THE RELATIONSHIP BETWEEN FACIAL REFERENCES AND MESIODISTAL WIDTH OF MAXILLARY ANTERIOR TEETH AMONG SAUDI PATIENTS

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Introduction

Selection of the maxillary anterior artificial teeth, especially the central incisors, represents a primary concern in denture esthetics[1]. Their size, form and color must be in harmony with the surrounding oral and facial environment[13]. The teeth width is considered to be more critical than the length[2]

It is very difficult task to select the proper size of anterior teeth for edentulous patients when no pre-extraction records are available. To have a systemic approach in such cases, several anatomical measurements have been suggested, such as Bizygomatic width, Interpupillary width, Interalar width, and width of the mouth.

Bizygomatic width:

This method is based on the work of Berry[4], Williams[5] and House [6,7] as transitional development of contribution from each one of them. This method was based on the ratio of 1:16 Maxillary incisor width to Bizygomatic width (facial width), and of 1:3.3 Maxillary anterior teeth width to bizygomatic width[8]. Trubyte tooth indicator instrument (Dentsply/Work Division, Dentsply Int'l. Inc., Work, Pa, USA) were designed based on this method.

Some clinicians have questioned the validity of this method[9]. La Vere et al[10,11] presented the work of the student on each other where measurements' of teeth were made on the stone casts of the subject. Trubyte tooth indicator was used to measure the byzygomatic width. They found that only 23% of the subject had the 1:16 ratio and majority of the subject, 53%, had facial width smaller than the central incisor. However, majority of the teeth selected were within a 1 mm difference width of the natural tooth dimensions.

Interpupillary width:

This method is based on the relationship between the interpupillary distance and the mesiodistal width of the maxillary central incisor as suggested and evaluated by Cesario and Latta[12]. They divided the subjects into four cater-

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gories: white male and female, and black male and female. They found that the ratio of 1:6.6 was full within the 95% of three of the four groups while the fourth (black male) the ratio was found to be 1:7.

Interalar width:

Several authors[13-15] have referred to the width of the nose to be used as a guide to select maxillary anterior teeth.

This method is based on locating the tip of the maxillary canine by extending parallel lines from the lateral surface of the alae of the nose on the labial surface of the upper occlusal rim[8,14,15]. Zarb et al[8] criticized, this method since it is not sufficiently reliable for use as the mean for final tooth selection. Smith[16] investigated the validity of this method by using a combination of clinical and radiographic examination of the interalar width and a stone cast for the teeth width. He found no significant relationship between intercanine (tip to tip) distance and interalar width. Mauroskoufix and Ritchie[17] found no relationship between nasal width and the four maxillary incisors. However, they found that 56% of the males and 53% of the females had differences between the intercanine (tip to tip) width and interalar to be less than 2mm.

Mouth width:

This method is based on the hypothesis that the distal surface of the maxillary canines should be approximately located at the corners of the mouth. The traditional clinical approach was to mark the upper occlusal rim at the corners of the mouth while the patient lips are relaxed. The distance between the two marks, measured by fixible ruler and the maxillary anterior teeth was chosen accordingly[8]. Silverman[18] indicated that the distal surface of maxillary canines were 4mm distal or medial to the mouth commissures.

Latta et al[19] evaluated the relationship between these four facial measurements in edentulous patients. They found no correlation between the widths of the subjects as a whole, nor when the subject were subdivided into race and sex groups.

This study evaluated the relationship between these four facial references and the mesiodistal width of the maxillary anterior teeth among Saudi patients.

Materials and Methods:

A total of 439 Saudi patients from Riyadh Saudi Arabia of which 202 (46%) were males and 237 (54%) were females, were randomly selected from the outpatient dental clinic of College of Dentistry and King Abdulaziz University Hospital at King Saud University. Age range of the patients was between 20 and 60 years old, all of whom had maxillary anterior teeth present with no caries, restoration, or severe attrition. Patients with congenital or surgical facial defects were excluded.

Greatest bizygomatic width of each patient was measured by using a face bow and millimeter ruler as suggested by Zarb et al[8]. The rest of the measurements were done with a Boley gauge to the nearest tenth of a millimeter. The Interpupillary distance was measured from midpupil to midpupil, and interalar width was measured by bringing the gauge beak just in contact with the outer surface of the widest point of the alae while the patient was in a relaxed state. The width of the mouth was determined by

measuring the lip vermillion from commissure to commissure while patient's lip was relaxed.

All teeth measurements were made intraorally by using a modified Boley gauge of which the beak was pointed to fit the embrasures. The mesiodistal measurements of the maxillary anterior teeth were recorded at the widest point (contact area).

Three readings for each measurements were taken and the mean of these readings was recorded. The recorded data were statistically analyzed.

Results:

Table 1 shows that the mean value of the measurements are greater for men than women which suggested differences in sex.

The facial anatomical references varied greatly. The bizygomatic width ranged from 99 to 170mm, interpulpillary distance ranged from 43 to 82mm, interalar width ranged from 24 to 62mm, and the width of the mouth measured from 31 to 75mm. Variations remained high even when the population was divided according to sex.

The correlation test was done between these four facial distances and four maxillary anterior teeth measurements. These four teeth measurements were the mean of the two central incisors, the total width of the two central incisors, the total width fo the four incisors (lateral to lateral), and the total width of the six anteriors (canine to canine). The later three measurements was obtained by adding the individual's measured width together.

The correlation test demonstrated no relationship between the four facial distances and any of the four teeth measurements (Table II). There was no relationship existed even when the population was divided according to sex.

