Use of Facial Indicator for Choosing Anterior Teeth

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Abstract

Background : One of the major hurdles in clinical prosthodontics has been the selection and replacement of maxillary anterior teeth in the absence of pre-extraction records. The size of the maxillary central incisor is important since they are the most prominent teeth in the arch. Various methods are used to measure their size, including the size of the face, zygoma and chin to estimate the width and height by using "the facial indicator ".

Objectives : To determine if a relationship exists between intra-oral and extra-oral facial measurements in Arab population (Male) that could assist dental practitioners in selecting maxillary anterior teeth in the absence of pre-extraction records.

Methods : A cross-sectional study design was used with a sample size of 84 participants from Ajman university dental college students who met the inclusion criteria. The width and height of the maxillary central incisors were measured using digital caliper. The facial indicator device used to decide the width and height of the face in an attempt to prove the existence of a direct relationship between the facial sizes ant the size of the natural maxillary central incisors.

Results : Two readings were used and we compared between the two readings, there is slight similarity in the measuring of cast length only. There is slightly good interclass correlation in the cast length in average of two readings. Since p-value is slightly more than (.05) therefore the length of the central incisor on the cast can be determined from the facial length only.

Conclusion : There is a relation between the lengths of the face with the length of the central incisors. Width of the face shows no relation with width of central incisor.

Keywords: Central Incisors; Size; Intraoral; Extra-oral; Landmarks; Teeth; Selection and correlation.

Introduction

One of the major hurdles in clinical prosthodontics has been the selection and replacement of maxillary anterior teeth in the absence of pre-extraction records. The selection of anterior maxillary teeth for prosthesis is carried to achieve pleasing esthetics [1,2]. However, issues associated with matching the anterior dental esthetics arise due to individual anatomical variations. If artificial teeth are selected to resemble their predecessors, patient acceptance is greater and an enhanced esthetic outcome is achieved. Maxillary central incisors are reported to be the most important teeth to satisfy the esthetic requirements of the patient with width being considered more critical than length [3]. Patient complaints primarily involve anterior tooth esthetics and the maxillary central incisor is usually at the center of the complaint. As a result, selecting artificial teeth requires an understanding of both physical and biological factors that are directly related to individual patients' features. Although it is agreed that the clinicians' choice in calculate maxillary incisor width or canine tip to canine tip selecting the appropriate width of artificial anterior distance. As the predictive strength is not strong, the author's maxillary teeth should be based on facial or arch recommends its use as a preliminary guide for determining the width of the maxillary anterior teeth during the initial selection measurements and proportions, there is little agreement of artificial teeth in the absence of pre-extraction records. Between clinicians and few reliable guidelines that exist [4,5].

This clinical study was conducted to determine if a relationship exists between intraoral tooth and arch measurements and extra-oral facial measurements that could assist dental practitioners in selecting esthetically appropriate maxillary anterior teeth in the absence of pre-extraction records [1,2].

Experimental Section (Materials & Methods)

Selection criteria [6-8]

The participants are selected according to the following criteria's:-

1. Complete maxillary and mandibular anterior teeth.

2. No periodontal diseases.

3. No spacing and crowding in anterior maxillary teeth.

4. No history of orthodontic treatments.

5. No intruded, extruded or rotated teeth in the anterior region.

6. Arabian Nationality.

7. Age above 18 years ensuring dental and craniofacial development was completed.

8. No prosthetic appliances or full coverage restorations on labial or occlusal aspects of the six maxillary anterior teeth.

9. Asymmetrical maxillary arch due to previously missing or extracted maxillary teeth, other than maxillary third molars.

Study sample

All fourth and fifth year Arab male dental students (n = 84) in the graduate entry Bachelors of Dentistry program at Ajman University of Science & Technology were invited to participate.

Examiners calibration

Before starting the study, the two principal investigators were calibrated under the supervision of the supervisor on the following measurements:

I. Tooth crown length and width measurement

II. Facial Indicator device measurement

Clinical protocols

Each student received a participant information statement outlining the study information, a questionnaire and a consent form. Ethical approval for the study was obtained from Ajman University of Science & Technology, Human Research Ethics Committee.

Material Selection

Impression

Figure 1: Impression taken for volunteer

Impressions are *negative* reproductions of dental structures. Irreversible hydrocolloid impressions materials were used to obtain an impression of the maxillary arches with stock trays (Figure 1).

