 | 5.96 | 0.48 | 0.639 |
| | Female | 15 | 67.53 | 4.73 | | |
| lt condyle | Male | 15 | 21.20 | 2.14 | 0.32 | 0.753 |
| | Female | 15 | 20.87 | 3.44 | | |
| lt ramus | Male | 15 | 45.87 | 4.87 | 0.67 | 0.512 |
| | Female | 15 | 46.93 | 3.86 | | |
| lt C+R | Male | 15 | 67.07 | 5.96 | 0.38 | 0.709 |
| | Female | 15 | 67.80 | 4.60 | | |
| AI OF C | Male | 15 | 3.20 | 1.83 | 0.23 | 0.818 |
| | Female | 15 | 3.39 | 2.51 | | |
| AI OF R | Male | 15 | 1.05 | 1.14 | 1.45 | 0.157 |
| | Female | 15 | 1.68 | 1.22 | | |
| AI OF C+R | Male | 15 | 0.55 | 0.51 | 0.87 | 0.39 |
| | Female | 15 | 0.76 | 0.77 | | |

**Table III T test Group III- Skeletal Class III**

| | Sex | N | Mean | Std. Deviation | t-value | p-value |
|---|---|---|---|---|---|---|
| Beta angle | Male | 15 | 36.33 | 1.05 | 1.35 | 0.188 |
| | Female | 15 | 35.87 | 0.83 | | |
| rt condyle | Male | 15 | 20.93 | 4.38 | 0.86 | 0.398 |
| | Female | 15 | 22.33 | 4.55 | | |
| rt ramus | Male | 15 | 42.27 | 6.40 | 0.53 | 0.601 |
| | Female | 15 | 43.40 | 5.29 | | |
| rt C+R | Male | 15 | 63.20 | 4.81 | 1.39 | 0.175 |
| | Female | 15 | 65.73 | 5.15 | | |
| lt condyle | Male | 15 | 20.80 | 4.18 | 0.80 | 0.43 |
| | Female | 15 | 22.07 | 4.48 | | |
| lt ramus | Male | 15 | 42.67 | 6.06 | 0.72 | 0.475 |
| | Female | 15 | 44.20 | 5.53 | | |
| lt C+R | Male | 15 | 63.47 | 4.29 | 1.62 | 0.117 |
| | Female | 15 | 66.13 | 4.72 | | |
| AI OF C | Male | 15 | 1.99 | 1.31 | 0.05 | 0.958 |
| | Female | 15 | 2.02 | 1.77 | | |
| AI OF R | Male | 15 | 1.49 | 1.52 | 0.60 | 0.554 |
| | Female | 15 | 1.20 | 1.14 | | |
| AI OF C+R | Male | 15 | 1.07 | 0.60 | 1.05 | 0.302 |
| | Female | 15 | 0.82 | 0.69 | | |

**Table IV Oneway Anova**

| | | N | Mean | Std. Deviation | F-value | p-value |
|---|---|---|---|---|---|---|
| Beta angle | Class I | 30 | 30.97 | 2.61 | 318.844 | <0.001 |
| | Class II | 30 | 23.27 | 2.02 | | |
| | Class III | 30 | 36.10 | 0.96 | | |
| | Total | 90 | 30.11 | 5.65 | | |
| rt condyle | Class I | 30 | 20.43 | 2.82 | 0.921 | 0.402 |
| | Class II | 30 | 21.37 | 3.33 | | |
| | Class III | 30 | 21.63 | 4.44 | | |
| | Total | 90 | 21.14 | 3.59 | | |
| rt ramus | Class I | 30 | 45.90 | 5.68 | 3.114 | 0.051 |
| | Class II | 30 | 45.70 | 4.38 | | |
| | Class III | 30 | 42.83 | 5.80 | | |
| | Total | 90 | 44.81 | 5.45 | | |
| rt C+R | Class I | 30 | 66.33 | 6.22 | 1.747 | 0.18 |
| | Class II | 30 | 67.07 | 5.31 | | |
| | Class III | 30 | 64.47 | 5.06 | | |
| | Total | 90 | 65.96 | 5.60 | | |
| lt condyle | Class I | 30 | 20.60 | 2.01 | 0.512 | 0.601 |
| | Class II | 30 | 21.03 | 2.82 | | |
| | Class III | 30 | 21.43 | 4.30 | | |
| | Total | 90 | 21.02 | 3.17 | | |
| lt ramus | Class I | 30 | 46.23 | 5.69 | 2.962 | 0.057 |
| | Class II | 30 | 46.40 | 4.35 | | |
| | Class III | 30 | 43.43 | 5.75 | | |
| | Total | 90 | 45.36 | 5.42 | | |
| lt C+R | Class I | 30 | 66.77 | 5.70 | 2.07 | 0.132 |
| | Class II | 30 | 67.43 | 5.24 | | |
| | Class III | 30 | 64.80 | 4.63 | | |
| | Total | 90 | 66.33 | 5.27 | | |
| AI OF C | Class I | 30 | 2.65 | 2.13 | 3.23 | 0.044 |
| | Class II | 30 | 3.29 | 2.16 | | |
| | Class III | 30 | 2.01 | 1.53 | | |
| | Total | 90 | 2.65 | 2.01 | | |
| AI OF R | Class I | 30 | 0.98 | 0.82 | 1.08 | 0.344 |
| | Class II | 30 | 1.36 | 1.20 | | |
| | Class III | 30 | 1.35 | 1.33 | | |
| | Total | 90 | 1.23 | 1.14 | | |
| AI OF C+R | Class I | 30 | 0.94 | 0.67 | 1.933 | 0.151 |
| | Class II | 30 | 0.65 | 0.65 | | |
| | Class III | 30 | 0.94 | 0.65 | | |
| | Total | 90 | 0.85 | 0.66 | | |

## DISCUSSION

**Sodawala et al**[2] suggested that vertical condylar asymmetries (greater than 3% cutoff) exists among post-adolescents with no clinical signs and symptoms of temporomandibular joint disorders and condylar, ramus and condylar plus ramus asymmetry indexes were not affected by the sex and ANB angle in these patients.

