Evaluation of facial asymmetry in esthetically pleasing faces

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ABSTRACT

Aims: The aim of the following study is to assess the extent of facial skeletal symmetry or asymmetry in individuals who had no visible facial asymmetry.

Materials and Methods: Posterior-anterior cephalographs of 50 esthetically pleasing faces were taken and traced for the Grummon’s facial asymmetry analysis. Parameters such as the horizontal planes, mandibular morphology, mandibular deviation and the transverse asymmetry were measured. To find the difference between different parameters Student’s t-test was performed.

Results: There existed a significant difference between the mandibular morphology measurements such as condylar-gonion distance, gonion-menton distance and the condylar-menton distance. Moreover the mandible showed the left side deviation. There was highly significant correlation between the zygomatic arch and the measurements like nasal cavity distance, condylar distance and the jugular process distance to the mid-sagittal plane.

Conclusion: Skeletal asymmetries are a common finding even in individuals who have normal facial features. Right sided dominance of the mandible was more and there was also tendency for the craniocaudal increase in the rate of the asymmetry.

Key words: Esthetics, asymmetry, mandibular deviation, skeletal asymmetry, transverse skeletal asymmetry

Introduction

Facial symmetry and asymmetry are of prime importance in judging the face to be attractive or unattractive. Facial symmetry is considered attractive in women¹ and women are less attracted to men with asymmetrical faces and symmetrical faces correlate with long term mental performance.² The art of facial beauty, the symmetry and the asymmetry related to it are of considerable interested in the field of the art, plastic surgery, orthognathic surgery, orthodontics and psychology.

The facial symmetry is considered as the prime requisite for the esthetically pleasing faces and facial esthetics in terms of symmetry and balance is termed as state of facial equilibrium. The left and right side of the face should correspond to each other in size, shape and volume with respect to the mid-sagittal plane if the face is symmetrical. Asymmetry is supposed to be seen in the face where the bilateral structures are not equidistance from the mid-sagittal plane.³

The usual scenario of the asymmetry measurement is the qualitative analysis of the asymmetry through visualization which is followed by the quantitative measurements,⁴ either directly taking the measurement on the face i.e., anthropometry or indirectly by measuring on the photographs in case of extra oral facial asymmetry. Whereas, the skeletal asymmetries are supposed to be measured by using different radiographic views like the lateral cephalograms, the panoramic radiographs, sub mental vertex view, the posterior-anterior cephalogram and the latest the computer tomographic view.⁶¹¹³

The facial asymmetries are the common findings in otherwise normal looking faces, and the same was proven by using the composite photographs of the individuals,¹²¹³ where by using the image technology the right and the left halves of the faces are separated.
and by joining the similar side picture a composite photograph was created and both the photographs looked different. The underlying cause for this asymmetry in normal looking people is the issue to be addressed. Many studies have evaluated the facial asymmetries, but very few have addressed the skeletal asymmetry in normal pleasing face and the present article will analyze the extent of skeletal asymmetry in otherwise normal looking faces using the posterior-anterior cephalograms.

**Materials and Methods**

A cross-sectional study was conducted on a sample of 50 adult subjects (25 male and 25 female). Simple random sampling was executed for the sample selection. All the subjects were taken from the daily out patients of the Department of Oral Medicine and Radiology, Darshan Dental College, Loyara, Udaipur, Rajasthan. The subjects were selected irrespective of intraoral occlusion/malocclusion. Criteria for selection of the subjects were:

1. Clinically acceptable facial harmony and symmetry.
2. Full complement of teeth.
3. No history of orthodontic treatment and gross deformity of the facial skeleton.
4. No functional displacement of mandible during opening and closing.

To minimize the subjective error in the selection, each person was examined by a panel of three orthodontists and the subjects were selected when all the three agreed. A total of 85 patients were examined and out of which 50 met the selection criteria. The subject was made to stand in the cephalostat and the target to source distance of five feet was maintained [Figure 1]. All the cephalograms were taken by the same machine (Gendex Orthoralix Panoramic/Cephalogram combination unit X-ray machine) and by the same radiographer. Each film was exposed for 0.80 s at 78 kVp and 10 mA setting and they were developed for 30 s and fixed for 60 s and dried. The radiographs were taken with the teeth in centric occlusion. Head position was fixed using a fluid level device and the plumb line. The purpose of the study was explained to the subject and the informed consent was obtained for participating in the study. The ethical clearance was obtained by the ethical committee of the Darshan Dental College and Hospital, Udaipur.

Tracing was done on acetate matte tracing paper (0.003 inches thick) using 0.5 mm pencil. The analysis for assessment of transverse frontal facial asymmetry was done by using parts of the frontal asymmetry analysis suggested by Grummons. All the measurements which are taken are shown in Figures 2-5.
The intra examiner variability was determined by randomly selecting a sample of 10 PA cephalograms for retracing within a period of 1 week. Kappa statistics was performed for the same and it account for the 0.92 ($\kappa = 0.92$).

The absolute value of the left and right difference (|d|) was used to compute the mean absolute asymmetry for each of the dimensions studied. Separate computation was made to test for left or right side dominance within the sample. Positive (+) sign for the left side and negative (−) sign for the right side were used to indicate sidedness.

**Statistical Analysis**

The statistical analysis was performed to find out the parameter which was least variable and thus most reliable for the determination of skeletal asymmetry and sidedness. Statistical analysis was also applied to find out the correlation among various parameters.