Pouring

Poured with Type IV dental stone (Figure 2).

Figure 2: Stone cast for volunteers.

Facial indicator

Measurements of widths and heights of Faces were made directly on participants using the facial Indicator The facial indicator is an analogic instrument that allows to carry the choice out , following the method found starting from J.L. Williams up to E. Pound, which method is part of scientific literature [9,10].

Position of the facial indicator

A. Put the indicator on the patient face anteriorly, the patient's nose should lean on the hole of the indicator (Figure 3).

Figure 3: Position of the facial indicator.

B. Center the upper horizontal black draw in line with hair junction, or first wrinkle, in case of bald patient. Pay attention in case of hair loss in the front area as it can deceive.

C. Place the vertical lateral black line draw in line with the patient's right zygoma.

D. The facial indicator is rightly positioned, pay attention in order not to lose the position during the controls and data research.

Digital caliper

Measurements of widths and heights of the maxillary right central incisors were made on the casts using a precise Digital Calliper read to the nearest 0.01 mm precision. All the measurements were obtained by one person [6] (Figures 4-6).

Figure 4: Digital caliper used in this project.

Figure 5: Measuring width of incisor tooth.

Figure 6: Measuring length of incisor tooth.

The conventional method of estimating the anterior tooth size

Different authors (from Pound as regards the definition method of teeth dimension till more recent confirmation Michigan University 1985 Dr. Brobelth , Maroscufis , Ricci who showed the correctness of the method in more than 80% examined cases), confirmed the existence of direct relationship among some individual facial sizes and the size of the natural central incisor [8,11-15]. It means that even in edentulous case, it is possible to trace, on the patient's face, the data relevant to original shape of the natural teeth, especially for the central incisor .The size choosing, according to E. Pound's method, is based on 2 parameters: the height, measured from hair junction or from first wrinkle to bone symphysis, the natural tooth width is equal 1/16 of the face width, measured between the two check bones (Figure 7).
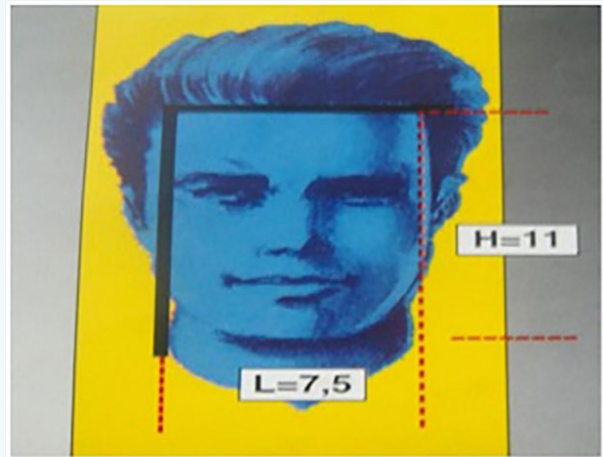

Figure 7: Standard method of using facial indicator.

Results

In this project we measured the length & width of central incisor twice, so to be more accurate in results two readings were used and we compared between the two readings. Table 1 shows the two readings of the cast width & length of 84 participants. We calculate the mean & standard deviation & show the difference between the two readings. Table 2 shows the average between two readings, after we calculated standard deviation we revealed there is slight similarity in the measuring of cast length only. To have a good reliability (the two readings should match each other) the Interclass Correlation Coefficient value should be more than 07. (> 0.5). In the Table 3 for the cast length average measures (.710)+(P < 0.05), so there is slightly good interclass correlation in the cast length in average of two readings. Table 4 indicates the interclass correlation of cast width show value (.335), this value is smaller than (< 0.5) and (p< 0.05) so it is not a good reliability correlation. Table 5&6 compares between the face width & length and cast width & length. Table 5 shows beta value (.207), t-test (1.913) and p-value (.059), since p-value is slightly more than (.05) therefore the length of the central incisor

on the cast can be determined from the facial length. Table 6 shows beta value (.087), t-test (.792) and p-value (.431), since p-value is too much far from the value (.05) therefore it indicates that the width of the central incisor cannot be determined depending on the facial width.

Table 1: Data of cast width and length of the participant.

