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Morphometric analysis of facial landmarks as a guideline for selection of maxillary central incisor

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Abstract

Esthetic dentistry has become a major focus for the public. Facial esthetics, to a large extent depends on the esthetic appearance of the maxillary anterior teeth and The maxillary central incisor in particular holds the key in creating a highly esthetic frontal profile. Estimation of dimensions of anterior teeth for an edentulous patient becomes quite difficult when there is lack of any pre extraction records. In this study two vertical facial measurements, one from pupil of eye to corner of mouth and other from base of nose to base of chin, was compared with the length of central incisor. The present study was conducted over a period of six months in 100 samples aged between 18-28 years divided in to two group and the subjects were selected according to inclusion criteria .In the present study,the mean distance between chin base and base of nose in male and female was 65.5 mm and 59.5mm respectively and the mean of second facial measurement from rima oris to centre of pupil in males and females was 62.39mm and65.56mm respectively. Whereas the mean length of central incisor was found to be 9.94mm in females and 10.72mm in males respectively. Correlation does exist between both the parameters i.e,base of nose to base of chin(mm) and pupil to rima oris(corner of mouth) with the central incisor length which is significant with a p value of <0.001 in this local population. The results of the present study help us to summarize that the two vertical facial measurements can be adopted as an adjunct for the selection of length of maxillary central incisor.

Keywords: Facial measurements, Rima Oris , Pupil ,Base Of Nose ,Base Of Chin, Central Incisor.

Introduction

In recent years, esthetic dentistry has become a major focus for the public. Facial esthetics, to a large extent depends on the esthetic appearance of the maxillary anterior teeth as these are the teeth mostly displayed during the smile[1].Maxillary incisors have a dominant effect in the smile esthetics as they occupy 50% of the apparent dimension of all the anteriors, The maxillary central incisor in particular holds the key in creating a highly esthetic frontal profile and therefore appropriate

selection of the tooth is of utmost importance in the restoration of the anterior segment of teeth in completely or partially edentulous patients.[2]

In this study two vertical facial measurement , one from from pupil of eye to corner of mouth and other from base of nose to base of chin , was compared with the length of central incisor. Here main of this of study was to assess reliability of these two extra oral facial measurements as a parameter in selection of the length of maxillary central incisor. In the absence of pre extraction records, these vertical measurements can aid a clinician in proper selection of size of artificial tooth in both complete and removable partial dentures

Methodology

The present study was conducted in the Department of Prosthodontics and Crown & Bridge. The project was done over a period of six months from November 2017 to May 2018. Institutional Ethical Committee clearance was obtained before proceeding with the study. This study is a Cross sectional study that includes a study population of 100 dentate subjects (50 male & 50 female) based on inclusion criteria were selected for this study. The subjects were selected according to inclusion criteria.

Inclusion Criteria

- Subject from whom informed consent has been taken
- Subjects with full complement of teeth
- Age limit:18-28years9

Exclusion Criteria

- Subjects with missing anterior teeth.
- Subjects having attrition in anterior teeth.
- Subjects with crowding of maxillary anterior teeth
- Subjects having anterior dental restorations.
- Subjects with developmental anomalies..
- Subjects with pathological migration, traumatic occlusion of anterior teeth and periodontal involvement

Armamentarium

- Digital vernier caliper
- Digital camera- Nikon D90SLR
- Tripod stand

Subjects are selected according to the inclusion criteria and proper informed consent are taken.

The following sequences of measurements were recorded on examination of the subjects.

a) Distance from pupil of eye to corner of mouth:

Subject is asked to sit straight facing forward with muscles relaxed so that facial muscles are in an unstrained position .The height of the lens of camera was adjusted on the tripod to match the eye level of the patient maintaining a standardized focus and at a distance of 1.5 meters from each subject who are selected for this study.(figure 1)

b) Distance from base of the nose to base of chin :

This distance was measured using an IP54 digital vernier caliper(model– HZ- S554DCA -1, Hangzhou United Bridge Tools Co. Ltd, China).The subject was seated comfortably on a dental chair in a relaxed state looking forward in an upright position and the distance is measured.Facial photograph were measured and analysed using adobe photoshop CS6,Adobe Systems.(figure2)

c) The length of the maxillary right central incisor:

The distance from the freegingival margin to the incisal edge(clinical crown) of the maxillary right central incisor was measured with the digital vernier caliper.(figure3)

Results and discussion

The relationship between various facial measurements and natural teeth could be used as a reliable guide in selection of maxillary anterior teeth. The size, form and colour of the teeth must be in harmony with the surrounding oral and facial structures.[24]

Generally, facial appearance varies between different ethnic groups. Each racial / ethnic group differs in their facial appearance and anthropometric measurements.

