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Original Article

Perceptions of mandibular asymmetry among orthodontists, oral and maxillofacial surgeons, and laypersons

Kamyar Tayyebi[1], Sepideh Arab[2], Farnoosh Razmara[3], Allahyar Geramy[2], Mohammad Javad Kharazifard[4], Elaheh Kamali[2]

[1]Department of Pediatric Dentistry, Qazvin University of Medical Sciences, Qazvin, Iran, [2]Department of Orthodontics, Tehran University of Medical Sciences, Tehran, Iran, [3]Department of Oral and Maxillofacial Surgery, Tehran University of Medical Sciences, Tehran, Iran, [4]Dental Research Centre, Dentistry Research Institute, Tehran University of Medical Sciences, Tehran, Iran

ABSTRACT

Background: Facial asymmetry is one reason orthodontic patients seek treatment. This study assessed the effect of mandibular asymmetry on facial esthetics and treatment needs perceived by laypersons, orthodontists, and maxillofacial surgeons.

Materials and Method: In this descriptive cross-sectional study, the frontal image of a model was captured and symmetrized from the facial midline using Adobe Photoshop software. The mandible was rotated 0°–8° with 1° intervals. Images were presented to 41 laypersons, 39 orthodontists, and 29 surgeons using an online questionnaire. The observers rated each image's esthetics with a 0–100 Visual Analog Scale and determined their treatment need by choosing one of the following three choices: No need for treatment, needs treatment, acceptable, but better to be treated. Analysis of variance for repeated measurements model. The regression method, Kruskal–Wallis analysis, was used for statistical analysis and the level of significance was set as $P < 0.05$.

Results: The images with 0° and 1° rotation received the highest esthetic rates among all three groups, while the images with 8° rotation were the least attractive ones. Furthermore, the image esthetic ratings significantly affected their treatment need. Mandibular asymmetry diagnosis threshold was 1° for orthodontists, and 3° for both laypersons and surgeons. The treatment need threshold was 5°, 6°, and 7° for surgeons, orthodontists, and laypersons, respectively.

Conclusion: The esthetics of images decreased when mandibular asymmetry increased. Treatment need was also related to increased asymmetry. Orthodontists were the most sensitive group in diagnosis, while surgeons were the most sensitive ones when it came to treatment.

Key Words: Esthetics, facial asymmetry, oral and maxillofacial surgeons, orthodontists

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Address for correspondence: Dr. Elaheh Kamali, Department of Orthodontics, Tehran University of Medical Sciences, Tehran, Iran. E-mail: elahehkamali1995@gmail.com

INTRODUCTION

Facial attractiveness is one of the main reasons people seek orthodontic/orthognathic treatment. It plays a key role in social interactions.[1] Facial symmetry is one of the important factors influencing the perception of facial attractiveness.[2,3] However, perfect facial symmetry is more a theoretical concept, and almost everyone has some degrees of facial asymmetry.[4,5] On the other hand, some attractive faces show clinically significant amounts of mandibular asymmetry.[6] Slight facial asymmetry has been reported to be normal

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and acceptable in adolescents and adults.[7] This asymmetry tends to increase on the lower and lateral sides of the face.[8] Mirror-reversed views have proved that full facial symmetry can even be unattractive, and small degrees of facial asymmetry are even more desirable.[9] Facial asymmetry can occur in the upper, middle, or lower facial thirds but is mainly located on the lower facial third.[10,11]

Although mandibular asymmetries are different in etiology, they are somewhat the same in treatment; a combination of orthodontics and orthognathic surgery is needed, which is time-consuming, costly, and accompanied by inherent surgical risks. Considering the above, there might be some degrees of asymmetry that patients might not be aware of or sensitive about, while professionals find it necessary to be treated. This conflict might lead to sensitizing patients, overtreatment, and unsatisfactory results.

Therefore, it seems there should be an answer about "which amount of asymmetry should be treated or, more importantly, which should not."

