ORIGINAL

Relationship of maxillary anterior teeth and some facial landmarks
Relación de los dientes maxilares anteriores y algunos puntos de referencia faciales

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Abstract

Background/Purpose: The size and shape of teeth is very important and should be beautiful and in harmony with the face components. This study aims to determine the association between the facial features and dimensions of the upper teeth in Iranian population.

Materials and methods: 160 students were selected, (80 male and 80 female), in this cross- sectional survey. Dental and facial dimensions were measured and recorded.Infrmation were analyzed utilizing SPSS 21, and independent t-test and Pearson correlation coefficient.

Results: A direct and significant relationship was observed between the upper central epicocronal height, face length (r=0.314, P<0.001) and mouth width (r=0.166, P=0.036). Also, a direct significant correlation was observed between the upper central mesiodistal width and face length (r=0.244, p=0.002). A direct relationship was observed between the upper anterior arch environment and face length (r=0.415, P<0.001), mouth width (r=0.168, P=0.034), intercanthal distance (r=0.291, P<0.001) and bizygomatic width (r=0.165, P=0.037), which was statistically significant.

Conclusion: Although there are different methods for estimating the teeth size, due to the relationship between some dimensions of the head, face and teeth, these dimensions of the head and face can be used to estimate the dimensions of teeth but most of the available information of facial and dental dimensions and their proportions is related to the other country's statistics, whose population is definitely different from the Iranian population and that there is no complete related information in dental reference books so by use of this study results this method can be used by Iranian dentists.

Key words: Anterior tooth dimensions, facial markers, beauty.

Resumen

Antecedentes/objetivo: El tamaño y la forma de los dientes son muy importantes y deben ser bellos y estar en armonía con los componentes de la cara. Este estudio pretende determinar la asociación entre los rasgos faciales y las dimensiones de los dientes superiores en la población iraní.

Materiales y métodos: En este estudio transversal se seleccionaron 160 estudiantes (80 hombres y 80 mujeres). Se midieron y registraron las dimensiones dentales y faciales, y se analizó la información con el programa SPSS 21, una prueba t independiente y el coeficiente de correlación de Pearson.

Resultados: Se observó una relación directa y significativa entre la altura epicocronal central superior, la longitud de la cara (r=0,314, P<0,001) y la anchura de la boca (r=0,166, P=0,036). Asimismo, se observó una correlación directa y significativa entre la anchura mesiodistal central superior y la longitud de la cara (r=0,244, p=0,002). Se observó una relación directa entre el entorno de la arcada anterior superior y la longitud de la cara (r=0,415, P<0,001), la anchura de la boca (r=0,168, P=0,034), la distancia intercantal (r=0,291, P<0,001) y la anchura bizigomática (r=0,165, P=0,037), que fue estadísticamente significativa.

Conclusiones: Aunque hay diferentes métodos para estimar el tamaño de los dientes, debido a la relación entre algunas dimensiones de la cabeza, la cara y los dientes, estas dimensiones de la cabeza y la cara se pueden utilizar para estimar las dimensiones de los dientes, pero la mayor parte de la información disponible de las dimensiones faciales y dentales y sus proporciones está relacionada con las estadísticas de otros países, cuya población es definitivamente diferente de la población iraní y que no hay información completa relacionada en los libros de referencia dentales por lo que mediante el uso de los resultados de este estudio este método puede ser utilizado por los dentistas iraníes.

Palabras clave: Dimensiones de los dientes anteriores, marcadores faciales, belleza.