Bezuur *et al.*[7,8] investigated the possible role of condylar asymmetry on the pathogenesis of craniomandibular disorders and suggested that the use of a screening protocol and a panoramic radiograph could be of preventive importance in daily practice. The use of panoramic radiographs in evaluating mandibular asymmetries concerns the effect of magnification occurring at the vertical dimensions of the mandible on the vertical measurements.

In a recent study, Kambylafkas[9] showed that panoramic radiographs could be used to assess vertical posterior mandibular asymmetries. The reproducibility of vertical measurements on panoramic radiographs is acceptable if the patients head position is standardised.

In the recent study, all the films were taken in standardised conditions and poor quality radiographs were excluded. Habets[10,11] and Saglam *et al*[12] investigated the relationship between temporomandibular joint disorders and condylar asymmetry and found increased condylar asymmetry indexes in subjects with temporomandibular joint disorders. In the present study, patients with clinical signs and symptoms of temporomandibular joint disorders were excluded. Habets[11,12] found that asymmetry index values greater than 3% must be taken into consideration as vertical asymmetries. The asymmetry values smaller than 3% may arise because of technical errors during film exposure.

In present study, asymmetric index of condyle shows significant difference between Class II and Class III only. Other variables have no significant difference. When we compare asymmetry of right ramus slight difference was seen between Class I and Class III.

Miller VJ *et al*[13]., investigated the relationship between condylar asymmetry and age in subjects with Angle's Class II division 2 malocclusion with deep overbite and no signs or symptoms of temporomandibular joint disorders and Angle's Class I occlusion as controls and found no statistically significant differences between these groups. The mean condylar asymmetry index of Angle's Class II division 2 malocclusion group and Angle's Class I occlusion group was 3.94% and 4.42% respectively.

OS *et al*[14]. investigated the effects of different occlusion types on the mandibular asymmetry in young individuals with no signs and symptoms of temporomandibular joint disorders and found that Angle's Class II division 1 malocclusion had a significant effect on the condylar asymmetry index when compared to Angle's Class II division 2 malocclusion, Angle's Class III malcclusion and normal occlusion types.

Studies of the etiology of condylar asymmetries by Saglam AM[15], Sezgin OS *et al*[14]., and Kurt G[16]., in which gender differences have been investigated revealed no statistically significant differences regarding asymmetry measurements. In the present study, no gender related statistically significant differences were found between the study groups regarding asymmetry measurements.

## CONCLUSION

This study suggested that vertical condylar asymmetries exists among post-adolescents with no clinical signs and symptoms of temporomandibular joint disorders and condylar, ramus and condylar plus ramus asymmetry indexes were not affected by the sex and **β** angle in these patients. Asymmetric index of condyle shows significant difference between Class II and Class III.

## REFERENCES

1. Mulick JF. An investigation of craniofacial asymmetry using the serial twin study method. Am J Orthod Dentofacial Orthop 1965;5:112-129.
2. Sodawala J, Shekar SE, Mathew S. Evaluation of condylar asymmetry in different skeletal patterns in post-adolescents. IJOCR 2014;2:1-6.
3. Schellas KP, Piper MA, Omlie MR. Facial skeletal remodelling due to TMJ degeneration: an imaging study of 100 patients. Am J Neuroradiol 1990;11:541-551.
4. Yamashiro T, Okada T, Takada K. Case report: Facial asymmetry and condylar fracture. Angle Orthod 1998;68:85-90.
5. Lu KH. Harmonic analysis of the human face. Biometrics 1965;21:491-505.
6. Liukkonen M, Sillanmäki L, Peltomäki T. Mandibular asymmetry in healthy children. Acta Odontol Scand. 2005;63:168-72.
7. Bezuur JN, Habets LLMH, Hansson TL. The recognition of craniomandibular disorders; a comparison between clinical, tomographical and dental panoramic radiographical findings in thirty one subjects. J Oral Rehabil 1988;15:549-54.
8. Bezuur JN, Habets LLMH, Hansson TL. The recognition of craniomandibular disorders; an evaluation of the most reliable signs and symptoms when screening for CMD. J Oral Rehabil 1989;16:367-372.
9. Kambylafkas P. Validity of panoramic radiographs for measuring mandibular asymmetry. Angle Orthod 2006;76:388-93.
10. Habets LLMH. The orthopantomogram, an aid in diagnosis of temporomandibular joint problems. I. The factor of vertical magnification. J Oral Rehabil 1987;14:475-480.
11. Habets LLMH. The orthopantomograph, an aid in diagnosis of TMJ problems II. The vertical symmetry. J Oral Rehabil 1988;15:465-71.
12. Saglam AM, Sanli G. Condylar asymmetry measurements in temporomandibular disorders. J Contemp Dent Pract 2005;5:59-65.
13. Millers VJ, Smidt A. Condylar asymmetry and age in patients with Angle class II division 2 malocclusion. J Oral Rehabil 1996;23:712-15.
14. Sezgin OS, Celenk P, Arici S. Mandibular asymmetry in different occlusion patterns - a radiographic evaluation. Angle Orthod 2007;77:803-07.
15. Saglam AM. The condylar asymmetry measurements in different skeletal patterns. J Oral Rehabil 2003;30:738-742.
16. Kurt G. Mandibular Asymmetry in Class II Subdivision Malocclusion. Angle Orthod 2008;78:32-37.