It is difficult to determine a threshold between a beautiful mild asymmetrical face, and an asymmetrical face that requires intervention.[12] This study aimed to determine the effect of mandibular asymmetry on facial attractiveness and treatment needs from the perspective of laypersons, orthodontists, and oral and maxillofacial surgeons.

Although some previous studies, such as Zamanian, Jarosz *et al*., and Dong *et al*., have evaluated the diagnostic threshold for mandibular asymmetry, to our knowledge this is the first time a study evaluated the threshold of diagnosis as well as treatment plan at a time, in an Iranian population.[13-15]

MATERIALS AND METHODS

In this cross-sectional descriptive study, an electronic questionnaire (Zoho Survey Pro) was used to collect data.

The model was a dentistry student with good insight into the study. The aims of the study were comprehensively explained to him, and informed consent was obtained to participate in the research and to use his image to create rotated images as well as to publish in related journals.

The subject had a proportionate face, normal facial height, and no obvious facial asymmetry or specific facial marks. He was invited to participate as a model for the research, and his photograph was taken with a camera (EOS 5D Mark III, Canon). The distance between the model and the camera was 1.5 m. The subject was asked to sit with the head in the natural position, the line between the two pupils parallel to the floor, the jaws in centric occlusion, and all the facial muscles at rest.

The image was opened in Adobe Photoshop software (version 0.1.22). It was cropped to remove any unnecessary background area and a white background was created. To enhance the lighting, color correction was implemented. The facial midline was constructed using the line passing through the points of the glabella, soft-tissue nasion, soft-tissue subnasale, and soft-tissue menton. Finally, a half image was mirrored horizontally to create the perfect facial symmetry [Figure 1a and b].[16]

Soft tissue landmarks (such as G ‹Sn‹ R-Co‹ L-Co‹ R-Go‹ L-Go‹ R-C‹ L-C‹ Mex) were used to define mandibular border on the digital photo before the alterations were made [Figure 2].

To produce the asymmetric images, the mandibular soft-tissue contour was rotated in increments of 0°, 1°, 2°, 3°, 4°, 5°, 6°, 7°, and 8° around the condyle. The angle of rotation was formed between the intercondylar line and the lateral border of the ramus. The condyles were approximately determined 7 mm below the Frankfort plane according to Beck *et al*.[17] To create an acceptable image, the philtrum and lips were rotated in a separate unit, about half of that of the jaw. Finally, the philtrum was reconstructed. Based on Severt and Proffit when the chin is deviated, it was more commonly found on the left side in class I

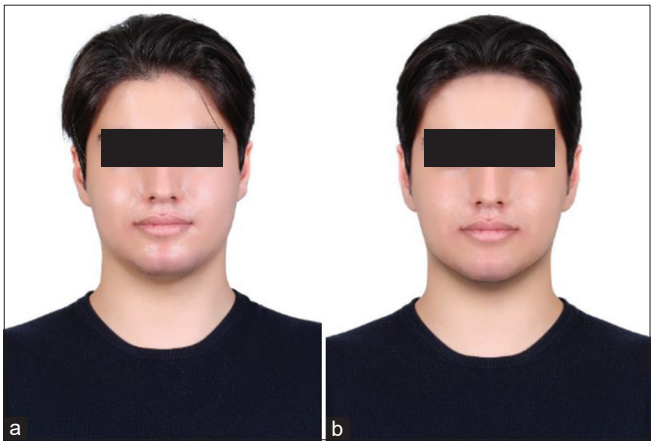

Figure 1: (a) Original image of the model, (b) Mirror-reversed view.

asymmetric patients. Therefore, we decided to make the deviation to the left side.[18]

To make the mandibular contour look more natural, some adjustments were performed. Finally, by rotating the mandibular contour in increments of 0°, 1°, 2°, 3°, 4°, 5°, 6°, 7°, and 8°, nine images were created [Figure 3].

