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ORIGINAL RESEARCH

CORRELATION BETWEEN SAGITTAL MALOCCLUSION TYPES AND MANDIBULAR ASYMMETRY: A RETROSPECTIVE STUDY

Bassam Ali Al-Turaihi[1], Wahab Razaq Jassim[2], Mustafa Shubbar[3], Dhuha M Hasan[4] , Abdulsahib S Jubran [5]
[1,4] Department of Pediatric Dentistry, Orthodontics and Preventive Dentistry, College of Dentistry, University of Babylon, Al-Hilla, Babil, Iraq
[2] Department of Surgery, College of Dentistry, University of Babylon, Al-Hilla, Babil, Iraq
[3,5] College of Dentistry, University of Alkafeel, Najaf, Iraq
[1]den129.duha.malik@uobabylon.edu.iq
[2]den251.whab.razak@uobabylon.edu.iq
[3]mustafashubbar@alkafeel.edu.iq
[4]den129.duha.malik@uobabylon.edu.iq
[5]abdalsahebsaad@alkafeel.edu.iq
Correspondence author Abdulsahib S Jubran, College of Dentistry, University of Alkafeel, Najaf, Iraq
abdalsahebsaad@alkafeel.edu.iq
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Background: While perfect facial symmetry is uncommon in nature, asymmetry arises from differences in size, shape, and position of facial landmarks.The last factor determining facial asymmetry is the variation between the two sides of the face with regard to the size, shape, and positioning of facial landmarks.

Aim: To evaluate the prevalence of vertical mandibular asymmetry examined by OPG x-ray with all three types of malocclusions and different skeletal sagittal patterns according to Angle classification in orthodontics.

Materials and Methods: This study investigated the mandibular symmetry and occlusion types in a sample of 402 individuals aged 9-49 years using panoramic X-rays. Kjellberg's index was employed to assess symmetry**.**

Results: revealed varying percentages of class I, II, and III occlusion types in males and females. Chi-square analysis indicated no significant gender-based differences in occlusion types or symmetry/asymmetry.

Conclusion: Asymmetry was significantly more prevalent in Class I malocclusion compared to Classes II/III. These findings suggest that while gender may not influence oc- clusion types or symmetry/asymmetry, the relationship between symmetry/asymmetry and occlusion type is significant.

Keywords**:** Correlation, skeletal sagittal pattern, Kjellberg's index.

INTRODUCTION

Despite the fact that there isn't perfect facial symmetry in nature. Differences of the two sides of the face in terms of the shape, size, and placement of facial landmarks are ultimately determined by facial asymmetry[(1)]. Facial growth may be impacted by certain disorders or asymmetric mandibular growth. A non-syndromic asymmetry that appears gradually during the years after birth may become noticeable throughout adolescence. Some mandibular asymmetries are idiopathic [(2)]. Studying the mandibular asymmetry is not important for esthetic purposes; the vertical condylar asymmetry is considered a risk factor for the development of a temporomandibular disorder [(3)]. The mandibular radiographic symmetry has

been confirmed at a significant level (P<0.001) according to R. BORATTO et al [4] but this a symmetry has not been studied thoroughly in which type of sagittal malocclusion is more common. our study uses a relatively big sample to check asymmetry across all Angle classification classes. Some studies confirm the correlation of asymmetry with some other malocclusions, such as unilateral posterior crossbite [5]. Our aim in this study is to distinguish which type of malocclusion is most frequently associated with a symmetry. The OPG and cephalometric x-ray are frequently used types in all orthodontic clinics, although OPG is essential in each dental clinic, but there is no significant statistical difference measured on OPG and PA cephalogram in utilising to measure the mandibular symmetry [6]. According to another study, the symmetry between the right and left sides of the face was absent, Using a photographical technique [7]. Some studies conclude that mandibular asymmetry is significantly different between patients with\only skeletal Class I and skeletal Class II malocclusions [8] . But not in all type of sagittal discrepancy. Other studies focusing on mandibular asymmetry only in growing patients (9). The facial asymmetry results from different factors originating from soft tissue or skeletal causes, the mandibular bone asymmetry is one of them [10].

