# Evaluation And Comparison Of Mandibular Asymmetry Indices In Different Classes Of Malocclusion: A Radiographic Study

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**Abstract:** Objective: To evaluate contribution of condylar and ramal asymmetries in various classes of maloclussion with the use of Orthopantomographs by frontal aspect . Materials and Methods: Panoramic radiographs (PRs) are routinely taken radiographs for the diagnosis purpose. All radiographs were taken by experienced radiology technician on digital panoramic system. The subjects were positioned with the lips in rest position & head oriented to Frankfort horizontal plane as suggested by Azevedo et al. The sample consisted of study five groups including 150 subjects of different types of malocclusions. All the radioghraphic films were traced & measured by the same author and all the asymmetry indices were measured using formula developed by Habets et al. Results: Descriptive statistics and Comparison of Condylar Asymmetry index(CAI), Ramal Asymmetry index(RAI) and Combined Asymmetry index(CoAI) showed that there no statistical significance within RAI (0.216) and CoAI (0.116), but statistically significant values were recorded within CAI (0.0052).We have found more asymmetry in condyle than ramus. Conclusion: Generally for orthodontic treatment orthodontist see mainly skeletal malformation in sagittal plan but from our studies it can be said that it is equally important to look for skeletal asymmetry from frontal aspect, particularly in lower third of the face and condyle. If such asymmetries are diagnosed earlier then it is possible to intervene them with the help of asymmetrical myofunctional appliances. [Manjiri J NJIRM 2016; 7(5):78-81]

**Key Words:** Malocclusion, Condyle, Ramus, Asymmetry indices

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**Introduction:** 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. Stedman medical Dictionary defines asymmetry as equality or correspondence in the form of parts distributed around a venter or an axis, at the two extremes or poles, or on two opposite sides of body.[1]

Teeth play a vital role in symmetry. Asymmetry of the craniofacial skeleton is more readily diagnosed from the frontal rather than other view. A method to determine asymmetry between the mandibular condyle and the ramus was introduced by Habets *et al.* This method compares the vertical heights of the mandibular right and left condyles and rami and thus the asymmetry indices. The regions that have the highest growth potential on the mandible are the condylar cartilages. Injuries occurring in these areas during the growth period can disturb the mandibles' down-and-forward growth potential, resulting in the displacement of the mandible toward the affected side. Thus, condylar asymmetries are thought to be one of the most important causes of mandibulofacial asymmetries.[2] Present study was conducted to rule out contribution of condylar and ramal asymmetries in various classes of maloclussion.

**Method:** Panoramic radiographs (PRs) are routinely taken radiographs for the diagnosis purpose. All radiographs were taken by experienced radiology technician on digital panoramic system. The subjects were positioned with the lips in rest position & head oriented to Frankfort horizontal plane as suggested by Azevedo et al.[3]

The sample consisted of study groups including 150 subjects of different types of malocclusions and were categorized into Group I(Class I malocclusion), Group II(Class II division I malocclusion), Group III (Class II division II), Group IV(Class II subdivision I & II), Group V(Class III).

All the radioghraphic films were traced & measured by the same author. On both right & left sides, the most lateral points of the condyle and the ramus were marked as X and Y, respectively. On each side, a line (ramus tangent) was drawn passing through points X and Y and termed as the A-line. Another line was drawn from the most superior points of the condyler images perpendicular to the A-line and termed as the B-line. The intersection of the A-and B- line was named point Z. the distances between point X- and Z- were measured as condylar height (CH). Similarly the distance between point X-Y- and between point Z- and

Y- were measured ramus height (RH) and combined height(CmH) ( See Figure 1). All the asymmetry indices were measured using formula developed by Habets et al[4]

Asymmetry index=
|right-left| x 100 /right+left

**Statistical analysis:** Statistical analysis was performed by performing students t-test, Mann Whitney U Test and One way ANOVA test.

**Results:** Demographic profile of the study showed that out of 150 subjects 64 were male subjects (42.6%) and 86 were female subjects(57.4%). Average age range was found to be 17.48 (Table1).

Descriptive statistics and Comparison of Condylar Asymmetry index(CAI), Ramal Asymmetry index(RAI) and Combined Asymmetry index(CoAI) showed that there no statistical significance within RAI (0.216) and CoAI (0.116), but statistically significant values were recorded within CAI (0.0052) ( Table 2).

By applying Kruskal-Wallis test, variation among mean values of CAI were significantly higher than expected by chance in all groups compared together ($p<0.05$).

Comparison of the groups by Mann Whitney U test showed highly significant values when Group I and Group V were compared($p=0.002$), comparison between Group II and Group III showed statistically significant value($p=0.052$). When Group II was compared with Group IV again statistically significant values were found($p=0.022$) and very highly significant values were found when Group II and V were compared(0.001). ( Table 3)

**Table No.1: Demographic Data For All Groups:**

| Age in years | Class I (n=58) | | Class II/1 (n=67) | | Class II/2 (n=13) | | Class II sub division 1&2 (n=3) | | Class III (n=9) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | Male | Female | Male | Female | Male | Female | Male | Female |
| 10-15 | 10 | 10 | 16 | 11 | 0 | 3 | 0 | 0 | 0 | 1 |
| 15-20 | 12 | 13 | 4 | 14 | 4 | 6 | 1 | 2 | 4 | 2 |
| 20-25 | 2 | 5 | 8 | 8 | 0 | 0 | 0 | 0 | 1 | 1 |
| 25-30 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-35 | 1 | 2 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 26 | 32 | 28 | 39 | 4 | 9 | 1 | 2 | 5 | 4 |
| Mean±SD | 17.67±2.15 | | 17.71±2.68 | | 16.73±3.94 | | 17.5±1.01 | | 17.83±1.03 | |