While taking the primary photo, a transparent ruler was held against the model's face at the infraorbital region to standardize the calibration of the Photoshop software ruler. The lateral displacement of the mandible was defined as the distance between the soft tissue menton in the original image and the altered image.

In order to evaluate attractiveness and treatment needs, we used an online questionnaire (Zoho survey). Images were randomly ordered on separate pages. The image without asymmetry was shown twice to evaluate the reliability. To blind, the images were adjusted in 11 different sequences, and raters were not informed which facial features had changed.

Participants, including laypersons with no history of orthodontic treatment (n = 41), orthodontists (n = 39), and maxillofacial surgeons (n = 29), were asked to rate each photo on a scale of 1–100 based on its esthetic appeal using a Visual Analog Scale (VAS) firstly. They also answered one of the following three options for each photo: No need to treatment needs treatment, acceptable but better to be treated.

According to the results of Jarosz *et al.*'s study, using the one-way ANOVA option in the PASS software (IBM Corp, Armonk, NY, US), considering $\alpha = 0.05$, $\beta = 0.2$, average standard deviation equal to 0.57, and the effect size equal to 0.49, the minimum sample size required for oral and maxillofacial surgeons, orthodontists and laypeople was determined as 11, 11 and 22 samples, respectively.[14]

The threshold of diagnosis was considered as the first degree in which the mean VAS score was significantly <0 ° rotation.

The threshold of treatment need was considered the rotation for which more than 50% of the raters chose "needs treatment."

Ethics approval was granted by the Research Ethics Committee of the School of Dentistry-Tehran University of Medical Sciences (approval ID: IR.TUMS.DENTISTRY.REC.1399.131).

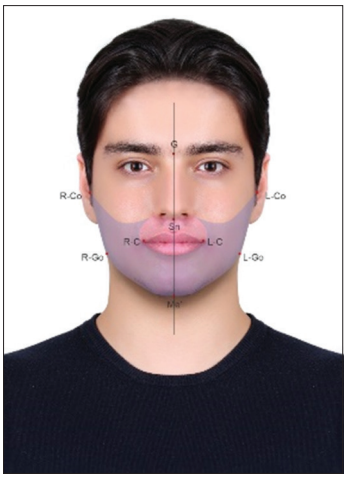

Figure 2: Schematic landmarks for anatomical measurements.

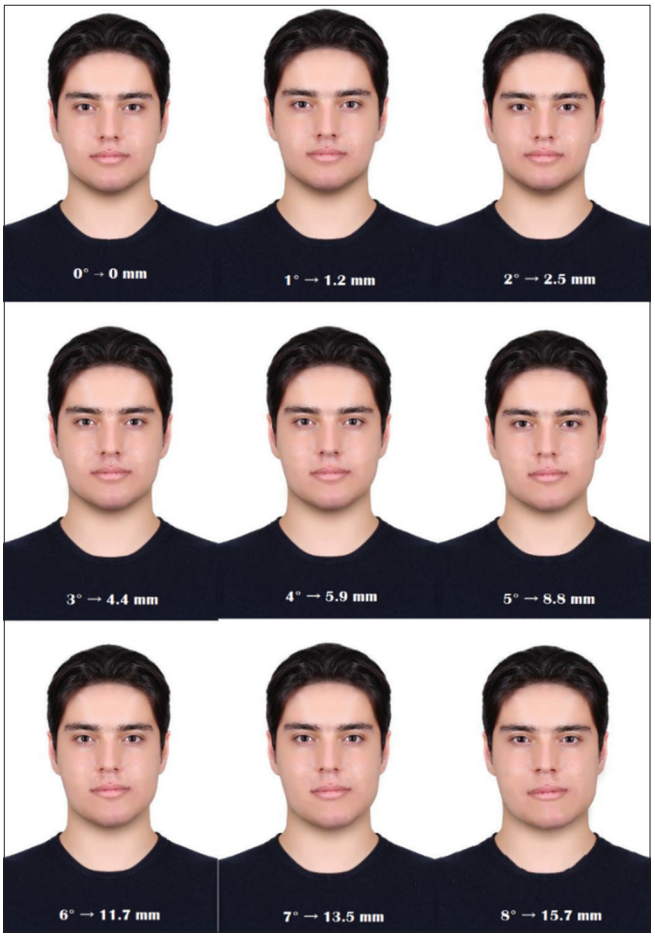

Figure 3: Edited images at each rotation angle and its linear deviation in millimetres.

