

Evaluation of mandibular asymmetry by orthodontists and the patients themselves

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Abstract

Introduction: Individuals are liable to have a difference of opinion regarding their own facial appearance as compared to how other people see them. It is important for the clinicians to understand this difference in perception in order to achieve satisfactory results. The aim of this study was to assess the agreement in subjective evaluation of mandibular asymmetry by orthodontists and the patients themselves.

Material and Methods: 110 patients fulfilling the inclusion criteria were selected. Full face frontal photographs of the patients were taken under standardized conditions. The patients were asked to assess their own photograph which was then compared with the analysis of the same photographs carried out by a panel of ten experts having minimum of three years of orthodontic experience. Each rater was asked to determine the presence or absence of asymmetry and state whether the asymmetry, if present is within acceptable range or whether it necessitates correction. A score of 0 was given if no asymmetry was detected, score of 1 was given if the asymmetry detected was within acceptable range and 2 was given if treatment is recommended. The data was analyzed using SPSS version 16.0.

Results: There was moderate level of agreement between the patients and the clinicians. The kappa value calculated was 0.54. The mean score given by the patients was 1.75 ± 0.923 whereas the mean score given by the clinicians was 2.06 ± 0.842

Conclusions: Moderate level of agreement was observed between orthodontists and patients. Difference in rating was found amongst the clinicians as well.

Keywords: Deviation; perception; facial symmetry

Introduction

Facial symmetry refers to similarity in size and position of different parts on opposite sides of a facial midline. Perfect bilateral symmetry seldom exists and it has been observed that the right side of the face is usually slightly larger than the left and it is the lower third of the face which is affected more.¹⁻³ The soft tissues may camouflage the minor disparities between facial proportions but as the difference becomes more conspicuous not only does it interfere with normal functions but it may also have

adverse effects on the personality development.^{2,4}

One of the reasons for seeking orthodontic treatment is to enhance esthetics and to improve interpersonal relationships.⁵ The achievement of a favorable treatment outcome is dependent on the overall facial appearance, perception of which differs between individuals.^{6,7} Patients usually judge themselves on the basis of photographs and mirror images not realizing both can manipulate their actual appearance because of which they are liable to have a difference of opinion regarding their own facial appearance as compared to how other people see them.⁷ It is important for the clinicians to understand this difference in perception in order to achieve satisfactory results.⁶

There is evidence confirming the superiority of trained clinicians over non-professionals in appreciating facial disparity. Grainne

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McAvinchey et al, concluded that orthodontists were able to recognize chin deviation at a lower level compared to lay persons.⁴

Albeit, great deal of work has been done on perception of facial imbalance, there is not much data available that relates the awareness and concern of the patients in detecting their own facial disharmony with the perception of orthodontists. Therefore, this study aims to evaluate the discrepancy between the patients' self-perception of lower face asymmetry and the visual perception of orthodontists.

Material and Methods

Approval of the ethical committee of Riphah International University and consent of the participants was taken. 110 patients and 10 orthodontists were recruited for the study. Sample included adult patients (18 years to 50 years) of either gender, dentists having minimum of three years of postgraduate training in the field of orthodontics, patients having mandibular asymmetry with no other perceivable asymmetry. Mentally disabled patients with previous history of orthodontic treatment or orthognathic surgery and those having deviation of anatomical structures other than the mandible more than 3mm were excluded from the study.

According to Farka's, an individual cannot perceive more than 3mm of deviation of the anatomical structures,⁸ therefore those who had deviation of the anatomical structures other than the lower face more than 3mm were not included in the study. To measure the extent of asymmetry a vertical reference line extending from the nasion to subnasale and a horizontal reference which was drawn perpendicular to and joining the center of two pupils were used to determine extent of deviation of the midline and bilateral structures. The anatomical structures (Figure 1) and lines (Figure 2) that were used to measure asymmetry are defined as in Table I.⁹

Full face frontal photographs of the selected patients with blue background were taken with Canon A810 Camera (Canon Inc. Tokyo, Japan) with standardized lighting. The head was stabilized with a cephalostat (AJAT, Finland) to achieve standard positioning with the camera fixed on a tripod at a distance of 5 feet from the patient. The lighting was standardized and adjusted so that no shadows were visible especially around the mandible so that accurate assessment could be made. The angulation of the camera was kept parallel to the floor with the help of a bubble level embedded in the tripod stand. The height of the camera was adjusted at the level of subnasale in all patients. The patients were asked to occlude the teeth in maximum intercuspation. Furthermore, female participants were instructed to tie their hair back and those who preferred to wear head scarves were asked to expose their ears at least. The male participants selected were clean shaven.