Data collected by the investigator were first entered to Excel (Microsoft Office Excel 2007). All data were visually screened for any missing data or outliers and for validity of distribution assumptions. Though we have checked for the outliers, they were not encountered in this particular set of data (if it all they are present one should measure the particular data again and rectify the same). The data were collected, tabulated, and statistically analyzed using the SPSS 15.0 programme (IBM, New York, US) statistical analysis package software. Independent t-test was used to find the differences between different measurements. The data was checked for the normal distribution using t-statistics and then the correlation coefficients between the various parameters were calculated using Pearson’s correlation to determine which combination would produce a higher value.

**Results**

All the subjects examined showed asymmetries in one or more of the measured dimensions. Table 1 shows the vertical asymmetry for the four planes investigated. The mandibular morphology in the form mean absolute value and the sidedness is depicted in Table 2. The present population showed 2.45° of asymmetry at Go angle. The Co-Go shows least and Go-Me shows highest rate of asymmetry of 2.23 mm and 3.96 mm respectively. In the sidedness, Go angle shows right sidedness. Both the Go-Me and Co-Me shows right sidedness, but Co-Go shows left sidedness which is statistically significant [Table 2].

Description of skeletofacial asymmetry in the transverse direction, their mean absolute value and sidedness (in

![Figure 4: Mandibular morphology and mandibular deviation](image)

![Figure 5: Transverse parameters](image)
millimeters) in Table 3. Co shows highest (3.46 mm) and Z shows lowest (1.07 mm) rate of asymmetry. In the sidedness
ZA, NC and Co shows the right side bias, in which ZA and
Co are statistically significant. But Z, J and Ag shows the
left side bias, in which J and Ag are statistically significant
[Table 3].

Table 4 shows mandibular deviation, their mean absolute
value and sidedness (in millimeters). 2.19 mm of
mandibular deviation with the left side dominance was
seen and same was statistically significant [Table 4].

Calculation of correlation among all the transverse
parameters is presented in Table 5. It shows reasonable
association between ZA and NC, ZA and Co, ZA and J,
including Co and NC. All the correlations are statistically
significant, but ZA and NC, and ZA and Co are highly
significant among them [Table 5].

Discussion

The present study was done to detect the skeletal asymmetry
in otherwise normally looking individuals.

Parallelism of the facial structures in the cranial base and
the lower facial region was assessed and there existed
no significant difference for the different asymmetries
measurements. Results indicated that the facial structures
were more or less parallel to each other and no gross
canting was seen in the present study and the findings are
in agreement with the earlier study. [15,16]

The mandibular morphology evaluation using various
measurements showed a significant difference for the mean
sidedness and absolute values for condyloid-gonion length,
gonion-menton length and the condyloid-menton length,
with later two showing the left sidedness. Gonial angle in
the present study showed right sidedness and same is in
accordance to the results of previous study. [15,16]

When the mean absolute and the sidedness values were
compared in transverse dimension there existed a significant
difference between zygomatic distance, condylar distance,
jugular distance and the antegonial notch distance, with
zygomatic arch distance and the condylar distance showing
right sidedness. Whereas left sidedness was appreciated
for the jugular process distance and the antegonial notch
distance, which is in contrary to earlier reports.

The mandibular offset at the menton was 2.19 mm and
this deviation is less compared to the study done by Goel
et al. [13] This is in agreement with Severt and Proffit[18]
who found incidence of 74% of chin deviations. This
high incidence of chin deviation may be due to the
asymmetries of mandibular length, which also showed
high incidence. Chin deviation in the present study
showed left sidedness which is in agreement with findings
of earlier studies. [15,17]

There existed highly significant correlation between the
zygomatic arch and the measurements like nasal cavity
distance, condylar distance and the jugular process
distance to the mid-sagittal plane. Cranial base and all
other structures which are correlated are situated in the
mid-face region that might be the reason behind the highly significant correlation. Similarly, jugular process distance and the antegonial notch distance shared a highly significant correlation. The reason might be the vicinity of their location. J shows left sidedness and NC shows right sidedness which is opposite to the results of previous study.[15]

More than 50% of the examined subjects in the present study showed asymmetry of 2 mm or more in the cranial region. In addition the results are in a similar line with results of the previous studies.[11,15,17,19]

The findings for the sidedness for the different parameters were variable and the most of measurements pertaining to the mandibular morphology showed right sidedness. Sleeping habits and other environmental influences may play a role in the difference between left and right sidedness. However, Lear[20] described a method for graphic and metric appraisal of the arch and palate form. He concluded that there was a marked asymmetry in the arch form where the subject spent equal positions at night with the right and the left cheeks pillowed. Nevertheless most of the earlier studies reported right side of the cranial structures to be greater in dimension than the left.[21]

When we considered the asymmetries from hair line to chin, we found that the asymmetries decrease in magnitude as we approach higher in craniofacial region and mandibular region shows the asymmetries of higher magnitude. This finding is in agreement with the results of Peck et al.,[17] and Goel et al.[15]

Chierici et al,[22] have described with their animal experiments that asymmetry of the face is related to functional demands of the masticatory apparatus and the musculo-skeletal systems, and skeletal asymmetry reflects onto the soft-tissue of the face, this is in contrast to the present study where mild skeletal asymmetry does not reflects onto the soft-tissue of the face.

Clinical Relevance
Skeletal asymmetries are the common findings in otherwise normal looking faces and are not supposed to be treated unless there are any occlusal disturbances.

Conclusion
Following conclusion can be drawn from the present study:
1. Asymmetries are common finding in human beings.
2. The asymmetries decrease in magnitude as we approach higher in craniofacial regions and mandibular region shows the asymmetries of higher magnitude.
3. Right side dominance of mandibular asymmetry was appreciated.

References


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