**Table No.2: Descriptive Statistics and Comparison of Asymmetry IndexValues for Groups:**

| Asymmetry Index Values | Groups | (n) | Mean ± SD | Minimum | Maximum | Significance/ Student's 't' test result |
|---|---|---|---|---|---|---|
| Condylar | Class I | 58 | 4.37±12.38 | -27.27 | 33.33 | 0.0052* |
| | Class II/1 | 67 | 2.46±11.24 | -33.33 | 27.27 | |
| | Class II/2 | 13 | -1.07±7.26 | -11.11 | 12.50 | |
| | Class II sub division 1&2 | 3 | 7.20±6.46 | 0 | 12.50 | |
| | Class III | 9 | 4.44±16.80 | -23.08 | 40.0 | |
| Ramus | Class I | 58 | -0.94±4.73 | -12.50 | 12.15 | 0.216 |
| | Class II/1 | 67 | -0.74±8.49 | -66.67 | 14.29 | |
| | Class II/2 | 13 | -1.51±2.89 | -10.34 | 1.49 | |
| | Class II sub division 1&2 | 3 | 0.81±1.41 | 0 | 2.44 | |
| | Class III | 9 | 0.36±3.36 | -4.76 | 7.69 | |
| Combined(Condylar+Ramus) | Class I | 58 | -0.57±3.47 | -7.37 | 10.57 | 0.116 |
| | Class II/1 | 67 | 0.46±2.54 | -9.62 | 13.73 | |
| | Class II/2 | 13 | -0.96±2.57 | -5.41 | 4.55 | |
| | Class II sub | 3 | 1.71±2.11 | 0.40 | 0.8 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | division 1&2 | | | | | |
| | Class III | 9 | 0.80±3.24 | -3.16 | 6.33 | |

*significant difference between the groups (p<0.01)

**Table No.3: Comparison of the groups Mann Whitney U test:**

| | **Class II/1** | **Class II/2** | **Class II sub division 1&2** | **Class III** |
|---|---|---|---|---|
| Class I | NS | NS | NS | 0.002** |
| Class II/1 | | 0.052* | 0.022* | 0.001*** |
| Class II/2 | | | NS | NS |
| Class II sub division 1&2 | | | | NS |

NS – Not significant, * p<0.05 significant, **p<0.01, highly significant *** p<0.001, very highly significant

**Discussion:** Knowledge of facial asymmetry can be helpful in diagnosis and treatment planning in orthodontics. It can be observed that facial asymmetry is mostly located in the lower third of the face. Studies of Azevedo et al[5] has shown the same. Previous studies by O'Byrn BL et al[6], Rose et al[7] have shown mandibular asymmetrics

along with deviation of chin and canting in occlusal plane. In literature the assessment of dentofacial asymmetrics has been performed by using different radiographic modalities like submentovertex, posterior-anterior cephalometric radiographs, computed tomography and MRI. Panaromic radiographs however are the most frequently used viewing technique for diagnostic purpose in dentistry, because in one radiograph we can have information regarding different structures like joints, teeth and other parts of the jaws in one exposure. Besides mandibular measurements such as tooth length or bone height, panaromic radiographs are now being used as diagnostic tool in more complicated studies, such as evaluation of vertical mandibular asymmetry, condylar and ramal height etc[7,8].

Bezuur et al[9,10] investigated the possible rule of condylar asymmetry on the pathogenesis of craniofacial disorders and suggested that the use of a screening protocol and a panoramic radiograph could be of preventive importance in daily practice.

Kambylatker et al[11] showed that panaromic radiographs could be used to assess vertical mandibular asymmetries. The reproductibility of vertical measurements on panaromic radiographs is acceptable if the patient's head position is standardized. In the present study, all the films were taken in standardized condition and poor quality radiographs were excluded. All radiographs were traced and measured by the same author to minimize intra observer error. Calculation of asymmetry index was done by method of Habetsel et al[4].

We got mild asymmetry present in all class of malocclusion. Maximum condylar asymmetry was found in class 2 subdivision 2 cases with condylar asymmetry of 7.20 ± 6.46. Same result was found in study of Nazimer Jabeen[12]. They found that 100% of class 2 subdivision cases showed facial asymmetry of varying degree.

We also found statistically significant asymmetry in class 3 cases with condylar asymmetry of 4.44 ± 16.80. Javed Soderwaler[13] in their study found class 3 malocclusion had 3.855% condylar asymmetry. While mean condylar asymmetry in class 3 individual is 4.42%.

We also found condylar asymmetry in class 1 cases with value of 4.37%.

We found more asymmetry in condyle than ramus. This can be explained by that condyle functions as a regional field (Enlow) of growth and it provides an adaptation for its own localized growth circumstances. Regional field of growth for condyle and ramus are different and it could be the reason that we did not find consistent correlation between condylar height and mandibular ramus height.

**Conclusion:** In view of the above observation all the patients with malocclusion should be assessed for asymmetries during clinical examination. Generally for orthodontic treatment orthodontist see mainly skeletal malformation in sagittal plan but from our studies it can be said that it is equally important to

look for skeletal asymmetry from frontal aspect, particularly in lower third of the face and condyle. If such asymmetries are diagnosed earlier then it is possible to intervene them with the help of asymmetrical myofunctional appliances.

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