Based on the anthropometric data obtained from a population, selection of teeth for that particular population has to be customized. This study was attempted to investigate the potential relationship between the two vertical facial measurements, one from the base of nose to chin base and other from rima oris to pupil of eye with the length of maxillary central incisor to provide reliable and reproducible guide for the selection of the anterior teeth.

In the present study ,the mean distance between chin base and base of nose in male and female was 65.5 mm and 59.5mm respectively and the mean of second facial measurement from rima oris to centre of pupil in males and females was 62.39mm and65.56mm respectively. Whereas the mean length of central incisor was found to be 9.94mm in females and 10.72mm in males respectively. Correlation does exist between both the parameters i.e, base of nose to base of chin(mm) and pupil to rima oris(corner of mouth) with the central incisor length which is significant with a p value of <0.001 in this local population. The method adopted for distance measurement in our study had the advantage of being a simple chair side procedure and was also less troublesome for the subjects and there was no additional expenditure.

- In group 1MALE
  - The correlation between the parameters Length of central incisor(mm) & Base of nose to chin(mm) shows a Excellent POSITIVE correlation, and is SIGNIFICANT with a p value of <0.001.
  - The correlation between the parameters Length of central incisor(mm) & Pupil to rimaoris (mm) shows a Good POSITIVE correlation, and is SIGNIFICANT with a p value of <0.001.
- In group 2 FEMALE
  - The correlation between the parameters Length of central incisor(mm) & Base of nose to chin(mm) shows a Very good POSITIVE correlation, and is SIGNIFICANT with a p value of <0.001.
  - The correlation between the parameters Length of central incisor(mm) & Pupil to rimaoris (mm) shows a Good POSITIVE correlation, and is SIGNIFICANT with a p value of <0.001.

The Incisal edge of the incisors gradually show attrition with increasing age, as a result of which the clinical crown height decreases. The average age of male subjects in this study was 24.64 years and female was 21.6 years This study excluded samples with significant attrition of incisal edge. Further, age of the sample was limited to 28years which is comparable with the age range of similar reported studies.

The results of present study were:

Males

Length of the central incisor = Measurement of Base of nose to chin (mm) × .231 - 3.792

Length of the central incisor = Measurement of Pupil to rima oris (mm) × .128 + 1.967

Females

Length of the central incisor= Measurement of Base of nose to chin (mm) × .145 + 1.22

Length of the central incisor = Measurement of Pupil to rimaoris (mm) × .092 + 4.714

The findings of present study together with the results of earlier published reports suggest that methods based on the relationship between the anterior teeth and these facial measurements may be used as preliminary guides in estimating the size of the maxillary central incisors in the absence of pre-extraction records in order to ensure acceptable aesthetics.

Limitations

1. Subjects with only class I occlusion was included for study and other types of occlusions were not taken into consideration.

2. Sample size was relatively small

3. Morphologic variations might have influenced the result.

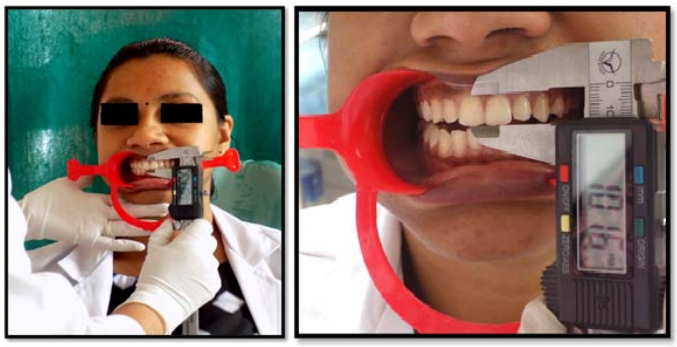


Figure 1: Incisor length measurement using vernier caliper

Figure 2: Base of nose to base of chin measurement using vernier caliper

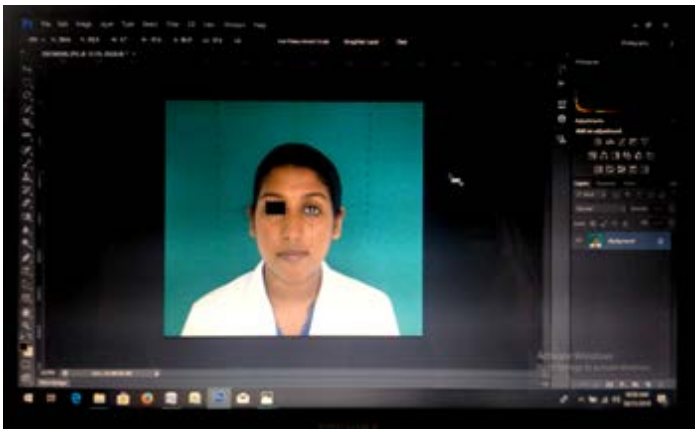


Figure 3: Pupil to rima oris measurement using Adobe photoshop CS6

Table 1: Mean and standard deviation of measurements from base of nose to chin base ,rima oris to centre of pupil and length of central incisor .

