Scholars Journal of Dental Sciences (SJDS) **ISSN 2394-4951 (Print)**
Abbreviated Key Title: Sch. J. Dent. Sci. **ISSN 2394-496X (Online)**

A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com DOI:10.36347/sjds.2018.v05i05.012

Evaluation of Facial Asymmetry in Subjects with Class I and Class II Molar Relation

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Original Research Article

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Article History
Received: 02.05.2018
Accepted: 08.05.2018
Published: 30.05.2018

DOI:
10.21276/sjds.2018.5.5.12

Abstract: To evaluate and compare the facial asymmetry and laterality of facial asymmetry in subjects with class I and class II molar relation using frontal photographs. The frontal photographs of 30 subjects of North Indian population were selected and divided into two Groups- Group I had 15 females with class I molar relation and Group II had 15 females with class II molar relation. Both groups were further subdivided into subgroup and b for evaluation of parameters of right and left side respectively. The photographs were cropped in Adobe Photoshop. 5 horizontal and 3 midline parameters were measured using Digimizer Software for evaluation of facial asymmetry. The data obtained were analyzed statistically using SPSS (version 16). When comparison of various parameters between subgroup of Group I and Group II Mid facial plane (Mfp) to Endocanthus and Chelion were higher on right side , Mfp to Ala of the nose and Gonion were higher on left side in Group I but difference was NS (statistically not significant). In Class II subjects, right hemiface was wider but statistically significant difference was seen only for Mfp to Exocanthus. All the parameters showed NS difference between Group I and Group II. Laterality of facial asymmetry was seen on left side in both groups with higher values in Group II than Group I but difference was NS. No conclusive result regarding wider hemiface was seen in Group I. Group II had a trend towards wider hemiface on right side. Laterality of facial asymmetry showed deviation towards left side and was more in Group II.

Keywords: Digimizer Software, hemiface, facial asymmetry.

INTRODUCTION

Beauty is subjective, as once the famous Greek philosopher Plato said “Beauty lies in the eyes of beholder”. Esthetic consideration for a face is greatly affected by cultural and ethnic factors, but whatever the culture, a disproportionate face becomes a psychosocial problem [1]. Harmonious facial features are more symmetrical closer to the facial midline and become asymmetrical as we move away from the facial midline [2].

Stedman’s medical dictionary defines symmetry as equality or correspondence in form of parts distributed around the center or an axis at the two extremes or poles or on the two opposite sides of the body [3].

Facial asymmetry is not seen ideally. Many human body parts undergo development with bilateral symmetry. This implies that the right and left sides can be divided into identical mirror images. However, due to biological factors inherent to processes of

development as well as environmental disturbances, perfect bilateral symmetry is rarely found [4]. 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. It could derive from the fact that the lower and midface develop from the medial and lateral nasal processes as well as maxillary and mandibular processes, and despite being intrinsically coordinated, these structures might imply time lag between growth of right and left analoge of such embryonic processes [5]. Another reason could be dominance of opposite cerebral hemisphere in right or left sided individuals resulting in overdevelopment of dominant side. 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 [6].

As malocclusion create problems in different planes of space, hence it is possible that subclinical facial asymmetry might be there in subjects with malocclusion Class II or Class III. Considering this, the aim of the present study was to evaluate and compare the facial asymmetry and laterality.

MATERIALS AND METHODS

A total of 30 frontal photographs of North Indian population were taken to evaluate facial asymmetry. The subjects were divided in two Groups – Group I and II, Group I had 15 females with Class I molar relation with mean age of 21.5± 1.5yrs and Group II had 15 females with class II molar relation with mean age of 21.5± 1.5yrs. Each Group was further subdivided into Group Ia and I b; Group II a and IIb for parameter of right and left side respectively. Table 1 shows distribution of sample.

The digital photograph of the subjects was taken using digital SLR camera. The head of the subjects were positioned so that the Frankfort horizontal plane and the inter papillary line were parallel to the surface of the floor. The camera was fixed on a tripod stand which was kept at a distance of 6 feets 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 were transferred to computer loaded with Digimizer software for the evaluation of facial asymmetry. The photographs from both groups were analyzed for five horizontal and three midline parameters using Digimizer after identification of required landmarks.