MATERIAL AND METHODS

A retrospective study of (402) patients with different angle classification malocclusion (199 female and 203 male), aged 9 to 49 years old, examined their pre-orthodontic treatment intraoral photographs and compared them with OPG x-rays. The data collected from two private dental clinic in Hilla city in Iraq. The symmetry on the mandible has been examined in the panoramic x-ray. Although of magnification in the vertical direction reach to 18% - 20% according to Lraheim and Svanace 1986 [11]. The panoramic still is a dependable tool in asymmetry indexes (AI) in clinical studies and similar. The idea behind these different indices is to measure the vertical heights of the right and left condyles in OPG. Kjellberg's technique is to be recommended according to Fuentes, R. et al [12]. The superior method used to examine the mandibular asymmetry via three-dimensional imaging CBCT (13), but also there are different methods or indices used to examine the mandibular asymmetry in OPG x-ray, like Habets' technique and Kjellberg's technique. The Kjellberg's index (Figure 1) is one of these indices which is used in our study to avoid the error caused by magnification by using the quotient CH:MH or CH: RH in the compression of two sides (CH condylar height, MH mandibular height, RH ramus height) [11].

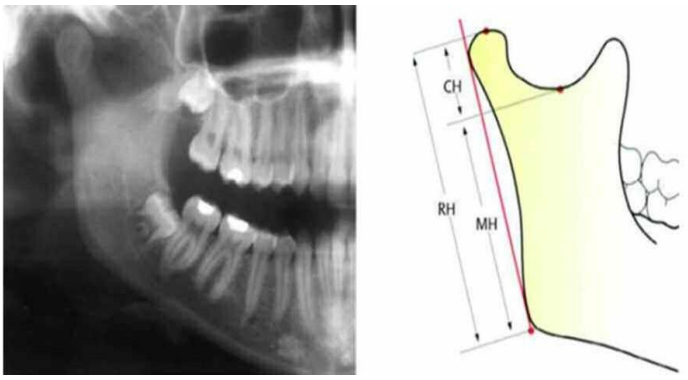

Figure 1. Kjellberg's index compares the heights of different parts of the jaw by using the ratio of CH (condylar height) to MH (mandibular height) or CH to RH (ramus height) [11].

Inclusion criteria

All the sample included in this study for patients attending dental clinics seeking orthodontic treatment, all of them has no congenital facial deformity like cleft palate or mandibular hyperplasia and have no history of any trauma to the mandibular bone. Congenital changes such as hypoplasia of the ramus and condyle can play a role in the development of mandibular asymmetry [14]. All the recruited sample has different types of malocclusion, varying from dental to skeletal malocclusion in different planes, coronal, axial and sagittal discrepancies. Regardless of the aetiology of malocclusion, whether dental, skeletal or due to bad habits.

Statistics analysis

The data were coded, entered into a computer, and analyzed with the Statistical Package for Social Sciences (SPSS 26, Chicago). The chi-square statistic was employed to assess the significance of differences between males and females in terms of angle classification, symmetry/asymmetry and the relationship between classification and symmetry/asymmetry. A significance level of $p < .05$ was adopted as the threshold for statistical significance, in line with convention.

RESULTS

Based on the chi-square analysis, there was no significant difference between gender and classification types ($p = 0.160$). This suggests that the distribution of occlusion types does not differ significantly between males and females. Similarly, there was no significant difference between gender and symmetry/asymmetry ($p = 0.745$), indicating that the distribution of symmetry and asymmetry of angles of occlusion in males and females is similar. However, there was a significant association between symmetry/asymmetry and classification ($p < 0.05$), indicating that the distribution of occlusion types differs significantly depending on whether the angles of occlusion are symmetric or asymmetric. Overall, these findings suggest that while gender may not be a

significant factor in determining occlusion types or symmetry/asymmetry, the relationship between symmetry/asymmetry and occlusion type is significant (Figure 1).

Occlusion type distribution

The results show that in males, 72% had class I, 19% had class II, and 9% had class III occlusion types, while in females, the distribution was 79% for class I, 15% for class II, and 5% for class III occlusion types (Table 1).

Symmetry/Asymmetry distribution

In males, 85% exhibited symmetry, while in males, 84% exhibited symmetry (Table 2).

