

## إمكانية استخدام البعد بين زاويتي الفم في تقدير العرض الإنسي الوحشي للأسنان الأمامية العلوية لتحقيق ابتسامة تجميلية

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### المُلخَص

خلفية البحث وهدفه: استنتجت بحوث عدّة وجود علاقة بين العرض الكلي للأسنان الأمامية العلوية والأبعاد الوجهية المختلفة في العديد من المجتمعات، ونظراً إلى عدم توفر أية دراسات عن المجتمع السوري هدف هذا البحث إلى تحري وجود علاقة بين البعد بين زاويتي الفم والعرض الإنسي الوحشي الكلي للأسنان الأمامية العلوية في المجتمع السوري. مواد البحث وطرقه: تألفت عينة البحث من 263 مراجعاً (147 ذكوراً، 116 إناثاً). أخذت طبقات للفك العلوي بمادة الإنسي - الوحشي الألبينات للحصول على أمثلة الدراسة لقياس البعد للأسنان بواسطة خيط سنّي، كما أُجريت صور شمسية أمامية لقياس البعد بين زاويتي الفم باستخدام برنامج 'SIGMA SCAN PRO 5'.

النتائج: وُجد أنّ متوسط البعد بين زاويتي الفم  $50.517 \pm 2.658$  ملم والعرض الإنسي الوحشي للأسنان الأمامية العلوية  $52.977 \pm 2.710$  ملم للمجموعة كاملة، في حين كان ( $52.473 \pm 2.981$  ملم و  $55.013 \pm 2.411$  ملم) لدى الذكور و ( $49.083 \pm 2.097$  ملم و  $51.249 \pm 2.814$  ملم) لدى الإناث. كما لُحظ وجود علاقة إيجابية بين هذين المتغيرين ( $r = 0.713$  و  $P < 0.000$ )، إلا أنّ هذه العلاقة كانت ضعيفة عند تقسيم العينة إلى ذكور وإناث ( $r = 0.451$  و  $r = 0.490$ ).

الاستنتاج: تبين وجود علاقة قوية بين البعد بين زاويتي الفم والعرض الإنسي الوحشي للأسنان الأمامية العلوية للمجموعة كاملة في حين أصبحت هذه العلاقة ضعيفة عند تقسيم العينة إلى ذكور وإناث. اعتماداً على هذه النتائج يعدّ البعد بين زاويتي الفم مرجعاً جيداً لتقدير العرض الكلي للأسنان الأمامية العلوية عند إجراء أي تدخل علاجي عليها. كلمات مفتاحية: البعد بين زاويتي الفم، العرض الإنسي الوحشي للأسنان الأمامية العلوية، بناء الأسنان الأمامية

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## The Use of Intercommissural Width to Estimate the Maxillary Anterior Teeth Width to Achieve Esthetic Smile

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### Abstract

**Background:** To date, and to the best of our knowledge, there were no data on the relationship between the facial and the dental measurements in the Syrian population.

**Aim of The Study:** This research aimed to study the potential relationship between the combined mesiodistal width of the six maxillary anterior teeth (MDW) and The Inter-Commissural Width (ICW).

**Materials and Methods:** Maxillary casts and frontal digital photographs were obtained from 263 adult Syrians (147 males and 116 females). Inter-Commissural Width was measured from the frontal photographs using a computer program 'SIGMA SCAN PRO 5'. In addition, the combined mesiodistal width of maxillary anterior teeth was measured from the casts for each participant using a dental floss. Means and standard deviations were calculated for all the measured variables.

**Results:** The MDW mean was found to be  $52.977 \pm 2.710$  mm, and  $50.517 \pm 2.658$  mm for ICW for the sample, while it was (MDW  $55.013 \pm 2.411$  mm, ICW  $52.473 \pm 2.981$  mm) for males and (MDW  $51.249 \pm 2.814$  mm, ICW  $49.083 \pm 2.097$  mm) for females. There was a significant positive correlation between ICW and MDW ( $r = 0.713$  and  $P < 0.000$ ), but it was weak positive correlation in males and females groups ( $r = 0.451$  and  $r = 0.490$  respectively).