Introduction

When anterior teeth are lost for any reason, their replacement by prosthetic and orthodontic treatments is essential in terms of beauty and function. In this case, creating enough space by orthodontic treatment for prosthetic treatments is an important issue. The size and shape of the anterior teeth has played a crucial role the beauty and function of the mouth and face. Therefore, several methods have been introduced to choose the measure of the teeth[1-5]. The appearance of the face created by denture reconstruction is very important for prosthodontists and their patients. Facial beauty is one of the most common reasons why patients seek to replace their missing anterior teeth. On the other hand, one of the reasons for the failure of prosthetic reconstruction is the great importance of beauty in this treatment. One of the most difficult clinical steps in the process of making a proper denture is the determination and substitution of anterior maxillary teeth in lacking of records before tooth extraction. The absence of these records can cause patient dissatisfaction with the beauty of dentures made[6-9]. The size of the upper anterior teeth is necessary to optimize the beauty of the teeth and face, and also their location, shape, and color increase the beauty of the smile. The size, position, shape, and color of the upper anterior teeth are essential for the beauty of the teeth and face, and also these parameters increase the beauty of the smile, so these parameters are of particular importance for the reconstruction of the anterior teeth, although in some cases these parameters are not recorded before tooth extraction[10,11]. Anthropological measurements, including width between two canine tips, bizygomatic width, the distance between two pupils, the distance between interalar, the distance between two canthus, and other anatomical structures are also of great importance for the reconstruction of the anterior tooth[8,9,12].

There are limited scientific criteria in dentistry texts that can provide a general and definitive guide to determine and define the appropriate tooth size. To choose the size of the anterior tooth, in addition to the need for general knowledge, the physical and biological factors related to each patient must also be considered[9,13,14]. One of the critical factors for providing beauty and attractiveness is the proportion, size, shape, and arrangement of the upper anterior teeth, especially the upper central tooth.

The average width of the maxillary central incisor is estimated to be one-sixteenth of the bizygomatic width. The total width of the 6 upper anterior teeth is less than one-third of the bizygomatic width[15-17]. The length of the teeth is determined by the space between the remaining ridges. When there is enough space between the ridges, using longer teeth will decrease the visibility of the prosthetic base and increase the beauty. According to studies, there is a relationship between the size of the face and the height of the crown of the upper central tooth. The height of the upper central tooth is one-sixteenth of the distance between the forehead protrusion and below the chin[17,18]. In general, the information and standards available in the field of selection of upper anterior teeth have been obtained from the Caucasian population and probably do not match the existing population in Iran[8]. Providing the basis for identifying the average racial dimensions of each population, makes it possible to make changes in existing dental generators to provide beauty. Due to the lack of such information in Kerman province, this survey was conducted to determine the association between the dimensions of upper anterior teeth and facial features.

Materials and methods

In this cross-sectional study, size of sample was estimated at least 160 people based on the previous study[6] at the level of 0.05 alpha and power of 80% test . In this study, all 160 students in dental school of Kerman University of Medical Sciences were selected. Inclusion criteria included students in dental school of Kerman University of Medical Sciences students with an age range of 18 to 23 years. The students with any hyperplasia or gingivitis, gingival resorption, gingival surgery, previous reconstructive interventions, diastema, traumatic injury or previous occlusal wear associated with Anterior teeth, malocclusion, or previous orthodontic treatment were excluded. Completed informed consent was gotten from each student. This survey was supervised and affirmed by the Student Research Committee of Kerman University of Medical Sciences (1397-203).

The measured dental dimensions included the mesiodistial width of the upper right central tooth, the epicocronal height length of the upper right central tooth, and the arch circumference from the distal of upper right canine to the distal of upper left one. The dimensions were measured with a digitate caliper with an precision of 0.01 mm. To evaluate the circumference of the arch, a floss was passed through the distal of canines and matched to the arch, and then marked in the contacts area and measured outside the mouth. Dimensions of the face include maximum bizygomatic width (the distance between the outermost points on the zygomatic arches on both sides), the distance between the inner canthus of the eyes, the distance between the corners of the mouth at rest (mouth width), the distance between the two nasal fins (nasal width) and the interval between two points gnathion and nasion (face length). These dimensions were measured directly by a digital caliper while the patient was sitting upright with no head restraints and looking away. To obtain accurate results, each evaluation was performed three times and its average was recorded as the final number. All these measurements were performed by a dentist.