Statistical analysis

We used analysis of variance for repeated measurements model, multiple linear regression backward method, least significant difference (LSD) test, Bonferroni test, and Kruskal–Wallis analysis for statistical analysis, and the level of significance was set at $P < 0.05$.

Initially, the mean and standard deviation of esthetic values for each degree of mandibular asymmetry (VAS marks) were calculated. The same was applied to the frequency of responses related to treatment needs, which were calculated and reported separately in each degree of mandibular asymmetry.

Analysis of variance for repeated measurements model was used to compare the degrees of the esthetic appeal of images between three groups, in which nine images were considered as a repeated factor and three groups were considered a between-subject factor. Comparisons between images with different degrees of rotation in each group were performed using the LSD test, and pairwise comparisons between images with different degrees of rotation between three groups were performed using the Bonferroni test.

Multiple linear regression backward method was used to determine the effects of age and gender and rater group in perception of the esthetic appeal, and ordinal regression backward method was used to determine the effects of mentioned variables on the need for treatment. The relationship between different asymmetries and esthetic evaluation or the need for treatment was analyzed using the Pearson correlation coefficient.

Kruskal–Wallis analysis was used to compare estimates of treatment needs in each rotation between the three groups.

RESULTS

Esthetic perception

The highest esthetic scores were reported for images without rotation as well as images with 1° of rotation and the lowest esthetic scores were reported for images with 8° of rotation by laypersons, orthodontists, and oral and maxillofacial surgeons [Table 1].

Among laypersons, the esthetic scores decreased as the degree of rotations increased except for the 0° to 1° and 5° to 6°. As the rotation rate increased from 1° to 8°, the average esthetic judgments of the images steadily decreased among orthodontists and maxillofacial surgeons [Table 1].

The visual diagnostic thresholds for mandibular asymmetry in each group were obtained from the amount of rotation the VAS score was significantly different from the original image VAS score. The findings showed that the diagnostic thresholds for mandibular asymmetry were 1° (1.2 mm) for the orthodontists and 3° (4.4 mm) for both laypersons and oral and maxillofacial surgeons.

The results of a pairwise comparison of esthetic scores of nine images by laypersons, orthodontists, and surgeons are summarized in Tables 2-4.

To analyze the effects of different independent variables (gender, age, and rater group) on esthetic perception of 0°–8° of mandibular asymmetry, the multiple linear regression backward method was used. According to the results, the effect of the raters group (laypersons, orthodontists, and surgeons) on the esthetic judgments of images without rotation ($P < 0.001$); images with 1° rotation ($P < 0.001$); 2° rotation ($P < 0.001$) and 3° rotation ($P = 0.013$) were significant. At these rotation degrees, surgeons are graded with the highest scores, and laypersons are graded with the lowest scores. The effect of age on the esthetic judgments of images with 3° ($P < 0.016$), 4° ($P < 0.002$), 5° ($P < 0.001$), 7° ($P = 0.018$), and 8° of rotations ($P = 0.083$) were significant; esthetic scores increased with age of the assessors. According to the regression analysis results, the effect of assessor gender on esthetic perception of mandibular asymmetry was not significant. The Intraclass correlation coefficient values between the first and second time for laypersons, orthodontists, and surgeons were 0.843, 0.779, and 0.823, respectively, which indicate good reliability.