Landmarks on Frontal Facial photograph (Fig 1)

- Nasion (N'): The point in the midlle line located at the nasal root.
- Right pupil (P'): The midpoint of the left eye pupil.
- Left pupil (P): Midpoint of the left eye pupil.
- Right endocanthus(Enr) : The point at the right inner commisure of the eye fissure.
- Left endocanthus(Enl): The point at the left inner commisure of the eye fissure.
- Right exocanthus(Exr): The point at the right outer commisure of the eye fissure.
- Left exocanthus(Exl): The point at the left outer commisure of the eye fissure.
- Pronasale (Prn): The most prominent part of the nose.
- Right ala of the nose (Alr): The most lateral point on right alar contour.
- Left Ala of the nose (All): The most lateral point on left alar contour.
- Labiale superius(Ls): The midpoint of the vermilion border of thr upper lip.
- Right chelion (Chr): The lateral point to the angle of the mouth on right side.
- Left chelion (Chl): The lateral point to the angle of the mouth on left side.
- Right gonion(Gor): The most lateral point at the right angle of the mandible.
- Left gonion(Gol): The most lateral point at the left angle of the mandible.
- Menton (Me): The lowest part of the chin on the mandible in the midline.

Reference plane (Fig 2)

- 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 (Fig 3)

- 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 inters commisure.
- Mfp-Chl: A distance from mid facial line to the left inter commisure.
- 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 (Fig 4)

Mfp- Prn: A linear distanc from the mid facial plane to pronasale.
Mfp -Ls-: A linear distance from the Mid facial plane to labiale superious.
Mfp -Me': A linear distance from mid facial plane to Menton

STATISTICAL ANALYSIS

Data were summarized as Mean ± SE (standard error of the mean). Groups were compared by one way analysis of variance (ANOVA) test.)p value less than 0.05 ($p<0.05$) was considered statistically significant.

RESULT

- Table 2: Comparison between right and left side in Group I.
- Table 3: Comparison between right and left side in Group II.
- Table 4: comparison between Group I and Group II for right and left side.
- Table 5: Deviation of midline parameters from Mid facial plane:

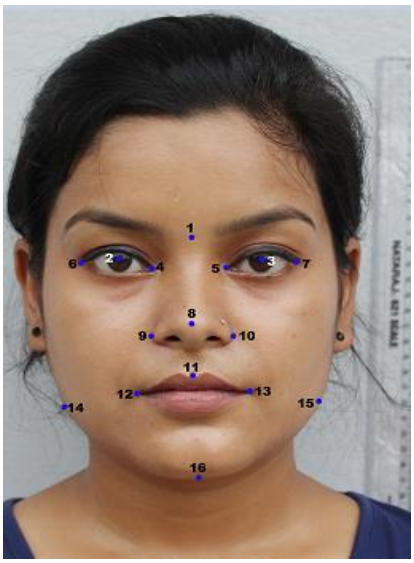

Fig-1: Landmarks on frontal facial photographs (1. Naasion, 2. Right pupil, 3. Left pupil, 4. Right endocanthus, 5. Left endocanthus, 6. Right exocanthus, 7. Left exocanthus, 8. Pronasale, 9. Right ala of the nose, 10. left ala of the nose, 11. Labiale superious, 12. Right chelion, 13. Left chelion, 14. Right gonion, 15. Left gonion, 16. menton)

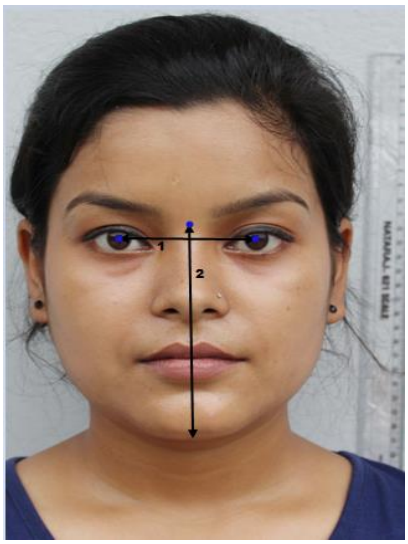

Fig-2: Refrence plane (1. Interpupillary line, 2. Mid facial plan

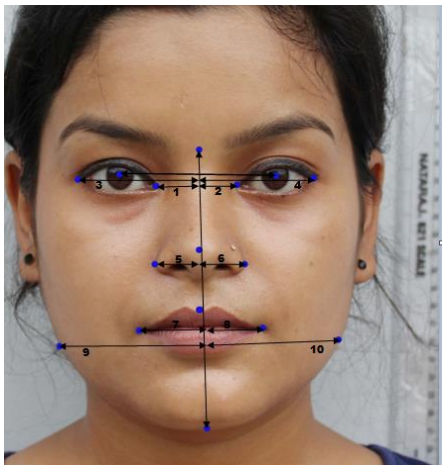

Fig-3: horizontal parameters (1. Mfp- Enr, 2. Mfp- Enl, 3. Mfp- Exr, 4. Mfp- Exl, 5. Mfp-Alr, 6. Mfp- All, 7. Mfp-Chr, 8. Mfp- Chl, 9.Mfp-Gor, 10. Mfp-Gol)

