

# Evaluation of Face and Lip Symmetry in Esthetically Pleasing Face – A Photographic Study

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## Abstract

**Objective:** The purpose of this study was to evaluate the facial attractiveness with the numeric facial analysis and to evaluate and compare the facial symmetry, laterality of facial symmetry, and lip symmetry in subjects with class I molar relation using frontal photographs. **Materials and Methods:** The frontal photographs of 35 females of North Indian population having esthetic face were selected for facial asymmetry and laterality of facial asymmetry by two examiners. Each were, further, divided into Groups I and II for evaluation of parameters of the right and left side, respectively. 70 patients were selected for lip symmetry examination in which 35 males and 35 female. Evaluation was done for clinically evident upper lip canting by two examiners. The photographs were cropped in adobe Photoshop. Five horizontal and three midline parameters were measured using Digimizer software for evaluation of facial asymmetry. The data obtained were analyzed statistically using SPSS (version 16). **Results:** On comparison of various parameters between subgroup; we found that the midfacial plane (Mfp) to chelion was higher on the right side, Mfp to Ala of the nose and exocanthus was higher on the left side in class I molar but difference was NS (statistically not significant). All the parameters showed NS differences. Laterality of facial asymmetry was seen on the left side. In lip symmetry evaluation, 38.89% of males and 55.56% of females had an asymmetric upper lip but the results were statistically non-significant. **Conclusion:** Laterality of facial asymmetry showed deviation toward left side and no significant lip symmetry was noticed.

**Keywords:** Face evaluation, Lip evaluation, Esthetics

## INTRODUCTION

Many human body parts undergo development with bilateral symmetry. However, the right and left sides can be divided into identical mirror images due to biological factors inherent to processes of development as well as environmental disturbances, perfect bilateral symmetry is rarely found.<sup>[1]</sup> Harmonious facial features are more symmetrical closer to the facial midline and become asymmetrical as we move away from the facial midline.<sup>[2]</sup>

The face often presents with a mild degree of asymmetry. Nevertheless, slight asymmetry, also known as relative symmetry, subclinical asymmetry or normal asymmetry, ends up being unperceived by its carriers and everyone around them. The etiology of subclinical asymmetry remains controversial.<sup>[3]</sup>

The facial asymmetry which is determined by both hard and soft tissue, although the soft-tissue morphology is known to reflect the underlying hard tissue structure, the hard tissue structure may not be fully expressed on the soft-tissue images.

The soft tissue may compensate for this asymmetry, or be more asymmetric.<sup>[4]</sup>

As we know, that the lower and midface develop from the medial and lateral nasal process as well as maxillary and mandibular processes, and despite being intrinsically coordinated, these structures might imply time lag between growth of the right and left analog of such embryonic processes.<sup>[3]</sup>

The literature also reports habitual mastication on one side, constant facial pressure during sleep exclusively on one side, deleterious oral habits, etc., as being of the causes of normal asymmetry.<sup>[1]</sup> Facial asymmetry assessment comprises patient's first interview, extra- as well as intraoral clinical examination,

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and supplementary imaging examination. Human frequently experience functional asymmetry, for example, right handed is more common (88–92%).<sup>[5]</sup>

With patients becoming increasingly conscious of a beautiful smile, smile esthetics has become the primary objective of orthodontic treatment. Modern orthodontics deals not only with the traditional dental and skeletal aspects but also the soft-tissue characteristics as a priority.

Smile analysis is part of a facial analysis and allows dentists to recognize positive and negative elements in each patient's smile. An asymmetry in the smile can be due to an asymmetric smile curtain or a transverse cant of the maxillary occlusal plane. Transverse canting can be due to different amounts of tooth eruption on the right and left sides or skeletal asymmetry of the mandible, resulting in compensatory canting of the maxilla.

The purpose of the study is to evaluate and compare the facial asymmetry, laterality of facial asymmetry, and lip asymmetry in subjects with class I molar relation in North Indians by frontal photographs.