**Conclusions:** A strong association was found between ICW and MDW for the whole sample but it was weak in both males and females groups. The Inter-Commissural Width is a reliable guide to estimate the combined mesio-distal width of the maxillary anterior teeth.

**Keywords:** Mesio-Distal Width, Inter-Commissural Width, Teeth Width Estimation.

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## Introduction

Dental appearance, one important aspect of facial attractiveness, encompasses not only teeth color but also the position, shape, and size and related aspects<sup>1</sup>. When reconstructing maxillary anterior teeth, some parameters could be used to assist in making a treatment plan that corresponds to the expectations of both patients and dental professionals. The art of selecting an appropriate shape of the teeth has high impact in dentistry because it enhances the beauty, restores the facial harmony, and brings psychological comfort to the patients<sup>2,3</sup>.

The selection and fabrication of maxillary anterior teeth must be in proportion with facial measurements, due to their prominent location in the arch when viewed from frontal aspect, to achieve a good esthetic<sup>4</sup>. Many attempts had been made to the use of facial parameters as a guide for selection and arrangement of anterior teeth for removable prosthesis, especially when pre-extraction records are not available. Bizygomatic Width, Inter-Commissural Width (ICW), Inter-Alar Width (IAW), Inner-Canthal Distance (ICD), and Inter-Pupillary Distance (IPD) had been widely used for this purpose<sup>5,6,7,8</sup>.

Al-Wazzan *et al* 1995<sup>9</sup> studied the relationship between some facial measurements (Bizygomatic width, IPD, IAW, and ICW) and MDW, and they found that the investigated facial parameters would not be a reliable guide for estimating the mesio-distal width of maxillary anterior teeth. Also, Al-Wazzan 2001<sup>10</sup> concluded that ICD can be used as a preliminary method for determining the width of the maxillary anterior teeth for edentulous.

El-Sheikh *et al* 1998<sup>4</sup> investigated the relationship between IPD, IAW, and MDW and found that these parameters could be used as a guide for maxillary anterior teeth selection.

Abdullah *et al* 2009<sup>7</sup> studied the relationship of the ICD with the MDW and showed that ICD may be used as an initial predictor to estimate the combined width of the maxillary anterior teeth and serve as a useful additional factor in tooth selection. Al-Wazzan *et al*<sup>4</sup> concluded that ICD can be used as a preliminary method for determining the width of the maxillary anterior teeth for edentulous.

Thalib *et al* 2016<sup>11</sup> concluded in their study that intercommissural width was directly proportional to the mesiodistal width of upper central incisors in Buginese tribe.

Miranda *et al* 2016<sup>12</sup> examined two-hundred individuals to find any correlation between intercommissural width and mesio-distal width of anterior teeth. Finally, they concluded that there is a strong relation between these two parameters.

Parciak *et al* 2017<sup>13</sup> investigated the relationship between the mesiodistal dimensions of the six maxillary anterior teeth and the bizygomatic width, interpupillary distance, intercanthal distance, interalar width, and intercommissural width of individuals of Asian, African-American, and white ethnicities. They did not find any correlation the facial dimensions and mesiodistal dimensions of the six maxillary anterior teeth among the three ethnicities except in Asian women, where the intercommissural width correlated with the width of the central incisor, the width of the two central incisors, the width of the four incisors, and the width of the six maxillary anterior teeth.

Kurt *et al* 2018<sup>14</sup> in their meta-analysis research found that there is little consistency in the selection of the anterior teeth appropriate for the intercommissural width of the individual by the dentist.

Zhuang *et al* 2010<sup>15</sup> studied the difference in facial dimensions between four races and noted that there is statistically significant differences in facial anthropometric dimensions ( $P < 0.05$ ) between males and females, all racial/ethnic groups.

Similarly, Jahanshahi *et al* 2008<sup>16</sup> found a statistical differences in all facial dimensions between Fares and Turkman ethnic groups. Also, there was significant differences between males and females in each group.