Mean and standard deviation of parameters

	gender	N	Mean	Std. Deviation
AGE	FEMALE	50	21.6	2.507
	MALE	50	24.64	2.345
Base of nose to chin(mm)	FEMALE	50	59.5164	3.994835
	MALE	50	65.5	4.277373
Length of central incisor(mm)	FEMALE	50	9.9442	1.099727
	MALE	50	10.72	0.783503
Pupil to rimaoris (mm)	FEMALE	50	62.3962	5.121784
	MALE	50	65.56	4.572143

Table 2: correlation between the measurements from base of nose to base of chin, rima oris to centre of pupil and length of maxillary central incisor

Pearson correlation analysis

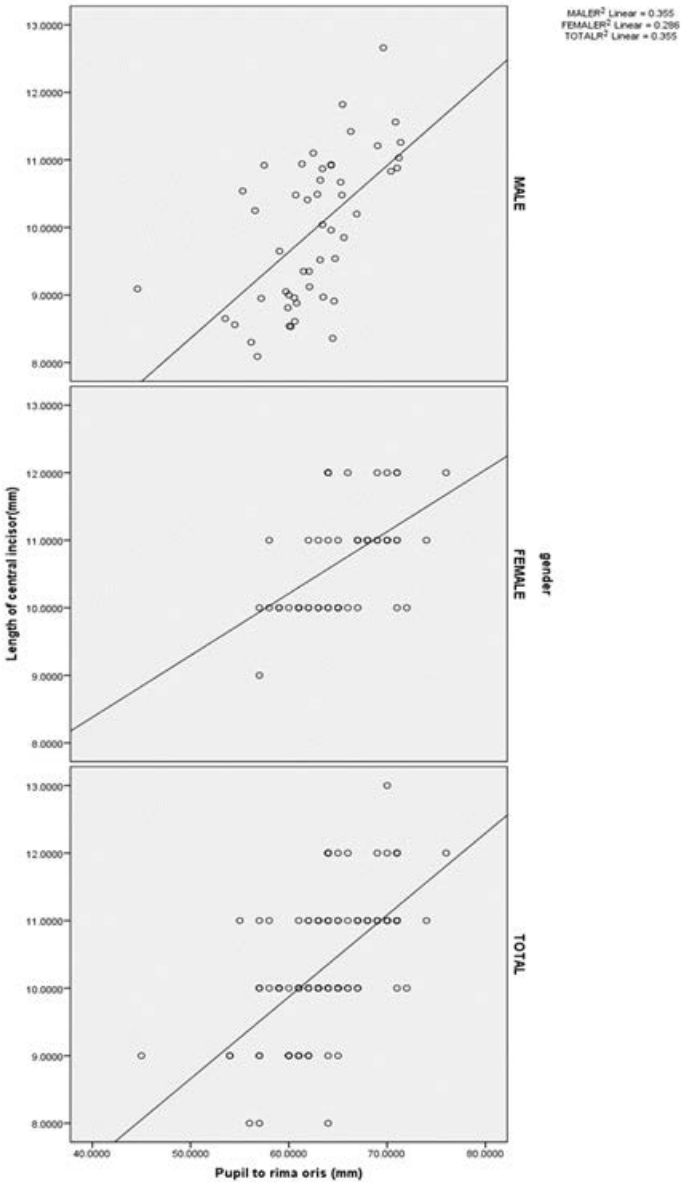
	Sn.	PARAMETERS BEING CORRELATED	N	Correlation(r)	P VALUE
Male	1	Length of central incisor(mm) & Base of nose to chin(mm)	50	0.838	**<0.001**
	2	Length of central incisor(mm) & Pupil to rimaoris (mm)	50	0.595	**<0.001**
Female	3	Length of central incisor(mm) & Base of nose to chin(mm)	50	0.792	**<0.001**
	4	Length of central incisor(mm) & Pupil to rimaoris (mm)	50	0.535	**<0.001**
Total	5	Length of central incisor(mm) & Base of nose to chin(mm)	100	0.797	**<0.001**
	6	Length of central incisor(mm) & Pupil to rimaoris (mm)	100	0.596	**<0.001**