The observations was analyzed by independent t-test, and the relationship between indicators was investigated by Pearson correlation coefficient test. The significance level in this study was considered 0.05.

Result

In this study, 160 participants were studied, (80 male, and 80 female). The mean of all upper anterior teeth dimensions except central mesiodistal width in men was significantly higher than female participants. Although the central mesiodistal width index was higher in male participants, but the results showed no significant difference between groups. Also, men showed significantly more facial dimensions compared with female participants (**Table I**).

A significant and direct relationship was observed between the upper central epicocronal height, face length (r=0.314, P<0.001) and the mouth width(r=0.166, P=0.036), which was statistically significant. also, the relationship between upper central epicocronal height, facial length (r=0.380, P=0.001) and bizygomatic width (r=0.229, P=0.041) was statistically insignificant. in female participants relationship between the upper central epicocronal height with nasal width (r= -0.221, p=0.049) was reverse and insignificant. (**Table II**).

A linear and direct correlation was observed between the upper central mesiodistal width and face length(r=0.244,

p=0.002). In male participants, the relationship between upper central mesiodistal width and face length (r=0.390, P<0.001) was direct and significant. (**Table II**).

A linear and direct significant relationship was observed between the upper anterior arch environment and face length (r=0.415, P<0.001), mouth width (r=0.168, P=0.034), internal canthus distance (r=0.291, P<0.001) and bizygomatic width (r=0.165, P=0.037). In male participants, a linear and significant direct relationship between the circumference of the upper anterior arch and the face length (r=0.547, P<0.001) and intercanthal distance (r=0.341, P=0.002). (**Table II**).

Among male and female participants, the mean ratios of the anterior arch to the nose width, the circumference of the anterior arch to the mouth width, the upper central mesiodistal width to the nose width, the upper central mesiodistal width to the mouth width, the interval from the internal canthus to the nose width, the distance from the internal canthus to the mouth width showed a statistically significant difference. But other ratios did not show significant differences (**Table III**).

Table I: The average dimensions difference between the upper anterior teeth and facial indices based on gender.

Dimension	Male		Female		P
	Mean	SD	Mean	SD	
Upper anterior arch circumference	52.0	3.3	50.8	2.4	0.011
Upper central epicocronal height	9.8	1.0	9.4	1.2	0.013
Upper central mesiodistal width	8.1	0.9	7.8	0.9	0.120
Face length	124.0	6.0	116.9	5.0	<0.001
Nasal width	30.2	3.5	27.2	2.9	<0.001
Mouth width	49.8	3.4	44.5	3.0	<0.001
Intercanthal distance	30.7	3.1	29.6	2.7	0.026
Bizygomatic distance	117.2	5.2	112.1	5.7	<0.001

Table II: Relationship between dental dimensions and facial indicators.

	Face length		Nose width		Mouth width		Intercanthal distance		Bizygomatic distance	
	r	p	r	p	r	p	r	p	r	p
Upper central epicocronal height	0.31	<0.001	0.00	0.959	0.17	0.036	0.03	0.694	0.09	0.271
Upper central epicocronal height (male)	0.38	0.001	0.02	0.853	0.04	0.723	0.13	0.246	0.23	0.041
Upper central epicocronal height (female)	0.13	0.243	-0.22	0.049	0.07	0.543	-0.13	0.243	-0.17	0.140
Upper central mesiodistal width	0.24	0.002	0.02	0.761	0.06	0.434	0.05	0.555	0.04	0.594
Upper central mesiodistal width (Male)	0.39	<0.001	0.07	0.560	-0.04	0.732	0.14	0.214	0.17	0.174
Upper central mesiodistal width (Female)	0.02	0.865	-0.14	0.219	0.00	0.984	-0.10	0.400	-0.17	0.123
Upper anterior arch circumference	0.42	<0.001	0.11	0.154	0.17	0.034	0.29	<0.001	0.17	0.140
Upper anterior arch circumference (male)	0.55	<0.001	-0.07	0.544	-0.02	0.850	0.34	0.002	0.14	0.037
Upper anterior arch circumference (female)	0.09	0.455	0.20	0.070	0.17	0.130	0.15	0.186	0.03	0.203

Table III: Differences in the mean ratios under study by gender.