Each photograph was edited with a photo editing software (Adobe Photoshop CS6) to obtain a uniform skin tone and remove blemishes to avoid distractions which could result in a biased opinion. Black and white photographs were displayed as a power point presentation on a laptop (Dell Vostro 3400). Each photograph was displayed for 10 seconds to maintain standardization. The observers were give a questionnaire to fill and had to determine the presence or absence of asymmetry and were then asked to classify into one of the three groups:

- I. Face is symmetrical
- II. Asymmetry present within acceptable range
- III. Severe asymmetry that requires correction

A score of 0 was given if no asymmetry was detected, score of 1 was given if the asymmetry detected was within acceptable range and 2 was given if treatment was recommended. The patients were asked to assess their own photograph and this was

then compared with the analysis of the same photographs carried out by a panel of ten experts having minimum of three years of orthodontic experience. The panel comprised of five male and five female orthodontists.

Data analysis was carried out using Statistical Package for the Social Sciences (SPSS version 16.0, Chicago, SPSS Inc). For the scores assigned to each photograph, mean and standard deviation was calculated. An independent t- test was used to compare both the groups. The level of agreement between the orthodontists and patients was evaluated using kappa test. Frequencies and percentages were analyzed for the clinicians as well as the patients. The *p* value less than 0.05 was considered as statistically significant.

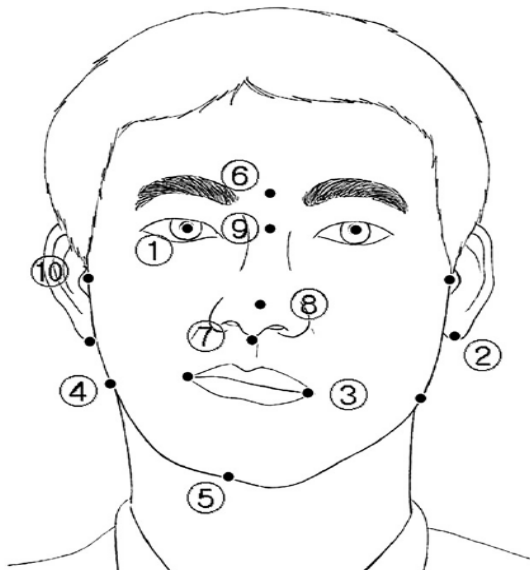


Figure 1: Landmarks used for measuring the extent of deviation from the norm

1. Pupil
2. Otopasion inferius
3. Cheilon
4. Soft tissue gonion
5. Soft tissue menton
6. Glabella
7. Subnasale
8. Pronasale
9. Soft tissue nasion
10. Preauriculare

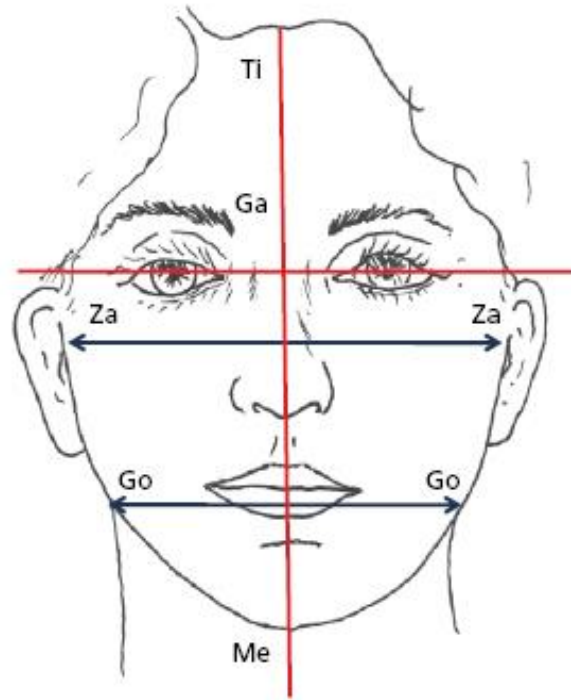


Figure 2 vertical reference line starting from the nasion and passing through subnasale and a horizontal reference line passing through the pupils were used to measure the extent of deviation of mandible and other structures.⁸

Results

The descriptive analysis of the results are displayed in the tabular and graphical form. Kappa analysis was performed to assess the level of agreement between the two groups. The mean score given by each observer was calculated as shown in Table II. The mean score for orthodontist 10 was highest with the standard deviation of 3.062 and lowest mean score was calculated for orthodontist 4 which was 1.85 with standard deviation of 0.869. The mean score for all the orthodontists was 2.06 ± 0.84 .