The objectives of this study were to investigate any relationship between Inter-Commissural Width (ICW) with the combined mesiodistal width of anterior maxillary teeth (MDW) in a Syrian population and using an existing relationship as a guideline to aid in maxillary anterior teeth fabrication with appropriate shape and dimensions.

## Materials And Methods

A convenient sample of 263 adult Syrians (categorized into 147 males and 116 females) aged 18 - 30 years participated in the study. The inclusion criteria in this study were:

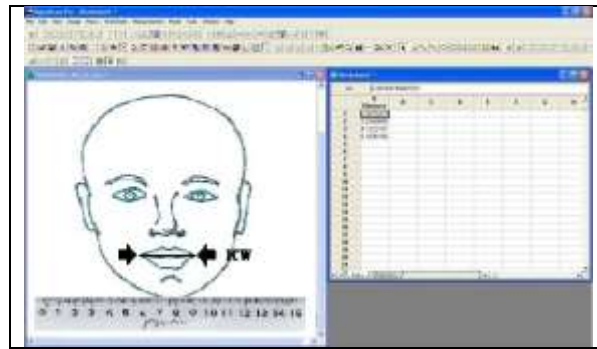
1. Patients with permanent teeth and no history of orthodontic treatment or extraction.
2. All the teeth are morphologically within normal range.
3. Good alignment of maxillary anterior teeth without spacing, missing or overlapping.
4. No proximal caries.
5. No restorations.
6. No abrasion or attrition.
7. No gingival hypertrophy.

Frontal image was taken for each participant using a digital camera.

Special computer software named "SIGMASCAN PRO5" was used to prepare the captured images and allow performing the different facial measurements (Figure 1).

The Camera was fitted on the tripod and the tripod was adjusted so that its head was parallel with the floor and elevated so that the camera opposes the midface region of the seated participant and 60 away from the midface region of the participant for the frontal captures <sup>9, 10</sup>. However, before photography

each participant was asked to remain still and look directly at the lens and the image was captured while the patient says the letter (M) (to make the jaws in the physiological rest position) with the lips closed and relaxed at the moment of image capture.



**Figure (1): Sigmascan Pro5 Interface Window**

Irreversible hydrocolloid impression of maxillary arch for each participant was obtained for each participant and the casts were pored with type (4) dental stone. The circumferential arc distance between the distal surface of the left and right canines was measured

with a dental floss through the contact points of these teeth, it was then sectioned and measured. This parameter was repeated three times and the average value was calculated and recorded for this measurement (Figure 2).



**Figure (2): The circumferential arc distance between the distal surface of the left and right canines**

Statistical Package for Social Science (SPSS) computer software (SPSS 16.0 SPSS Inc., Chicago, USA) was used to calculate mean and standard deviation of each parameter. Also, the correlation between each of the facial measurements and combined mesio-distal width of maxillary anterior teeth was calculated using Pearson correlation coefficient. Finally, a comparison of the results between males and females was performed using student T-Test at 95% confidence interval.

#### **Reliability of the measurements**

In order to test the reliability of the measurements, 10 randomly selected casts and photos were measured by

five dental practitioners within a two-week period. Statistical analysis (ANOVA) revealed no significant differences among different individuals testing the casts and images or between the first and the second measurements made to confirm the reliability of the measurements ( $p > 0.05$ ).

#### **Results**

Table (1) shows that in all the parameters, males exhibited higher values than females. Furthermore, there was a statistically significant difference between males and females in all the measured parameters ( $P < 0.000$ ).

	Total Sample (mm)	Males (mm)	Females (mm)
ICW	50.517±2.658	52.473±2.981	49.083±2.097
MDW	52.977±2.710	55.013±2.411	51.249±2.814

The MDW mean was found to be 52.977±2.710 mm, 50.517±2.658 mm for ICW in the whole sample. While it was (MDW 55.013±2.411 mm, ICW 52.473±2.981 mm) for males and (MDW 51.249±2.814 mm, ICW 49.083±2.097 mm) for females.