Table 1. Percentage of angle classification malocclusion depends on gender.

Gender	Class I	Angle cla Class II	ssificatio n Class III	Total
Male	72%	19%	9%	203
Female	79%	15%	5%	199
Total	302	70	30	402

The comparison by the Chi-square test did not yield significance (p > 0.05).

Table 2. Percentage of Symmetry/Asymmetry depend on gender

Gender	Symmetry	Asymmetry	Total
Male	85%	15%	203
Female	84%	16%	199
Total	336	66	402

The comparison by Chi-square test did not yield significance (p > 0.05).

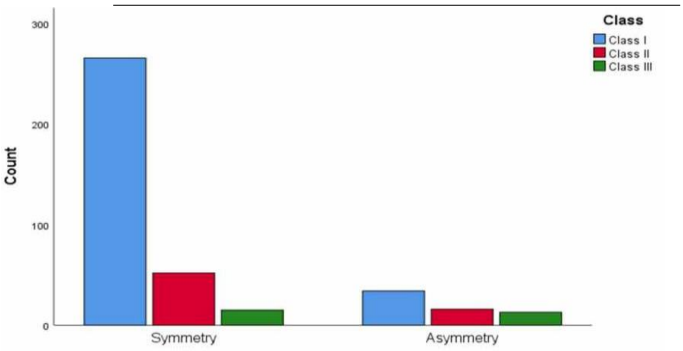

Figure 2. The relationship between symmetry/asymmetry and occlusion type. The comparison by Chi-square test was significance (p > 0.05)

DISCUSSION

The aetiology and impact of lower jaw asymmetry present a complex and multifaceted challenge for clinicians. Understanding the varied origins of asymmetry, including developmental, pathological, traumatic, and functional factors, is crucial in devising effective treat- ment strategies [15]. The severity of symmetry will also differ and impact the extraoral and intraoral appearance of each individual, which will affect the approach of treatment. In cases where minor asymmetry is associated with malocclusion, treatment focusing on correcting the malocclusion may effectively compen- sate for the asymmetry. However, severe forms of asymmetry necessitate a more comprehensive ap- proach. Integrating orthodontic treatment with orthognathic surgery becomes essential to not only address the esthetic concerns but also to improve the overall function of the orofacial system. Furthermore, the impact of severe asymmetry on breathing underscores the need for a holistic approach that considers both aesthetic and functional aspects of treatment [16, 17]. In our study, we utilized diagnostic tool (OPG) to evaluate mandibular asymmetry. While extra-oral photographs provide valuable visual information, the precision and widespread availability of OPG make it a preferred choice for assessing asymmetry in dental clinics. The emergence of advanced imaging techniques such as CBCT also presents opportunities for more detailed evaluation, but the accessibility and precision of OPG make it a practical choice for initial assessment. Our study findings align with Lagos in relation to Class I malocclusion, as we observed similar trends in our sample [18]. However, our results differ from those reported by Foster and Day, who found a higher percentage of Class II malocclusion [19]. These variations in the distribution of malocclusion classes highlight the potential influence of geographical, eth- nic, or temporal factors on the prevalence of specific malocclusion types. Understanding these differences is crucial for developing region-specific treatment strategies and may also indicate changes in oral health patterns over time. Further research into the underlying reasons for these discrepancies could provide valuable insights into the evolving nature of malocclusion patterns and contribute to the development of more targeted and effective orthodontic interventions. Overall, the multifactorial nature of mandibular asym- metry requires tailored treatment approaches based on the specific etiology and severity of the condition. In- tegrating diagnostic tools and considering the impact on both esthetic and functional aspects is crucial in developing effective and patient-specific treatment plans.

CONCLUSION

In summary, while gender may not play a significant role

in determining occlusion types or symmetry/asymmetry, the relationship between symmetry/asymmetry and occlusion type is indeed significant. These insights contribute to our understanding of the factors influencing occlusion types and highlight the importance of considering symmetry/asymmetry in the classification of occlusion. The higher frequency of asymmetry in class I malocclusion suggests a need for further research and consideration in orthodontic treatment planning or conducting 3D research by CBCT for more accurate results.

Conflict of Interest

The authors declare that they have no conflict of interest.

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