Ratios	Male		Female		Total		P
	Mean	SD	Mean	SD	Mean	SD	
Upper central epicocronal height to face length	0.08	0.01	0.08	0.01	0.07	0.01	0.370
Upper anterior arch environment to upper central mesiodistal width	6.50	0.61	6.56	0.73	6.52	0.67	0.610
Upper anterior arch circumference to the nose width	1.75	0.23	1.89	0.20	1.81	0.22	<0.001
Upper anterior arch circumference to the mouth width	1.05	0.10	1.15	0.09	1.09	0.10	<0.001
Upper anterior arch circumference to intercanthal distance	1.71	0.18	1.73	0.17	1.71	0.17	0.470
Upper anterior arch circumference to bizygomatic distance	0.44	0.03	0.45	0.03	0.44	0.03	0.051
Upper central mesiodistal width to nasal width	0.27	0.04	0.29	0.05	0.28	0.04	0.003
Upper central mesiodistal width to mouth width	0.16	0.02	0.18	0.02	0.16	0.02	<0.001
Upper central mesiodistal width to intercanthal distance	0.27	0.04	0.27	0.04	0.26	0.03	0.730
Upper central mesiodistal width to bizygomatic distance	0.07	0.01	0.07	0.01	0.06	0.01	0.330
Intercanthal distance to the nose width	1.03	0.14	1.09	0.11	1.06	0.13	0.001
Intercanthal distance to the mouth width	0.62	0.07	0.67	0.06	0.64	0.06	<0.001
Intercanthal distance to bizygomatic distance	0.26	0.03	0.26	0.03	0.26	0.02	0.510

Discussion

Beauty is one of the most important reasons for participants to seek prosthetic treatments. Also, smile is affected personal attractiveness and has a great role in the person's own mood and his social impact[19-21]. Having a beautiful smile directly depends on the condition of the teeth, gums and how they fit with the composition of the face[9,22,23]. The correct choice of the six anterior teeth in terms of size, shape and color are major factors of successful Prosthetic treatment. The harmony of face dimensions, such as the corners of the lips, the filtrum, and the distance between the two nasal fins are more prominent in complete denture treatment. The correct choice is to access to the best dentolabial harmony and the appearance of the face[13,24-26]. This choice is especially difficult when no information is available from the patient's natural teeth[27]. Hayden has been suggested to investigate the correct size of the anterior teeth[28,29]. However, the ratios expressed in different studies are not the same, and the most similarity in the results is related to the ratio between the nose width and the width of the six anterior teeth[30]. Many efforts have been made to investigate the approach to suppose the width of these teeth and the beauty obtained[2,3,9,12,31,32]. In this study, the indices of upper anterior Arch circumference, upper central epicocranal height, upper central mesiodistal width, face length, nasal width, mouth width, internal canthus distance and bizygomatic width between the two sexes were measured. The results showed that the mean of all anterior teeth dimension indices except central mesiodistal width in men was significantly higher than female participants. Although the central mesiodistal width index was higher in male participants, but this difference was not significant. Facial landmarks were also significantly higher in men than female participants.