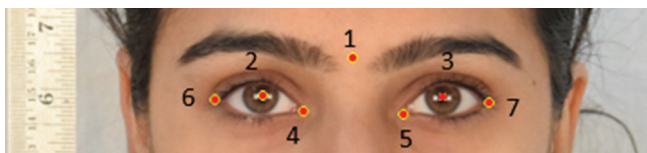
## MATERIALS AND METHODS

A total of 35 frontal photographs of North Indian females having esthetic face with class I molar relation were taken to evaluate facial asymmetry. Each one was further divided into Groups I and II, that is, parameters of the right and left side, respectively. The digital photograph of the subjects was taken using digital single-lens reflex camera.

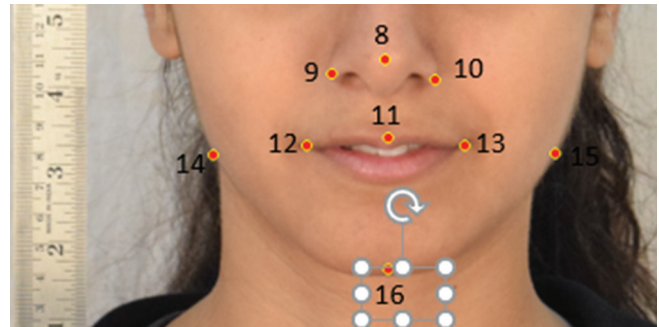
The head of the subjects was positioned so that the Frankfort horizontal plane and the interpupillary line were parallel to the surface of the floor. The camera was kept at a distance of 5 ft from the face of the subjects with vertical ruler attached to wall for calibration of the photographs. Digital photographs were cropped using Adobe Photoshop Cs. Cropped photographs which were transferred to computer loaded with digimizer software for the evaluation of facial asymmetry.

The photographs were analyzed for five horizontal and three midline parameters using digimizer after identification of required landmarks.

### Landmarks on frontal facial photographs

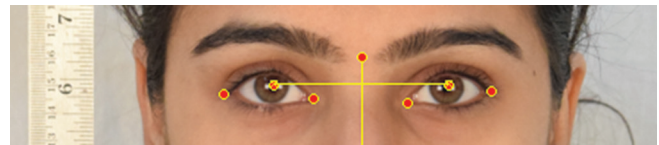


1. Nasion
2. Right pupil
3. Left pupil
4. Right endocanthus
5. Left endocanthus
6. Right exocanthus
7. Left exocanthus



8. Pronasale,
9. Right ala of the nose
10. Left ala of the nose
11. Labiale superius
12. Right chelion
13. Left chelion
14. Right gonion
15. Left gonion
16. Menton

### Reference plane



- Interpupillary line (PP'): A horizontal line from left pupil to right pupil.
- Mid facial plane (Mfp): A line perpendicular to interpupillary line from nasion.

### Horizontal parameters

- Mfp-Enr: A distance from mid facial line to the right endocanthus.
- Mfp-Enl: A distance from mid facial line to the left endocanthus.
- Mfp-Exr: A distance from mid facial line to the right exocanthus.
- Mfp-Exl: A distance from mid facial line to the left exocanthus.
- Mfp-Alr: A distance from mid facial line to the right ala of the nose.
- Mfp-AlL: A distance from mid facial line to the left ala of the nose.
- Mfp-Chr: A distance from mid facial line to the right chelion.
- Mfp-Chl: A distance from mid facial line to the left chelion.
- Mfp-Gor: A distance from mid facial line to the right gonion.
- Mfp-Gol: A distance from mid facial line to the left gonion.

### Midline parameters

- Mfp-Prn: A linear distance from the midfacial plane to pronasale.
- Mfp-Ls-: A linear distance from the midfacial plane to labiale superius.

- Mfp-Me': A linear distance from mid facial plane to menton.

For lip asymmetry sample of 70 patients were selected during smile, in which 35 males and 35 females were evaluated. Evaluation was done for clinically evident upper lip canting by two examiners. Each subject was healthy, without any facial asymmetry in repose.

An upper lip cant was considered to be present when a difference existed between the amount of tooth structure and gingiva seen on the right and left sides during smiling.



### Inclusion criteria

The following criteria were included in the study:

- 1 Having class I molar relation bilaterally
- 2 Both genders
- 3 18–40 years of age.