The patients themselves were less sensitive to the degree of asymmetry, mean score of patient's own observation was 1.75 with standard deviation 0.92 which was less than that of the orthodontists.

The female orthodontists were less critical of the presence of asymmetry as compared to

male orthodontists as depicted in Table II. Mean calculated for the female orthodontists was 1.97 ± 0.782 whereas for male orthodontists was 2.09 ± 0.753 . The kappa value for collective agreement as shown in Table III was 0.54 showing moderate level of agreement. Maximum level of agreement was found for severe asymmetric cases when both orthodontist and the patient believed that correction was needed. The level of agreement was calculated as 97.2% (Table IV).

Table I: Definition of landmarks used for measurement of asymmetry⁹

Landmark	Definition
Pp (pupil)	It is the black circular opening in the center of the eye
G (glabella)	It is the most prominent point on the forehead between the supraorbital ridges
Na` (soft tissue nasion)	The center of soft tissue outline of the base of the nose
O (otobasion inferius)	The inferior point of insertion of the ear
Sn (subnasale)	Point at which columella blends with the upper lip
Pn (pronasale)	It is defined as the mid point on the tip of the nose
Ch (cheilion)	It is the most lateral margin of the upper lip, located at the angle of the mouth
Me (menton)	It is defined as the most inferior portion of soft tissue outline on the chin
Go` (soft tissue gonion)	It is the most everted point on the angle of the mandible
Pre (preauriculare)	Most lateral point on the soft tissue outline in front of tragus
Zero point	It is the point of intersection of vertical and horizontal reference line

Table II: Mean and Standard Deviation of observations of orthodontists and patient

	Mean	Std. Deviation
Clinician 1	2.01	0.862
Clinician 2	2.00	0.867
Clinician 3	2.04	0.812
Clinician 4	1.85	0.869
Clinician 5	1.98	0.857

Clinician 6	2.13	0.814
Clinician 7	2.13	0.814
Clinician 8	2.11	0.850
Clinician 9	2.05	0.817
Clinician 10	2.33	3.062
Patient	1.75	0.923
Mean of all female orthodontists	1.970	0.782
Mean of all male orthodontists	2.09	0.753
Mean of all orthodontists	2.06	0.842

Table III Collective agreement

	Value	P-value
Measure of Agreement (Kappa)	.54	.000

Table IV :Orthodontist * patient Cross-tabulation						
			patient			Total
			symmetrical	mild asymmetry	needs correction	
Orthodontist	symmetrical	Count	34	0	0	34
		% within patient	53.1%	.0%	.0%	30.9%
	mild asymmetry	Count	28	7	1	36
		% within patient	43.8%	70.0%	2.8%	32.7%
	needs correction	Count	2	3	35	40
		% within patient	3.1%	30.0%	97.2%	36.4%
Total	Count	64	10	36	110	

Discussion

There is consensus on the surgical correction of severe mandibular deviation but the difference of opinion is often experienced when the deviation is moderate. The orthodontists and the patients might not agree on the treatment approach which ultimately leads to failure of the treatment. The aim of this study was to assess how the perception varies among different individuals namely the patients and the orthodontists. According to Johson, the ability to discern between a balanced and an imbalanced face is determined by a number of variables, a

trained eye will be able to distinguish more accurately as compared to an untrained eye. A systemic review by Wang et al concluded that the minimum threshold for recognizing chin deviation was 4 mm for orthodontists and patients.¹⁰

Various methods can be employed to quantify the amount of deviation. Some of the methods that have been commonly used include the 3 Dimensional images which have limited usage because of their high cost. Postero-anterior Cephalograms are commonly used to determine the amount of deviation but due to superimposition, accurate identification of the landmarks becomes difficult. Also there is a risk of radiation exposure. A 2 dimensional image can be obtained by developing a computerized image which is then altered to different degrees of laterality. The drawback of such images is that they are not factual images and interpretation of such images can be misleading because we as orthodontists treat real faces.¹¹