Table I
Means Values and Range of Measurements (mm)

	All Subjects	Men	Woman	Minimum	Maximum
Bizygomatic	128.38 ± 9.97	131.78 ± 8.93	125.81 ± 9.98	99	170
Interpupillary	60.92 ± 4.63	61.91 ± 4.02	60.13 ± 4.91	43	82
Interalar	37.59 ± 4.85	39.50 ± 5.07	36.11 ± 4.13	24	62
Mouth	50.79 ± 5.09	53.51 ± 4.56	48.68 ± 4.46	31	75
Central incisor	8.42 ± 0.83	8.61 ± 0.65	6.30 ± 0.60	6.5	13
Two Centrals	16.85 ± 1.56	17.21 ± 1.47	16.39 ± 1.60	12	51
Interlateral	29.93 ± 2.66	30.62 ± 2.77	28.99 ± 2.57	22	22
Intercanine	45.16 ± 3.28	45.16 ± 3.52	43.93 ± 3.22	30	69

± = SD

Table II
Correlation Matrix between Facial References and Teeth Measurements (All Subjhects)

	Central Incisor	The two centrals	Interlateral	Intercanine
Bizygomatic	-0.0285 (0.5530)	-0.0285 (0.5530)	-0.0332 (0.4898)	-0.1125 (0.5189)
Interpupillary	-0.0158 (0.7412)	-0.0158 (0.7412)	-0.0286 (0.5513)	-0.1131 (0.0180)
Interalar	-0.0333 (0.4866)	-0.0333 (0.4866)	-0.0557 (0.2444)	-0.0359 (0.4535)
Mouth	-0.0789 (0.1222)	-0.0789 (0.1222)	-0.0738 (0.1231)	-0.0287 (0.5496)

(.) = P-value for r (correlation)

Discussion:

When there is no pre-extraction record, the selection of the maxillary anterior teeth for edentulous patient will be more difficult. Among the solutions to this problem is the use of anatomical facial references, such as the bizygomatic width, interpupillary distance, interalar width, and the corners of the mouth. Present day dentists are uncertain about the true value of these methods[(10,16,19)]. Zarb et al[(8)] stated, with respect to interalar width, that "this is not sufficiently reliable for use as the means for the final selection". In this study, there was no correlation found between the above mentioned facial widths and the four measurements of the maxillary anterior teeth which are the mean of the two central incisors, the total width of the two central incisors, the total width of the four anteriors (interlateral distance) and, the total width of the six anterior teeth (intercanine distance).

Bizygomatic width:

There was no correlation between the Bizygomatic width and the central incisor width. Only 18% of the subjects had 1:16 proportion, and majority of them (67%) had the bizygomatic width smaller than the width of the central incisors. This results are in agreement with La Vere et al[(10,11)] who found that 23% of the subjects had the 1:16 ratio and the 53% had smaller bizygomatic width.

These results suggested that using facial width as a guide for central incisor selection may result in selecting a larger central incisor. However, the majority (59%) of the teeth select-

ed was within 1mm of the width of the natural tooth and this is also in agreement with La Vere et al[10,11].

Interpupillary distance:

Cesario and Latta[12] found that the ratio 1: 6.6 of central incisor to interpupillary falls within the 95% confidence interval of the mean for three groups out of the four group subjects. In the present study, no such correlation was found. However, 57% was within 1mm of natural tooth width if this method used.

Interalar width:

In concurrence with Mavroskaufis and Ritchie[17], there was no correlation between the intralar width and the four maxillary anterior (lateral to lateral).

Smith[16] found no significant relationship between interalar width and the intercanine distance. On the other hand, Mavroskaufis and Ritchie[17] found some demonstrable relationship where the difference between the interalar width and intercanine distance was within 2mm in 56% of the men and 53% of the women. In both studies the intercanine distances were measured from tip of the canine to tip of the canine. This should help in arranging the teeth rather than selecting them. The suggestion was to position the tips of the canines on the two perpendicular lines drawn from the outer surface of the alae.

In the present study the intercanine distances were measured from distal surface to distal surface of the canines.

Lee[14] indicated that the interalar width was equal to intercanine distance. In the present study only 7% of the subjects had intercanine distance within 1mm of the interalar. Smith[16] found 19% of the subjects were within 0.5mm.

Width of the mouth:

Silverman[18] stated that "the distal surface of the maxillary cuspid is ± 4mm distal or medial to the commissure of the mouth". Only 40% of the subjects in this study had the intercanine distance within 4mm of the width of the mouth which was determined by measuring the maxillary lip vermillion from commissure to commissure.

The results of this study showed that the four investigated facial distances would not be a reliable guide for selecting the maxillary anterior teeth. However, they can be used as inital tentative step, or in combination with each other or with the other means of tooth selection and the final decision should be made during the try-in stage of the denture and to be confirmed by the patient.

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Summary:

A total of 439 Saudi patients were examined to determine if there is a correlation between the width of the maxillary anterior teeth and four anatomical facial references. The bizygomatic width, interpupillary distance, intraalar width and the width of the mouth. All measurements done by using a modified Boley gauge except the bizygomatic which was done by using a face bow. No correlation was found between the measurements for the population as whole, nor when the population was divided accordingly to sex.

العلاقة بين نقاط التحديد الوجهية وعرض الأسنان الأمامية العلوية بين المرضي السعوديين

تم فحص إجمالى عدد ٤٣٩ مريض سعودى لتحديد وجود صلة بين عرض الأسنان الأمامية العلوية مع أربع نقاط تحديد تشريحية وجهيه، وهى العرض ما بين الوجنتين، والمسافة ما بين الحدقتين، العرض بين الجناحين مع عرض الفم.

كل القياسات تمت بإستخدام قياس بولى المعدل بخلاف قياس ما بين الوجنتين فقد تم بإستخدام القدمة الوجهية.

لم يتم إيجاد صلة بين القياسات للسكان ككل ولا حين تم تقسيم السكان تبعاً لنوعية الجنس.