Based on our results, the relationship between upper central mesiodistal width and gender was not statistically significant. Also, the correlation between the upper central mesiodistal width and the bizygomatic width, the distance between the inner canthus, the mouth and nose width was not statistically significant, but the correlation between the upper central mesiodistal width and the face length was statistically significant. It was further found that the ratio of upper central mesiodistal width to nasal width was 0.28, central mesiodistal width to mouth width was 0.16, upper central mesiodistal width to internal canthus distance was 0.26 and upper central mesiodistal width to bizygomatic width was 0.6. All measured ratios except upper central mesiodistal width to bizygomatic width showed a significant difference between females and males. This ratio was higher in women than men. In Ibrahimagic study, the width of the central tooth was 1.5 mm smaller than similar samples of Western Europeans (average width 7 mm); While in British men, the rate is 8.65, in Chinese society 8.85 and in Africa 9.9 mm[33]. In Lavere study, the average length of the upper central tooth was 8.66 in men and 8.19 in women, and It was a total of 8.46 mm. In some sources, the average length of the right maxillary central tooth is 10.5 mm, and the width of the central maxillary tooth is 8.5 mm[25]. Our results showed that the e width of the right maxillary central tooth was 8.55 mm, which agreed with the results of previous researches. In the Keng study, about 42.8% of the subjects had a central width greater than 9.5 mm, indicating the larger size of teeth[34].

The width of the central maxillary tooth in men and women in this study is similar to the findings of a number of other studies. For example, Pak nahad studied the average mesiodistal width of the central incisor of 100 students of Shahid Beheshti Dental School and 8.58 mm reported for men and 8.23 mm for women[35]. On the Iranian population, the mean obtained in this study was 8.7 mm in men and 8.4 mm in women[35]. Further research, Oshaq et al. Obtained an overall average of 8.4, which is close to the results of this study[14]. These results are different from Memarian and Rostamkhany et al[27, 36]. In the first study, the average width of the upper central tooth in a population of 100 participants referred to Tehran Dental School in the age range of 20-30 years was 8.9 in females and 9.1 in males. The next study was on a population of 100 people who were all men. The age range was 17-37 years; the average was 8.9 for this tooth. This difference can be related to the inequality of the number of samples in terms of gender in these two studies. Owsen et al., by measuring the width of the anterior maxillary teeth in various ethnicities, concluded that despite racial differences, men's teeth are always wider than females[37]. Gillen et al. found that men have wider and longer teeth than women He showed that the difference in the measure of the central teeth and the canine in the two sexes is significant[38]. This case is comparable with the result obtained in the study of Hasanreisoglu et al.[13].

In the present study, the Pearson correlation coefficient test shows that there is no strong relation between interzygomatic distance and the mesiodistal width of the upper central incisor. These results are similar to the findings of Scandrett et al.[39]. In Hasanreisoglu et al.'s study, no relationship was found in men[13]. This will lead to wider teeth selection for the patient. Because the ratio obtained is approximately equal to 1:13; however, the ratio obtained in this study has been confirmed in some studies[24]. In Rawat et al. study, the width of the central maxillary teeth to the bizygomatic width follows a ratio of 1:16[40]. The result of their study on the relationship between the bizygomatic width and the central tooth in two sexes is similar to the present study. However, in our study, the ratio of bizygomatic widthto the width of the maxillary central tooth differed from the normal value, which was also statistically significant. It can be due to the different statistical samples. Their study was conducted in India and the present study was conducted in a population from southern Iran.

In this study, the significant relationship observed between tooth length and gender. Also, the correlation between the upper central length and bizygomatic width, the distance between the inner canthus, and the nose width was not statistically significant, but the correlation between the upper central the face length and the mouth width was statistically significant. There was no significant gender difference in Central epicocronl height. Consistent with the results of the present study in Sadeghi et al.'s 2010 study, no relationship was found between gender and tooth size. In this study, the length of teeth was 9.45 mm in men and 9.16 mm in women[41]. In their study, as in the present study, the length and width of teeth were slightly higher in men than in women. In a 2014 study by Radia et al., The relation between upper central and interzygomatic width was 1:15.56 (1:15.57 in men and 1:15.37 in women) and the relationship between upper central epicocronal height and face height has been achieved 1:17.93(1:17.97 in men and 1:17.89in women)[42].

The intercanthal distance in the present study was 30.14 mm. In the study of Lotfi et al., The average distance between the inner canthos was 32.28 mm (7 m), and Abdullah et al. findings[44] also stated that the average distance of internal canthus was 32 mm, which was very close to the present study. Our finding were lower than the results of Murphy et al.[26], who suggested an average intercantal distance of 33.9 mm, but higher than the results obtained by Freihofer[45]. The ratio between the four measurements of the anterior teeth of the maxilla and the distance of the internal canthus in all samples was very close to the results obtained by Al wazzan et al.[43].