	Cast length 1	Cast width1	Cast length 2	Cast width2
Mean	9.154524	8.218452	9.07881	8.26619
N	84	84	84	84
Std. Deviation	0.794248	0.562176	0.972746	0.654655

Table 2: Difference in length of the two readings.

	Face length	Face width	cast length	Cast width	difference Length
Mean	11.607	7.738	9.116667	8.242321	2.490476
N	84	84	84	84	84
Std. Deviation	0.4185	0.3512	0.781858	0.472848	0.806963

Table 3: Interclass Correlation Coefficient, length.

Intraclass Correlation Coefficient (length)							
	Intraclass Correlation b	**95% Confidence Interval**		**F Test with True Value 0**			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.550a	0.382	0.684	3.449	83	83	0
Average Measures	.710c	0.553	0.812	3.449	83	83	0

Table 4: Interclass Correlation Coefficient, width.

Intraclass Correlation Coefficient (width)							
	Intra class Correlation b	**95% Confidence Interval**		**F Test with True Value 0**			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.201a	-0.013	0.397	1.503	83	83	0.032
Average Measures	.335c	-0.026	0.569	1.503	83	83	0.032

Table 5: Coefficients cast, length.

Coefficients a cast length						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	4.635	2.345		1.977	0.051
	Face length	0.386	0.202	0.207	1.913	0.059

Table 6: Coefficients Cast, width.

Coefficients a Cast width						
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	7.335	1.147		6.393	0
	Face width	0.117	0.148	0.087	0.792	0.431

Discussion

With respect to perception, the central incisors are the most dominant anterior teeth in the dental arch because they can be seen in their full size [9,16]. Therefore it is essential to estimate the exact size of the maxillary central incisor while fabricating prosthesis for the maxillary anterior segment. Many dental and facial characteristics differ following the geographical location and historical background. Therefore, information regarding tooth norms, size in a group of population is useful to dentist when restoring or replacing teeth. The present study was undertaken primarily to determine as accurately as possible the length of the maxillary central incisors with the help of facial measurements of the distance from the hair line to the base of the chin in the absence of pre-extraction records in a subset of the Arab students of AUST. Determination of a mathematical or geometrical relation between anterior teeth is important to achieve an aesthetic result. It would be helpful if statistically reliable results exist to support exciting theories. In earlier studies, measurements were made using extracted teeth [17,18]. However, recent investigations attempted to measure the clinical tooth dimensions either on casts or using computer-based images or intraoral evaluations [19,20]. In the measurement of the width of central incisor on the cast the two readings were not similar, that is due to a different location selected to position the verner caliper on the tooth, and the Intra class Correlation was (.335). In the measurement of the length of central incisor on the cast the two readings were almost similar; the Interclass Correlation was (.710). From the results of T-test there is statistically significance difference when the P-value is less than (<.05) for the length the T-test value (1.913) and p-value (.059), since p-value is slightly more than (.05) therefore the length of the central incisor on the cast can be determined from the facial length. For example if someone has a long face or high value in facial indicator maybe this indicate that his/her central incisors are also long. About the width the T-test value is test (.792) and p-value (.431), since p-value is too much far from the value (.05) therefore it indicates that the width of the central incisor cannot be determined depending on the facial width. In the present study, limitations such as minor inaccuracies common to the making of dental cast might have affected the measurements. Time constraints and the exclusion criteria restricted the number of volunteers who could be recruited into the study. This study was done on male population, so it will be interesting to find out the relation between the females too.

Conclusion

Based on the results and the limitations of this study we can conclude the following points:

a) There is a relation between the length of the face with the length of the central incisors.

b) Width of the face shows no relation with width of central incisor.

c) From our point of view we advise others who are interested in this topic to take a larger sample size of participant and from different ethnic to achieve high degree of accuracy.

Further Works

The suggesting of future works and improvements that may be in account for this project is to increase sample size, involve more population and nationality, compare our methodology to others methods of recording of length and width.

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Author Contributions

"Ahmed Alsaadi and Mohammed Mahdi conceived and designed the experiments; Ahmed Alsaadi performed the experiments; AhmedAlsaadi and Mohammed Mahdi analyzed the data; Ibrahim almarzooq contributed reagents/materials/analysis tools; Ahmed Alsaadi&Mohammed Mahdi wrote the paper.

Conflicts of Interest

"The authors declare no conflict of interest".

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