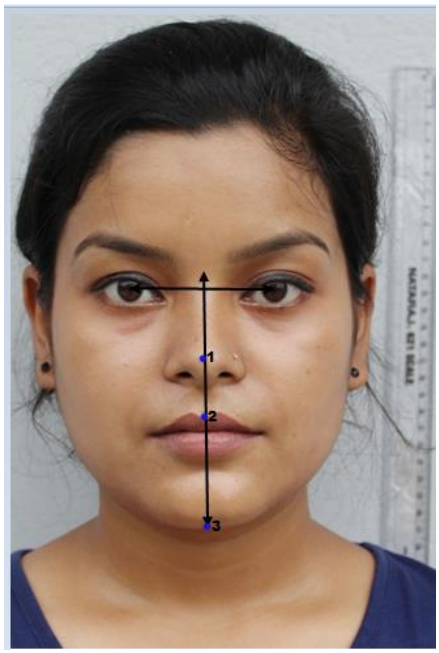

Fig-4: Midline Parameters (1. Mfp-Prn, 2. Mfp-Ls, 3. Mfp- Me')

Table-1: Distribution of sample

	Subgroups	Number of sample	Age (mean±years)
(class I molar relation)	Group Ia	15	21.5+-1.5
	Group Ib		
Group II (class II molar relation)	Group IIa	15	21.5+-1.5
	Group IIb		

Table-2: Comparison between right and left side in Group I

Paired Samples Statistics					
		Mean	N	Std. Deviation	P value
Pair 1	Enr	2.3320	15	.33773	NS
	Enl	2.2380	15	.30238	
Pair 2	Exr	6.3893	15	.57391	NS
	Exl	6.3860	15	.54166	
Pair 3	Alr	2.5800	15	.30447	NS
	All	2.6640	15	.31818	
Pair 4	Chr	3.5540	15	.35069	NS
	Chl	3.5380	15	.28265	
Pair 5	Gor	7.6060	15	.77192	NS
	Gol	7.6300	15	.72198	

(p < 0. 05 – significant, p < 0. 01 – highly significant and p< 0. 001 – very highly significant and NS – not significant)

Table-3: Comparison between right and left side in Group II

Paired Samples Statistics					
		Mean	N	Std. Deviation	P value
Pair 1	Enr	2.4540	15	.37161	NS
	Enl	2.3833	15	.32348	
Pair 2	Exr	6.7673	15	.66407	<.05*
	Exl	6.6133	15	.56482	
Pair 3	Alr	2.8167	15	.46779	NS
	All	2.6913	15	.31293	
Pair 4	Chr	3.6527	15	.56132	NS
	Chl	3.5767	15	.36607	
Pair 5	Gor	7.6147	15	.59752	NS
	Gol	7.3480	15	.75973	

(p < 0. 05 – significant, p < 0. 01 – highly significant and p< 0. 001 – very highly significant and NS – not significant)

Table-4: comparison between Group I and Group II for right and left side

Class I vs Class II for right – left difference Group Statistics					
	Group	N	Mean	Std. Deviation	P value
Enr-Enl	Class I	15	.0940	.27102	NS
	Class II	15	.0707	.20268	
Exr-Exl	Class I	15	.0033	.32346	NS
	Class II	15	.1540	.26806	
Alr-All	Class I	15	-.0840	.20760	NS
	Class II	15	.1253	.37683	
Chr-Chl	Class I	15	.0160	.33596	NS
	Class II	15	.0760	.44734	
Gor-Gol	Class I	15	-.0240	.56001	NS
	Class II	15	.2667	.76938	

(p < 0. 05 – significant, p < 0. 01 – highly significant and p< 0. 001 – very highly significant and NS – not significant)