The results showed that the central mesiodistal width to the medial canthus distance was equal to 0.26 and this ratio did not show a significant difference in two genders. Similar to the results of the present study, the width of the central tooth to the distance of the internal canthus in the study of Lotfi et al[46]. Was equal to 0.266, which was calculated in the study of Alwazzan et al.[43] 0.267. In general, it should be noted that the differences between the results of the this study with other may be attributable to genetic variation as well as existing differences, in addition to breeding differences, related to differences in measurement methods. In the reconstruction and replacement of anterior teeth, despite the possibility of using different indicators to select teeth with dimensions close to reality, it should be noted that these indicators should not be the sole owner of the selected teeth. Because people's perceptions of beauty are different and individual and social factors affect it[47]. Therefore, in addition to using the basic principles to make the right choices, social, racial and individual differences of each person should be considered to increase participants' satisfaction with their smiles[48].

One of our limitations is that it is uni-center due to the fact that the dimensions of the teeth are different in different ethnicities; it is better to study the information about students in several provinces in future studies. It is suggested that by collecting the results of other similar studies conducted in Iran and conducting a comprehensive analysis, an effective step be taken in presenting the norms of Iranian society and producing teeth with appropriate dimensions.

Conclusion

Although there are various techniques for estimating the teeth size, due to the relationship between some dimensions of the head, face and teeth, these dimensions of the head and face can be used to estimate the dimensions of teeth but most of the available information of facial and dental dimensions and their proportions is related to the other country's statistics, whose population is definitely different from the Iranian population and that there is no complete related information in dental reference books so by use of this study results this method can be used by Iranian dentists.

Declaration of competing interest
The authors have no conflicts of interest to declare.

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References

1. Arigbede A, Igwedibia P. Size of maxillary anterior teeth in relation to selected facial anatomic landmarks among a group of subjects in port harcourt. Journal of Advances in Medicine. 2016;14(9):1-6.

2. Shetty SK, Malli P, D'Souza J, Shenoy K, Chunduri ST, Fernandes K. Inner Canthal Distance, Inter Pupillary Width, and Golden Proportion, as Predictors of Width of the Maxillary Central Incisors - An In Vivo Study. J Evol Med Dent Sci. 2021;10(22):1650-5.

3. Shammas M, Bukhar EO, Rummani AJ, Almasri AA, Bakhsh DE, Hafiz LO. Evaluation of Relation between Bizygomatic Width and Mesiodistal Dimension of Maxillary Central Incisor in Saudi Population: An In-vivo Study. J Clin Diagn Res. 2020;14(10).

4. Osagbemiro BB, Akadiri OA, Arigbede AO. Patients' attitude towards anterior teeth extraction an prosthetic replacement at the UPTH Dental Center, Port Harcourt. Niger J Med. 2011;20(1):52-6.

5. Naeem S, Hussain MW, Qamar K. The role of the interalar width in the anterior teeth selection. Pakistan Oral & Dental Journal. 2012;32:569.

6. Deogade SC, Mantri SS, Sumathi K, Rajoriya S. The relationship between innercanthal dimension and interalar width to the intercanine width of maxillary anterior teeth in central Indian population. J Indian Prosthodont Soc. 2015;15(2):91-7.

7. Kini AY, Angadi GS. Biometric ratio in estimating widths of maxillary anterior teeth derived after correlating anthropometric measurements with dental measurements. Gerodontology. 2013;30(2):105-11.

8. Ellakwa A, McNamara K, Sandhu J, James K, Arora A, Klineberg I, et al. Quantifying the selection of maxillary anterior teeth using intraoral and extraoral anatomical landmarks. J Contemp Dent Pract. 2011;12(6):414-21.