Need for treatment

The frequency of answers related to treatment need across the three groups of raters are summarized

Table 1: Mean and standard deviation of the esthetic Visual Analog Scale scores for each degree of rotation in three groups

Degree of rotation groups	0°	1°	2°	3°	4°	5°	6°	7°	8°
Laypersons	74.75±17.85	75.60±18.75	69.45±20.32	69.0±19.78*	59.2±24.17	54.08±23.19	55.73±21.63	51.08±21.18	48.03±22.42
Orthodontists	89.18±10.95	83.11±12.54*	82.16±14.41	76.42±18.37	67.16±18.79	65.53±20.62	54.84±20.9	48.0±20.9	42.21±20.63
Surgeons	90.0±10.89	89.21±10.77	85.86±11.08	82.57±13.85*	71.64±19.26	67.14±19.71	56.57±22.92	50.96±21.87	43.14±22.62

*marks significant differences

Table 2: Comparison of layperson's Visual Analog Scale scores regarding the esthetic of images with 0°–8° of rotations

Degree of rotation	1°	2°	3°	4°	5°	6°	7°	8°
0°								
P	0.747	0.08	0.025*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	−0.85	5.3	5.75	15.55	20.675	19.025	23.675	26.725
1°								
P	-	0.02*	0.046*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	6.15	6.6	16.4	21.525	19.875	24.525	27.575
2°								
P	-	-	0.895	0.004*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	-	0.45	10.25	15.375	13.725	18.375	21.425
3°								
P	-	-	-	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	-	-	9.8	14.925	13.275	17.925	20.975
4°								
P	-	-	-	-	0.054	0.262	0.003*	0.001*
Mean difference	-	-	-	-	5.125	3.475	8.125	11.175
5°								
P	-	-	-	-	-	0.557	0.228	0.076
Mean difference	-	-	-	-	-	−1.65	3	6.05
6°								
P	-	-	-	-	-	-	0.093	0.021*
Mean difference	-	-	-	-	-	-	4.65	7.7
7°								
P	-	-	-	-	-	-	-	0.2
Mean difference	-	-	-	-	-	-	-	3.05

*marks significant differences

Table 3: Comparison of orthodontist's Visual Analog Scale scores regarding the esthetic of images with 0°–8° of rotations

Degree of rotation	1°	2°	3°	4°	5°	6°	7°	8°
0°								
P	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	6.079	7.026	12.763	22.026	23.658	34.342	41.184	46.974
1°								
P	-	0.673	0.003*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	0.947	6.684	15.947	17.579	28.263	35.105	40.895
2°								
P	-	-	0.043*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	-	5.737	15	16.632	27.316	34.158	39.947
3°								
P	-	-	-	0.002*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	-	-	9.263	10.895	21.579	28.421	34.211
4°								
P	-	-	-	-	0.0512	0.001*	0.001*	0.001*
Mean difference	-	-	-	-	1.632	12.316	19.158	24.947
5°								
P	-	-	-	-	-	0.001*	0.001*	0.001*
Mean difference	-	-	-	-	-	10.648	17.526	23.316
6°								
P	-	-	-	-	-	-	0.001*	0.001*
Mean difference	-	-	-	-	-	-	6.842	12.632
7°								
P	-	-	-	-	-	-	-	0.001*
Mean difference	-	-	-	-	-	-	-	5.789

*marks significant differences

Table 4: Comparison of oral and maxillofacial surgeon's Visual Analog Scale scores regarding the esthetic of images with 0°–8° of rotation

Degree of rotation	1°	2°	3°	4°	5°	6°	7°	8°
0°								
P	0.598	0.054	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	0.786	4.143	7.429	18.357	22.857	33.429	39.036	46.857
1°								
P	-	0.013*	0.001*	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	3.357	6.643	17.571	22.071	32.643	38.25	46.071
2°								
P	-	-	0.18	0.001*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	-	3.286	14.214	18.714	29.286	34.839	42.714
3°								
P	-	-	-	0.006*	0.001*	0.001*	0.001*	0.001*
Mean difference	-	-	-	10.929	15.429	26	31.607	39.429
4°								
P	-	-	-	-	0.04*	0.001*	0.001*	0.001*
Mean difference	-	-	-	-	4.5	15.071	20.679	28.5
5°								
P	-	-	-	-	-	0.001*	0.001*	0.001*
Mean difference	-	-	-	-	-	10.571	16.179	24
6°								
P	-	-	-	-	-	-	0.008*	0.001*
Mean difference	-	-	-	-	-	-	5.607	13.429
7°								
P	-	-	-	-	-	-	-	0.005*
Mean difference	-	-	-	-	-	-	-	7.821