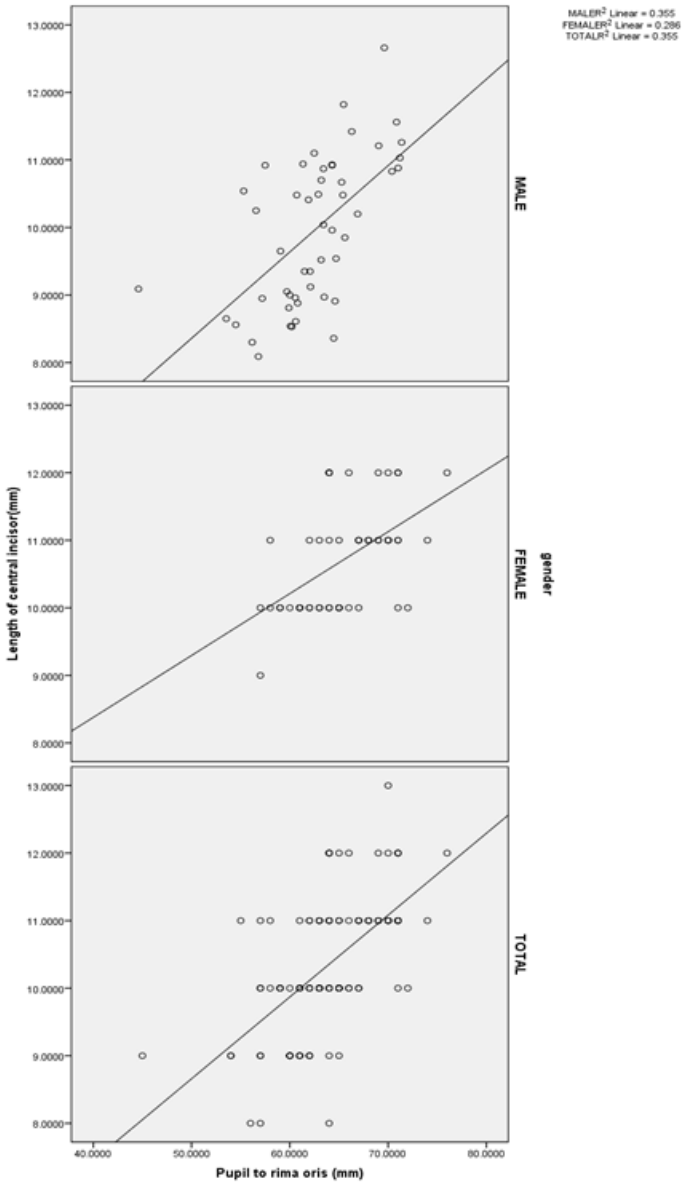
Table 3: Linear Regression Analysis

	Group	R	R Square	Std. Error of the Estimate	Constant	Beta	p value	Equation	
Base of nose to chin (mm)	Male	.83	.70	0.6056	-3.79	0.231	**<0.001**	Length of the central incisor =	-3.79+0.23 (Base of nose to chin(mm))
	Female	.79	.62	0.4836	1.22	0.145	**<0.001**	Length of the central incisor=	1.22+0.14 (Base of nose to chin(mm))
	Total	.79	.63	0.6247	0.28	0.161	**<0.001**	Length of the central incisor=	0.28+0.16 (Base of nose to chin(mm))

		R	R Square	Std. Error of the Estimate	Constant	Beta	p value	Equation	
Pupil to rima Oris (mm)	Male	.59	0.35	0.892	1.96	0.12	<0.001	length of the central incisor	1.96+0.12 (Pupil to rimaoris (mm))
	Female	.53	0.28	0.669	4.71	0.09	<0.001	length of the central incisor	4.71+0.09 (Pupil to rimaoris (mm))
	Total	.59	0.35	0.8300	2.60	0.12	<0.001	length of the central incisor	2.60+0.121(Pupil to rimaoris (mm))

Graph 1





Graph 2

Conclusion

Within the limitations of present study, the following conclusions can be drawn:

1. The correlation between the parameters Length of central incisor (mm) & Base of nose to chin (mm) shows a good POSITIVE correlation, and is SIGNIFICANT.
2. The correlation between the parameters Length of central incisor(mm) & centre of pupilto corner of mouth(mm) shows a good POSITIVE correlation, and is SIGNIFICANT

3. The two vertical facial measurements can be used in the selection of maxillary anterior teeth
4. Comparison of the Length of central incisor(mm) between the two groups shows that Length of central incisor(mm) is higher in MALE group
5. Comparison of the Pupil to rimaoris (mm) between the two groups shows that Pupil to rimaoris (mm) is higher in MALE group
6. Comparison of the Base of nose to chin(mm) between the two groups shows that Base of nose to chin(mm) is higher in MALE group

Hence from above results we can arrive at a conclusion that the two vertical facial measurements would serve as a guide in esthetic enhancement of the maxillary anterior dentition in this local population.

These findings together with the results of earlier published reports suggest that methods based on the relationship between the anterior teeth and certain facial measurements may be used as preliminary guides in estimating the size of the maxillary central incisors in the absence of pre-extraction records in order to ensure acceptable aesthetics.1 However, to further authenticate these results there is a need for larger cross sectional studies.

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