Frontal photographs are also used, they have the advantage of being more economical as compared to 3D images and landmarks can be easily determined due to lack of superimposition.¹²⁻¹⁴ In our study considering the drawbacks of other methods, frontal photographs of each patient were used for evaluation. After the consent was taken photograph of each patient was taken under standardized conditions. Each photograph was then photo shopped to remove blemishes and acne to prevent distractions. Different reference planes have been proposed to measure the amount of asymmetry. For quantification of asymmetry horizontal and vertical reference lines were taken. Vertical reference line was determined first and a horizontal plane was drawn perpendicular to it. The purpose of defining mid sagittal plane first was that the horizontal plane would not have been accurate in the presence of ocular canting.^{9,15} After true vertical line is determined, the landmarks on

both sides of the face are measured taking the mid sagittal plane as a reference line. According to Paek et al, the mid sagittal plane is a line joining the glabella and the anterior nasal spine. This line is preferred because the distance between both sides is smallest from this line. In the present study, nasion was taken as the reference instead of the glabella because locating glabella on a photograph is difficult. Subnasale was chosen since it is the corresponding landmark of anterior nasal spine.

Overall kappa value in the present study showed that there is moderate degree of agreement between the orthodontists and the patients. Highest agreement was seen between orthodontist 4 and the patient with kappa value of 0.72 and the least level of agreement was observed between clinician 3 and patient with kappa value of 0.42. Patients categorized into those needing surgical correction exhibited maximum level of agreement. Minimum agreement was observed for those classified into the second group which was those who do exhibit asymmetry but do not require treatment. The results of this study were similar to that of Edler et al. They conducted a study evaluating the level of agreement of mandibular asymmetry between the orthodontists and oral surgeons. Significantly high level of agreement with kappa value of 0.77 was observed in that study.¹⁶

The results of the present study displayed higher agreement between the two groups compared to the one carried out by Ymanoto et al. In their study highest kappa value was less than 0.4 and there was lack of agreement between the patients and the orthodontists.¹⁷ The difference in methodology can be the reason for difference in results between our study and the previous ones. In our study we used facial photographs which are more reliable as compared to the manipulated images used in other studies.

Due to similarity in years of clinical experience there was no significant difference

between the ratings given by the orthodontists themselves. It has been proven that an experienced clinician may be less critical to asymmetry as compared to a less experienced one. Another reason can be that the newer generation are more exposed to the ideal images which they see on social media and this can significantly influence their perception of beauty.¹⁸

The right side was more dominant than the left side in 78.7% of the patients. The results of our study agreed with that of Heraguchi et al who investigated the facial asymmetry on 1800 subjects. To assess the deviation of menton, a reference line was drawn representing the mid sagittal plane. The plane was perpendicular to the inter-pupillary line. Their study concluded that right side was more developed as compared to the left side but as one ages the left side tends to become more dominant. In 79.7% of the subjects the right hemi-facial was larger and in 79.3% of the participants the menton was deviated towards the left side.¹⁹ However, some studies have concluded that the left side of the face was larger. The difference can be due to the variation of age or difference in methodology.²⁰

Our study showed some difference of opinion between the male and the female orthodontists. The females gave a lower score, 1.97 with standard deviation of 0.782, which signifies lower perception of asymmetry as compared to the male orthodontists with mean score of 2.09 with standard deviation of 0.753 for whom the presence of asymmetry was more noticeable. The results of our study agreed with those of other studies that have evaluated the difference in sensitivity to asymmetry between the male and female observers. According to Little et al, the men from Tanzania were more critical of asymmetry as compared to the females. For them a face seemed more attractive if it had little to no asymmetry.²¹ Similarly in another study by Sean Marcy, male orthodontists were more critical as compared to female

orthodontists.¹ However McAvinchey et al reported no difference in ratings between the male and the female participants.⁴ Kawak and Palermo reported that females are more sensitive to deviation of the eyes whereas for men the deviation of the nose and the mouth was more noticeable.^{22,23} One explanation for this difference in perception is that the anatomical variability of the higher centers in both genders makes men more critical.

The way a human perceives things can depend on various factors and this difference depends on culture, social status, background, mood of the individual and the difference in hormones.²⁴

Conclusions

The patients were found to be less critical as compared to the orthodontists particularly when the deviation was mild or moderate regarding assessment of mandibular asymmetry. Variables such as gender of the rater assessing the asymmetric face as well as the experience in the field of orthodontics were found to influence the perception of the raters. Female orthodontists gave lower scores compared to male clinicians and this observation supports the notion that men are more sensitive to deviation as compared to females. The significance of this study was to assess how individuals belonging to different professions objectively evaluate mandibular deviation. The information gained can be used to plan according to the patient's requirements and this will also help in preventing the orthodontists from subjecting the patients to unnecessary surgeries.

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