*marks significant differences

in Table 5. Overall, with increasing mandibular deviation, the need for treatment increased in all three groups.

The thresholds of treatment need were 7° (13.5) for the laypersons, 6° (11.7) for the orthodontists, and 5° (8.8 mm) for oral and maxillofacial surgeons, respectively, by considering the opinion of more than 50% of the raters.

The regression test showed that the esthetic perception of each image had significant effects on the answers related to the need for treatment ($P < 0/001$) in all degrees of rotation. The negative correlation coefficient for all rotated images indicates a decrease in the rater's sensitivity to the need for treatment with age. In addition, the group of evaluators had significant effects on the need for treatment judgment for images with 5° ($P = 0.001$), 6° ($P < 0.001$), and 7° ($P < 0.001$) of rotations; in which surgeons considered the most need and laypersons considered the least need for treatment. Agreement coefficient values between the first and second time for laypersons, orthodontists, and surgeons were 0.7, 0.87, and 0.89, respectively, which indicate good agreement.

DISCUSSION

Physical attractiveness, including facial appearance, has a significant impact on mental health and social interactions.[19,20] The aim of this study was to determine the effect of mandibular asymmetry on facial esthetic and treatment needs from the perspective of laypersons, orthodontists, and oral and maxillofacial surgeons.

The results of the present study showed that orthodontists diagnosed a mandibular asymmetry at a 1° (1.2 mm) discrepancy, whereas laypersons and maxillofacial surgeons needed 3° (4.4 mm) of asymmetry to notice a change. Orthodontists were the harshest group in terms of diagnosis. The treatment threshold for mandibular asymmetry among oral and maxillofacial surgeons, orthodontists, and laypersons was 5° (8.8 mm), 6° (11.7 mm), and 7° (13.5 mm), respectively. It can be concluded that although orthodontists are more sensitive in diagnosing asymmetries, they are less sensitive to the need for treatment. Laypersons are less sensitive in both diagnosis and treatment. However, they graded the 0°–3° of deviations with lower mean scores than

Table 5: Frequency of distribution of answers to treatment need for 0°–8° rotated images across three groups of raters

Rotation degree Rater group	0°	1°	2°	3°	4°	5°	6°	7°
Laypersons, *n* (%)								
Need for treatment	0	0	4 (10)	2 (5)	11 (27.5)	13 (32.5)	15 (37.5)	22 (55)
Acceptable	14 (35)	11 (27.5)	15 (37.5)	19 (47.5)	15 (37.5)	20 (50)	18 (45)	12 (30)
No need for treatment	26 (65)	29 (72.5)	21 (52.5)	19 (47.5)	14 (35)	7 (17.5)	7 (17.5)	6 (15)
Orthodontists, *n* (%)								
Need for treatment	0	1 (2.6)	2 (5.3)	2 (5.2)	10 (26.3)	12 (31.6)	24 (63.1)	34 (89.5)
Acceptable	2 (5.3)	8 (21.1)	4 (10.5)	14 (36.9)	20 (52.6)	19 (50)	12 (31.6)	4 (10.5)
No need for treatment	36 (94.7)	29 (76.3)	32 (84.2)	22 (57.5)	8 (21.1)	7 (18.)	2 (5.3)	0
Oral and maxillofacial surgeons, *n* (%)								
Need for treatment	1 (3.6)	2 (7)	2 (7.1)	3 (10.7)	9 (32.1)	15 (53.6)	23 (82.1)	24 (85.7)
Acceptable	3 (10.7)	0	5 (17.9)	5 (17.9)	12 (42.9)	10 (35.7)	4 (14.3)	4 (14.3)
No need for treatment	24 (85.7)	26 (93)	21 (75)	20 (71.4)	7 (25)	3 (10.7)	1 (3.6)	0

surgeons and orthodontists, which might be due to the comparison of a normal face with the beauty criteria presented by the media.