### Exclusion criteria

The following criteria were excluded from the study:

- 1 Previous orthodontic treatment
- 2 Temporomandibular disorder
- 3 Facial asymmetry
- 4 Missing teeth
- 5 Trauma or any disease that could affect craniofacial growth and development.

### Statistical analysis

Data were summarized as mean  $\pm$  standard error of the mean. Groups were compared by student's *t*-test.  $P < 0.05$  was considered statistically significant. Percentages and frequencies were calculated for categorical variables such as lip cant and gender. Chi-square test was applied for gender-wise comparison at a significance level of  $P < 0.05$ .

## RESULTS

Table 1 shows the comparison between left and right side of face in female patient having class I molar relation.

In the dimension representing endocanthus deviation, the right side is  $1.77 \pm 0.5$  mm and left side  $1.99 \pm 0.5$  mm with mean deviation of 0.21 mm toward left side, which is statistically non-significant ( $P < 0.05$ ). Same as exocanthus deviation for the right side  $2.14 \pm 0.11$  mm, for the left side  $2.43 \pm 0.11$ , found deviation toward left side with mean difference of 0.29 mm, which is statistically non-significant.

In this study, dimension from the right and left side of the ala of the nose to mid sagittal plane is  $1.96 \pm 0.71$  mm and  $2.14 \pm 0.71$  mm, respectively, and was deviated toward left side and results were statistically non-significant.

**Table 1: Comparison between left and right side of face in female patient having class I molar relation**

| Facial landmarks | Mean   | Standard Deviation | r     | Mean Diff | 't'   | P-value |
|------------------|--------|--------------------|-------|-----------|-------|---------|
| ENR              | 1.7755 | 1.14087            | 0.508 | 0.21629   | 1.153 | 0.257   |
| ENL              | 1.9918 | 1.09407            |       |           |       |         |
| EXR              | 2.1434 | 1.26907            | 0.113 | 0.29346   | 0.930 | 0.359   |
| EXL              | 2.4368 | 1.51927            |       |           |       |         |
| ALR              | 1.9691 | 0.77817            | 0.713 | 0.17400   | 1.692 | 0.100   |
| ALL              | 2.1431 | 0.82490            |       |           |       |         |
| CHR              | 2.1422 | 0.97190            | 0.364 | 0.07240   | 0.423 | 0.675   |
| CHL              | 2.0698 | 0.80549            |       |           |       |         |
| GOR              | 2.1217 | 0.93284            | 0.484 | 0.11971   | 0.767 | 0.448   |
| GOL              | 2.2414 | 0.88308            |       |           |       |         |

Chelion to mid sagittal plane shows deviation toward right side with mean difference of 0.72 mm, statistically non-significant.

Gonion shows deviation toward left side from mid sagittal plane ( $2.24 \pm 0.48$  mm), with mean difference of 0.11 mm, which is statically non-significant.

In Graph 1, laterality of facial asymmetry was seen on the left side and difference was significant. Tip of the nose and labial superious shows deviation toward left side with frequency of 28% ( $P = 0.000$ ) and the values are highly significant.

Menton is deviated toward left side from mid facial plane with frequency of 24% ( $P = 0.001$ ), which if highly significant.

Graph 2 analysed distribution of lip asymmetry which shows asymmetry of lip is seen in more in females as compare to males (females 55.56 and males 38.89).

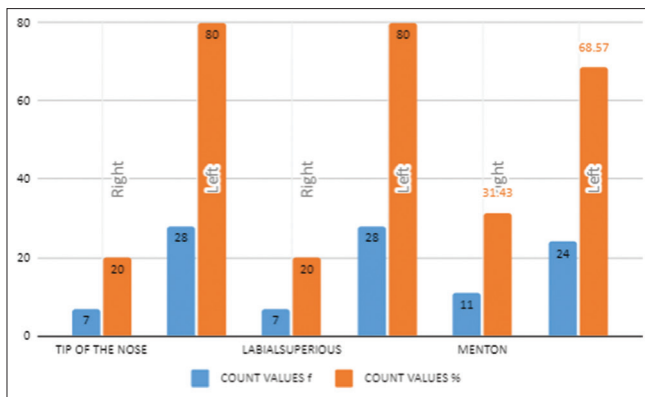
Lip symmetry was found among males with 61.11% and differences were statistically non-significant among females and males.