9. Pierrot KN, Paul SIBJ, Celestin MN, Augustin MM, Joseph LPS, Fidele NBJOJoS. Determinants Factors for the Choice of the Width Prosthetic Upper Central Incisor: Review of the Literature. Open J Stomatol. 2020;10(11):333-40.

10. Hasan AS, Habeeb SH, Qadir AQM, Kazanji M. Relation of Maxillary Central Incisors Width to some Facial Measurements. Journal of Oral and Dental Research. 2017;4(2).

11. de Oliveira Farias F, Ennes JP, Zorzatto JR. Aesthetic Value of the Relationship between the Shapes of the Face and Permanent Upper Central Incisor. Int J Dent. 2010;2010.

12. Majeed MI, Haralur SB, Khan MF, Al Ahmari MA, Al Shahrani NF, Shaik S. An Anthropometric Study of Cranio-Facial Measurements and Their Correlation with Vertical Dimension of Occlusion among Saudi Arabian Subpopulations. Open Access Maced J Med Sci. 2018;6(4):680-6.

13. Hasanreisoglu U, Berksun S, Aras K, Arslan I. An analysis of maxillary anterior teeth: facial and dental proportions. J Prosthet Dent. 2005;94(6):530-8.

14. Oshagh M, Bayani F, Feyzi N. RELATION BETWEEN CRANIOFACIAL DIMENSIONS AND ANTERIOR TEETH SIZE. J Dairy Sci. 2009;27(2(80)):84-93.

15. Shetty K, Kumar M, Palagiri K, Amanna S, Shetty S. Facial measurements as predictors of the length of the maxillary central incisor in a cross section of the Indian population-A clinical study. J Oral Hyg Health. 2013;1(1):1-4.

16. Rahn AO, Ivanhoe JR, Plummer KD. Textbook of complete dentures: PMPH-USA; 2009.

17. Jadhav VV, Vasudevan SD, Kamble R, Tiwari MM. ViVan Formula- A Modified Formula for Estimating the Mesiodistal Width of Maxillary Central and Lateral Incisor. J Evolution Med Dent Sci. 2020;9(14):1144-7.

18. Zarb GA, Bolender CL, Carlsson GE, Boucher CO. Boucher's Prosthodontic Treatment for Edentulous Patients: Mosby; 1997.

19. Jalalian E, Shakeri S, Nasiri A. Evaluation of Relationship between Smile Line and Age. Journal of Kerman University of Medical Sciences. 2004;10(1):43-8.

20. Horn S, Matuszewska N, Gkantidis N, Verna C, Kanavakis G. Smile dimensions affect self-perceived smile attractiveness. Sci Rep. 2021;11(1):2779.

21. Golshah A, Serenjianeh AM, Imani MM. Smile attractiveness of Persian women after orthodontic treatment. Am J Orthod Dentofacial Orthop. 2020;158(1):75-83.

22. Ricketts RM. The biologic significance of the divine proportion and Fibonacci series. Am J Orthod. 1982;81(5):351-70.

23. Marquardt SR. Dr. Stephen R. Marquardt on the Golden Decagon and human facial beauty. Interview by Dr. Gottlieb. J Clin Orthod. 2002;36(6):339-47.

24. Latta GH, Jr., Weaver JR, Conkin JE. The relationship between the width of the mouth, interalar width, bizygomatic width, and interpupillary distance in edentulous patients. J Prosthet Dent. 1991;65(2):250-4.

25. LaVere AM, Marcroft KR, Smith RC, Sarka RJ. Denture tooth selection: an analysis of the natural maxillary central incisor compared to the length and width of the face: Part II. J Prosthet Dent. 1992;67(6):810-12.

26. Murphy WK, Laskin DM. Intercanthal and interpupillary distance in the black population. Oral Surg Oral Med Oral Pathol. 1990;69(6):676-80.

27. Memarian M, Masoomi R. Selection of six anterior teeth for edentulous patients. J Dent Med. 2005;17(4):81-7.

28. Sellen PN, Jagger DC, Harrison A. Methods used to select artificial anterior teeth for the edentulous patient: a historical overview. Int J Prosthodont. 1999;12(1):51-8.