Specialists (orthodontists, surgeons) are more sensitive about morphological characteristics in the dentofacial region than laypersons. However, it should be noted that, nowadays, some people are more aware of esthetics through the media, although their knowledge is not necessarily valid or scientific.

Attractiveness studies often use laypeople as observers but seldom use patients. The results of Naini *et al*.'s study showed that orthognathic patients were more critical than laypeople, suggesting that in future studies, greater emphasis may be put on evaluating the perceptions of patients as well.[21]

The effect of age on esthetic evaluation was not significant in images with limited rotations, but it was significant with increasing rotation (3° and more); older raters from all three groups, were more tolerant of mandibular deviation. It may be that the older raters have grown up with the concept that alteration of facial esthetics is an accepted norm. The relationship between age and the need for treatment was shown only in the rotation of 8°, as sensitivity to the need for treatment in that rotation was less with age. There were no significant gender differences when assessors graded mandibular asymmetry regarding facial beauty and the need for treatment. The results of the present study agree with the findings of Naini *et al*. that an observer's gender had no significant effect on attractiveness ratings when the images were altered in 5-mm increments from 0 to 25 mm to represent horizontal, vertical, and combined asymmetry.[21]

Dong *et al*. used three-dimensional (3D) images to assess the influence of chin asymmetry on perceived facial esthetics. The chin was altered in 2-mm increments from 0 to 12 mm and to the left and right using the Geomagic software (3D Systems, Rockhill, SC); they demonstrated that the observers progressively increased the grade ratings and the desire for surgery for greater asymmetries. They found a statistically significant difference between clinicians (orthodontists and general dentists) and laypersons in the cognition of chin asymmetry and the treatment recommendations.[15] These findings are consistent with the results of the present study.

Alrbata *et al*. also found that the image of 4 mm asymmetry was defined by laypersons and general dental practitioners as the threshold of abnormality, while orthodontists and oral and maxillofacial surgeons realized 2 mm for it.[20] These data are close to the results of the current study. Other studies demonstrated that a significant difference exists between professionals (orthodontists and maxillofacial surgeons) and laypersons when subjectively evaluating morphological characteristics in the dentofacial region. They suggested that the observed differences were probably related to the variation in knowledge and experience between the groups.[14]

Corte *et al*. assessed the perception of mandibular deviation among 45 laypeople, 27 dentists, and 31 orthodontists. All groups were able to perceive the asymmetry; however, orthodontists were the most sensitive.[22] In the present study, dentists were replaced with surgeons, and orthodontists were still the most sensitive group.

Similar to Corte *et al*., Naini *et al*., Alhammadi, and Pinho *et al*., the results of the present study also showed that orthodontists possessed the highest accuracy among all groups of raters in diagnosing asymmetries.[21-24]

Although the results of the present study and other studies indicate some therapeutic indications for different values of mandibular asymmetry, it should be noted that they are based on static images. The results may be different if we consider real dynamic clinical conditions, since variables such as patients' facial expressions, body language, and personality traits affect esthetic perception. Based on the results of Darby *et al*.'s study, overall 3D facial asymmetry scores for the sampled Caucasian adults with clinically symmetrical faces increased in magnitude from rest to natural and to maximal smiles.[25]

Attractiveness is determined by different factors. Along with factors related to the assessor, some factors related to the model, such as hairstyle, color eyes, and other facial structures, can affect the judgment of beauty. Although a global assessment of asymmetry was performed here, the distribution of local and body feature-specific asymmetries (e.g. nose versus chin asymmetries or orbital asymmetries) may have affected the perception of overall asymmetry.[26] Other features can also affect the perception of asymmetry. The interaction between an observer's "handedness" and "side of asymmetry (right vs. left)" are shown to be significant; for images with asymmetry toward the left, the rating decreased by 0.12 in the Likert scale compared with asymmetry toward the right for right-handed assessors.[19] One of the limitations of the present study was that the effect of variables such as socioeconomic status, race, handedness, and facial attractiveness of assessors was not evaluated.