## DISCUSSION

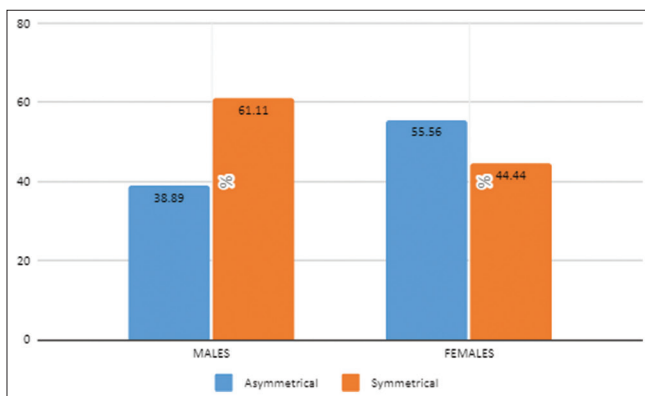
Facial asymmetry was investigated subjectively in relation to soft-tissue features using facial frontal photographic measurements.

In our study, comparison of left and right side of facial asymmetry and soft-tissue characteristics using frontal photographs. A similar study was done by Masuoka *et al.*<sup>[6]</sup> to find out correlation between facial asymmetry and cephalometric indices. In that study, ten orthodontists classified 100 facial frontal photographs. However, author did not report soft-tissue factor responsible for the assessment.

Lee *et al.*<sup>[7]</sup> assessed the soft tissue characteristics of facial asymmetry with photographs. In that study, five observers examined photographs of patients and divide them into moderate, severe asymmetry and divide them into three equal regions. However, author did not report any soft-tissue measurements. We evaluate facial asymmetry by dividing face into two parts, that is, right and left side and measured using digimizer software.



**Graph 1:** Deviation of midline parameters from mid facial plane



**Graph 2:** Analysis and distribution of lip asymmetry

Beauty is represented by harmony of facial proportions including skeletal structures, teeth, and soft tissue of the face.<sup>[8]</sup> Orthodontic treatment frequently aims to preserve our increasing facial characteristics through visible changes on soft tissue. Hence, this study is conducted on esthetically pleasing face. This study was developed to evaluate the facial symmetry in frontal view.

Goel<sup>[9]</sup> conducted a study on Indian population (Karnataka population) using posteroanterior cephalogram of 120 subjects with class I occlusion, the bilateral width observed to be larger on the right side of face as compared to the left side. In contrast, in our study, non-significant results were found among left and right side of face.

Severt and Proffit found that most facial asymmetries were in the lower third of the lateral facial surface. In the normal population, the lowest mean frequency of asymmetry was observed in the eye socket (2%), followed by the nose (7%) and mouth (approximately 12%).<sup>[15]</sup>

Facial asymmetry had been evaluated with help of midline landmarks deviated from midfacial plane. The present study concluded that midline landmarks were deviated toward left side in class I molar patients. Our results were similar to previous study done by Kumar and Subrahmanya,<sup>[10]</sup> Miller *et al.*,<sup>[11]</sup> and Haraguchi *et al.*,<sup>[12]</sup> that is, menton is deviated toward left side.

According to a report by Haraguchi *et al.*,<sup>[12]</sup> lateral displacement of the cephalometric menton toward the left side

was found more frequently than right side deviation. Similarly, in our study, menton is deviated toward left side.

A study by Shah and Joshi suggested that possible cause of asymmetry in gonial angle is due to asymmetric functional patterns such as unilateral chewing and muscular atrophies.<sup>[13]</sup>

Reason for laterality in facial asymmetry had been attributed to various causes in different studies such as due to environment influences, habitual chewing, and changes due to postnatal factors. Most studies suggested that the left side of face is more expressive as compare to the right side, it can be due to asymmetry that probably stems from the right hemisphere dominance for emotional expression.<sup>[12,14]</sup>

Further study can be done by comparing photographic method of assessment of soft tissue and hard tissue using posterior anterior cephalogram in future.

## CONCLUSION

- Laterality of facial asymmetry showed deviation toward left side
- No conclusive result regarding wider hemiface was seen in class I subjects
- There is no significant lip symmetry was noticed between males and females.

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