Table-5: Deviation of midline parameters from mid facial plane

	Class I			Class II			χ^2 value	P value
	Left	Right	Center	Left	Right	Center		
TIP OF THE NOSE	10 (66.7)	2 (13.3)	3 (20)	9 (60)	5 (33.3)	1 (6.7)	2.338	NS
LABIALE SUPERIOUS (LIP)	3 (20)	9 (60.0)	3 (20)	5 (33.3)	10 (66.7)	0 (0)	3.553	NS
MENTON (CHIN)	9 (60)	4 (26.7)	2 (13.3)	8 (53.3)	6 (40)	1 (6.7)	0.792	NS

(p < 0. 05 – significant, p < 0. 01 – highly significant and p< 0. 001 – very highly significant and NS – not significant)

DISCUSSION

Facial asymmetry had been attributed to developmental or environmental causes. As subclinical facial asymmetry is anticipated in subjects with Class II or Class III malocclusion, it was decided to conduct this study for comparison of facial asymmetry between subjects with Class I or Class II molar relation. The result of present study indicated that mid facial plane (Mfp) to Endocanthus and Chelion were higher on right side, Mfp to Ala of the nose and Gonion were higher on left side in Group I but difference was NS. In Class II subjects, right hemiface was wider but statistically significant difference was seen only for Mfp to Exocanthus. All the parameters showed NS difference between Group I and Group II. Laterality of facial asymmetry was seen on left side in both groups with higher values in Group II than Group I but difference was NS. Facial asymmetry had been evaluated in litratures at different levels using variety of parameters. According to Azevedo *et al*. [7] —that the asymmetry was mainly seen in the lower third of the face in the subjects with Class II subdivision. This asymmetry was only slightly different compared with a normal-occlusion group, who also had some facial asymmetry. Many investigators have also found asymmetry as a normal facial feature, there is no consensus in the literature regarding the degree, side and spatial localization of facial asymmetry [8-10]. Goel *et al.* [11] conducted a study on Indian population (Karnataka population) using Posteroanterior cephalograms of 120 subjects (males and females) with Class I occlusion, the bilateral widths were observed to be larger on right side than left side. In contrast in our study significant difference between right and left side in Group I was not significant. Though right side was wider than left in subjects with Class II molar realtion but the difference was not significant. Similar to present study, studies by Haraguchi [12], Reddy[13], Farkas[14], Rajpara[15], Shah[16] Smith[17], Adamu[18], Kumar [19] and Ercan[20], Ferrario [21] and Peck *et al*. [22] found right side was larger than left side.

Laterality of facial asymmetry had been evaluated by assessing deviation of midline landmarks in different studies. The present study concluded that midline landmarks were deviated toward the left side in both the groups. Our result were similar to the previous studies done by Miller[23], Haraguchi [24], Fong [25] and Kumar *et al*. [19] which also demonstrated deviation toward left side. Amara *et al*. [26] showed that the deviation <1.7 mm are clinically difficult to notice. Other auther consider an asymmetrical face as having bone deviations equal to or greater than 2mm [27-29]. As deviation in our study was also lesser than. 68 mm, hence was not perceived by patients as facial asymmetry. The reason for laterality in facial asymmetry had been attributed to various causes in different studies. Mobility of facial expression exhibits facial asymmetry [12]. Most studies suggested that the left side of the face is more expressive of emotions: an asymmetry that probably stems from the right hemisphere dominance for emotional expression, hence left side laterality had been observed in most of the studies [24, 30, 31]. Another possible source is habitual chewing on one side, which is responsible for increased skeletal development on the ipsilateral side. Differential activity of the two hemifaces in relation to the contralateral hemispheres was thought to result in differential muscular development of the two hemifaces, hence, facial asymmetry was evident [16].

Within limitation of the present study, it can suggest that mild form of facial asymmetry is evident in normal subjects with class I and class II occlusion. Laterality of facial asymmetry being mild was not perceived by the individuals as a problem, though laterality was more obvious in subjects with Class II malocclusion. In such cases no treatment is required but it has to be explained to the patients before starting Orthodontic treatment. In other cases where patients are conscious of their facial asymmetry, certain soft tissue surgeries like sliding genioplasty can be planned or Orthodontic mechanics can be employed to solve this disharmony by compensation. Further studies with large sample size can validate the results of present study. Also studies can be conducted to compare different population groups. The photogrammetric method of assessment of soft tissue asymmetry can be compared with asymmetries of underlying hard tissues using Posteroanterior cephalogram in future.

CONCLUSIONS

- No conclusive result regarding wider hemiface was seen in Group I.
- Group II had a trend towards wider hemiface on right side.
- Laterality of facial asymmetry showed deviation towards left side and was more in Group II.

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