Pearson correlation test was conducted to measure the relationship between the inter-commissural width and the combined mesiodistal width of the maxillary anterior teeth. There is a significant strong positive relation between the ICW and the MDW ( $r = 0.713$  and  $P < 0.000$ ) for the whole sample (Table 2) and it could be calculated with the following equation:

$$\text{MDW} = \text{ICW} \times (1.05)$$

		ICW
MDW	Pearson Correlation	.713
	Sig. (2-tailed)	.000

Furthermore, it was found that there is weak positive correlation between MDW and ICW ( $r = 0.451$  and  $P < 0.000$ ) in male group (Table 3), also it was resulted that there is a weak positive correlation MDW and ICW ( $r = 0.490$  and  $P < 0.000$ ) in female group (Table 4).

		ICW
MDW	Pearson Correlation	.451
	Sig. (2-tailed)	.000

		ICW
MDW	Pearson Correlation	.490
	Sig. (2-tailed)	.000

## Discussion

The use of anatomical facial references, such as the ICW; is one of the most methods applied to estimate the ideal maxillary anterior teeth shape and diameter during the fabrication stage. In the present day, dentists are uncertain about the true value of this method due to the lack of data.

In agreement with the present study, most of the studies stated that the mean values of all ICW and MDW measurements are greater for men than women which suggested differences in sex.<sup>1,2,3,4,6,7,8,9,10</sup>

Al-Wazzan *et al*<sup>1</sup> found that the ICW measured 50.79 ± 5.09 mm, 53.51 ± 4.56 mm, and 48.68 ± 4.46 mm for the total sample, males, and females, respectively. This was approximately similar to the measurements of the present study 50.517 ± 2.658 mm, 52.473 ± 2.981 mm, and 49.083 ± 2.097 mm for the whole sample, males, and females, respectively. On the other hand, Al-Wazzan *et al*<sup>1,8</sup> stated that there was no correlation between the ICW and MDW among the tested sample, even when the population was divided according to sex, so the ICW would not be a reliable guide for estimating the combined width of maxillary anterior teeth. In this study, a significant strong relation was found between ICW and MDW ( $r = 0.703$  and  $P < 0.000$ ) for the total sample. Furthermore, this significant relation was also found when separating the sample depending on sex, ( $r = 0.601$  and  $P < 0.000$ ), and ( $r = 0.635$  and  $P < 0.000$ ) for males, and females, respectively.

In agreement to this study, Gomes *et al* 2006<sup>(1)</sup> mentioned that a significant correlation between ICW and the MDW, when observed from the frontal aspect ( $P \leq 0.000$ ).

Also, Sinavarat *et al* 2013<sup>17</sup> also studied 100 Thai subjects and found a correlation between the intercommissural width to the intercanine tip width and the width of the distal surface of the canine.

Miranda *et al* results were also similar to this study where it was observed a strong correlation between intercommissural distance and the mesio-distal width of maxillary anterior teeth.

In a study conducted by Kini *et al* 2012<sup>18</sup> on Indian subjects to investigate the relation between ICW and MDW of the upper teeth it was resulted that there is a relation between these two parameter, and the intercommissural distances with the help of standardized photographs can help us determine the combined widths of the anterior teeth accurately. These conclusions were similar to the ones resulted from Banu *et al* 2017<sup>19</sup> which found a significant correlation between these two parameters also.

Deogade *et al* 2014<sup>20</sup> concluded in their study on 540 Indian persons that intercommissural width could be used as a supportive guide in estimating the mesio-distal width of upper anterior teeth. While, Thalib *et al*

in their study on buginese tribe found no correlation between ICW and MDW of maxillary teeth.

### Conclusions

This study limited itself to a sample consisting of 263 subjects categorized unequally between males and females with the former being the larger of the two. The unequal distributions of participants on the basis of gender appears to be related to the social affairs of a conservative society that makes the number of female participants unsurprisingly smaller than that of male ones, especially when it comes to photography and its ethical concerns.

1. Syrian males and females are different in all of the facial and dental parameters included in this study, with males' parameters significantly higher than females.

2. There was an association between ICW and MDW for the whole sample and it could be calculated with the following equation:

$$MDW = ICW \times 1.05$$

3. This equation could help the dentist to estimate the approximately combined width of maxillary anterior teeth as a first step in building a perfect smile.

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