The present study was inspired by Jarosz *et al*.'s study, which rotated the mandible around the subnasale point, resulting in unrealistic lip rotation, which is far from what happens in the clinic and might grab the attention of raters to the lips instead of the chin deviation. It leads to unrealistic and exaggerated lip rotation, which is more visible than mandibular rotation.[14] In the present study, the mandible was rotated around the condyle, the lips were rotated by half, and the philtrum was reconstructed, resulting in more realistic images.

It seems more realistic to use a real face than the average face used by some researchers. In another study, two-dimensional silhouettes were used as asymmetric subjects.[27] The latter method does not seem very realistic for asymmetric perception, as silhouettes cannot reconstruct facial features such as form, proportions, texture, and color.

During treatment planning for asymmetry of the lower jaw, it should be considered that there will be some compensatory rotations in other structures of the face such as orbits, naso-maxillary complex, and alveolar process; therefore, constructive mandibular asymmetry was not exactly replication of natural asymmetric faces.[28]

Based on the latest authors' knowledge, the present study is the first to investigate both the attractiveness and the need for treatment at a time, in cases with mandibular asymmetry. The rating scale used in this study was a 100-mm VAS for assessing attractiveness.[1] Conventionally, the scale is administered using a horizontal bar with a range of 0–10 or 0–100. Ten millimeters VAS used in other studies was too narrow to allow the assessors the ability to express small differences between images. One hundred millimeters VAS, therefore, appears to be a more accurate one.[1] To increase the study power, the sequences of presenting images were random (In 11 different sequences).

The Likert-like scale was used to assess the need for treatment. Both the VAS scale and the Likert scale are accurate enough to assess facial esthetic; however, some raters preferred the Likert scale because of its simplicity.[20]

In the present study, a photograph was taken from a model in frontal view, and then, to make asymmetric images, the photo was altered using Photoshop software. Although this is an acceptable and widely used method,[29] perceptions of facial esthetics using videos and dynamic subjects are highly suggested.

Several studies about esthetic perceptions found that dentists, particularly orthodontists, are less tolerant than the general public for some dental conditions. Therefore, some dentists may overestimate the need for orthodontic treatment.[21] Dental specialists need more objective and quantitative data to guide their decisions accurately and promote better communication with patients when planning treatment that responds to the patient's needs. Moreover, although it is necessary to inform the patient about the facial asymmetry, it should not be emphasized too much, especially in borderline amounts, when the patients do not feel the need for treatment.

CONCLUSION

The images without rotation and images with 1° of rotation had the highest esthetic score among all three groups of observers, while images with 8° of rotation were also the most unpleasant images. Moreover, as the asymmetry increased, the attractiveness of the images decreased.

The visual diagnostic thresholds for mandibular asymmetry were 1° (1.2 mm) for the orthodontists and 3° (4.4 mm) for the laypersons and oral and maxillofacial surgeons. The thresholds of the treatment needed were 7 ° (13.5 mm) for the laypersons, 6 ° (11.7 mm) for the orthodontists, and 5 ° (8.8 mm) for oral and maxillofacial surgeons.

Orthodontists were the most sensitive group in diagnosis, while surgeons were the most sensitive ones when it came to treatment. There were no significant gender differences when assessors graded mandibular asymmetry regarding facial beauty and the need for treatment.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

The authors of this manuscript declare that they have no conflicts of interest, real or perceived, financial or non-financial in this article.

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