29. Abdullah MA. Inner canthal distance and geometric progression as a predictor of maxillary central incisor width. J Prosthet Dent. 2002;88(1):16-20.

30. Ahmadian L, Arbabi R, Arbabi-Kalati F, Soltani B. Correlation between some facial indexes and mesiodistal width of maxillary anterior teeth. Zahedan J Res Med Sci. 2012;13(8):e93765.

31. Cesario VA, Jr., Latta GH, Jr. Relationship between the mesiodistal width of the maxillary central incisor and interpupillary distance. J Prosthet Dent. 1984;52(5):641-3.

32. Gomes VL, Gonçalves LC, do Prado CJ, Junior IL, de Lima Lucas B. Correlation between facial measurements and the mesiodistal width of the maxillary anterior teeth. J Esthet Restor Dent. 2006;18(4):196-205.

33. Ibrahimagić L, Jerolimov V, Celebić A, Carek V, Baucić I, Zlatarić DK. Relationship between the face and the tooth form. Coll Antropol. 2001;25(2):619-26.

34. Keng SB, Foong KW. Maxillary arch and central incisor dimensions of an ethnic Chinese population in relation to complete denture prosthodontics. Int Dent J. 1996;46(2):103-7.

35. Paknahad H. Evaluation of relationship between size of anterior teeth and facial indexes. MSD thesis. Tehran University of Medical Sciences; 1993.

36. Rostamkhany F, Asadzadeh Aghdaee N, Esmaily H. Evaluation of relationship between length and width of natural maxillary central and lateral incisors, and some measurable parameters of the face. Journal of Mashhad Dental School. 2005;29(Issue):209-14.

37. Owens EG, Goodacre CJ, Loh PL, Hanke G, Okamura M, Jo KH, et al. A multicenter interracial study of facial appearance. Part 2: A comparison of intraoral parameters. Int J Prosthodont. 2002;15(3):283-8.

38. Gillen RJ, Schwartz RS, Hilton TJ, Evans DB. An analysis of selected normative tooth proportions. Int J Prosthodont. 1994;7(5):410-7.

39. Scandrett FR, Kerber PE, Umrigar ZR. A clinical evaluation of techniques to determine the combined width of the maxillary anterior teeth and the maxillary central incisor. J Prosthet Dent. 1982;48(1):15-22.

40. Rawat A, Godbole S, Sathe S, Patidar N, Ramteke S. Evaluation of relation between bizygomatic width and mesiodistal dimension of maxillary central incisor in Indian Population: An in vivo study. Int J Sci Stud. 2015;3(6):38-42.

41. Sadeghi R, Sarlati F, Kalantari S. Relationship between crown forms and periodontium biotype. J res dentillofac sci. 2011;8(1):1-8.

42. Radia S, Sherriff M, McDonald F, Naini FB. Relationship between maxillary central incisor proportions and facial proportions. J Prosthet Dent. 2016;115(6):741-8.

43. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. J Prosthet Dent. 2001;86(6):608-12.

44. Abdullah MAi, Stipho H, Yf T, Khan N. The significance of inner-canthal distance in prosthodontics. Saudi Dent J. 1997;9:36-9.

45. Freihofer HP. Inner intercanthal and interorbital distances. J Maxillofac Surg. 1980;8(4):324-6.

46. Lotfi Kamran Mh, Haghparast - Ghomsheh A. The Relationship between intercanthal dimension and width of maxillary anterior teeth. Journal of Indian Dental Association. 2007;19(3):8-13.

47. Ahmad I. Anterior dental aesthetics: Dental perspective. Br Dent J. 2005;199(3):135-41;quiz 74.

48. Gonçalves LC, Gomes VL, De Lima Lucas B, Monteiro SB. Correlation between the individual and the combined width of the six maxillary anterior teeth. J Esthet Restor Dent. 2009;21(3):182-91.