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COMPARATIVE EVALUATION OF THE MESIODISTAL WIDTH AND SHADE OF SIX MAXILLARY ANTERIOR TEETH IN CENTRAL INDIAN POPULATION

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HOW TO CITE THIS ARTICLE:

Sonika Kankane, Yashshree Sancheti, A. J. Pakhan, Seema Sathe, S. R. Godbole. "Comparative Evaluation of the Mesiodistal Width and Shade of Six Maxillary Anterior Teeth in Central Indian Population". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 11, February 05; Page: 1823-1830, DOI: 10.14260/jemds/2015/260

ABSTRACT: The size, form and color of the teeth must be in harmony with the oral and facial structures. The aim of this study was to measure mesiodistal width and shade of six anterior natural teeth of maxilla in a cross section of Central India population to act as a guide in restoration of anterior teeth in dentulous and edentulous patients. These readings were taken from 100 males and 100 females. The mean mesio-distal width and difference of each tooth on both side, combined mean mesio-distal width and difference of both side, most common shade of each tooth and difference of shade on both sides were estimated. It was observed that there is variation in mesiodistal width in right and left sides signifying that the anterior teeth are not mirror images of one another. Male subjects have greater mesiodistal width than females and right side dominates than left side.

KEYWORDS: Mesiodistal width, anterior teeth, shade selection, artificial teeth.

INTRODUCTION: Face is the most expressive part of human body as it determines an individual's identity. In today's world, looking good is a primary concern, as beauty in health is the 'new mantra'. The focus of dentistry in the present times is not only on prevention and treatment but on meeting the demands for better esthetics. Thus, dentistry has evolved from a curative to a creative science.

The loss of teeth affects the facial appearance. Proper placement of tooth should be functional and esthetically pleasing. The size and form of the anterior teeth are important to not only dental esthetics but also are part of facial esthetics. It is a matter of great concern, when planning treatment to replace anterior teeth. The selection and arrangement of anterior teeth for edentulous patients has remained a challenging experience, especially when no pre-extraction records are available. Since it is difficult to establish firm, scientific rules or laws of esthetics for teeth arrangement, there must be blending of art and science of prosthodontics.

The introduction of Dentogenic concept by Fisher and Frush has made the selection of teeth more appropriate with respect to sex, personality and age of the patient. The size, form and color of the teeth must be in harmony with the oral and facial structures. The width of the teeth is considered more critical than the length. It has been observed in various studies that there is variation in mesiodistal width of the right and left side signifying that the anterior teeth are not mirror images of one another. The artificial teeth available in the market do not differ in size for right and left sides and there is no variation for male and female subjects.

In addition, there is no change in the shade of all the anterior teeth. These both factors play a major role in imparting 'denture look' to the prosthesis. Most studies done in this area do not include the population of Asia and India, one of its largest countries and no studies on measurements of tooth size and shade have been made on the Central Indian population. The aim of this study was to measure the mesiodistal width and shade of six anterior natural teeth in maxilla in a sample of Central Indian population.

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MATERIALS AND METHODS: This study was conducted on students and patients reporting in the outpatient department of Sharad Pawar Dental College and Hospital and Acharya Vinobha Bhave Rural Hospital, Sawangi, Wardha (M. H.) A total of 200 subjects, out of which 100 males and 100 females in the age group of 18–25 years, having normal occlusion, without crowding, rotation and spacing were selected. Those excluded were subjects with anterior teeth fractures, congenital or acquired maxillofacial defects, attrition, any missing anterior tooth, microdontia or macrodontia. Impressions of maxillary arches were made using standard protocols and according to manufacturer's recommendations using irreversible hydrocolloid impression material (Tropicalgin, Zhermack).

Impressions were poured with Type III dental stone (Kalstone, Kalabhai, Mumbai) immediately. After one hour casts were recovered and were numbered in serial order according to group i.e., Group A (Males) and Group B (Females). On each cast, a line was drawn perpendicular to long axis of the tooth in the maximum tooth contours of the teeth between a line parallel to occlusal and labial surfaces.

The mesio-distal widths were measured using digital vernier caliper (Aerospace) (Fig. 1). The measurements were taken by three observers from the casts (Fig. 2) and were recorded on a tabular chart sheets having all the details of each subject of both groups with measurement for each tooth, difference of the three teeth of one side from the other, combined width of the three teeth 11, 12, 13 and 21, 22, 23 and the difference of the combined widths of both the sides.

Shade of each tooth 11, 12, 13 and 21, 22, 23 of every subject was determined by using Vitapan Classical Shade guide for incisal 3rd and body portion (Fig. 3). Shade selection was done under natural daylight by two operators. Tabular chart sheets also included shade column for each of the six teeth.

RESULTS: By subjecting the data to descriptive analysis, it was noted that the mesiodistal widths of the maxillary anterior teeth were different in males and females (Table 1, Graph 1). It was also noted that there was variation in the mesiodistal width of right and left side, with more difference seen in males. The maximum variability of 0.32% between right and left side was found in maxillary central incisor in males. Thus the combined mesiodistal widths of 11, 12, 13 and 21, 22, 23 were also different both sides in males and females (Table 2 & 3, Graph 2).

The most common shade and its percentage in central incisor, lateral incisor and canine of right side and left side have been shown in Table 4 and 5 respectively.

DISCUSSION: Variations in every individual lead to characteristic appearance as mentioned by Young.^[1] The tooth size standards based on odontometric investigations can be used in age and sex determination. Most studies done in this area do not include Asia and India even though they form largest population as compared to other ethnic groups, no measurements of tooth sizes and shades have been made on the Central Indian population. So a study was planned to measure the mesiodistal width of six anterior natural teeth and also investigated variations in the size of left and right maxillary anterior teeth and differences between men and women. Krajicek.^[2] in 1969 stated that out of the two proportions width and length, width has been considered the most important. Tooth selection is usually based on the premise that teeth are identical on each side of the dental arch,

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which is not the case in the natural dentition.^[3] In the matter of size of the teeth, commonly sets of comparative sizes decided by the manufacturers are accepted.^[4]

The mesiodistal diameter of maxillary central incisor according to standard textbooks is 8.5mm^[5] and 8.6mm^[6] and it has been observed from past literature that varies from 8.36 to 9.33mm^[7-11] in different ethnic groups of Caucasian, Ohio, American, American Negroes, Saudi, Mongoloid and North Indian population. Not much has been mentioned about right and left side, but the literature states that there is definitive difference between both the sides. In the present study, the mean right maxillary central incisor width in male subjects was 8.78mm whereas it was 8.46mm for the left side. Similarly, the mean mesiodistal width of right maxillary central incisor in female subjects was 8.08mm whereas it was 7.95mm for the left side.

It was found that the right maxillary central incisor was bigger than the left side with a difference of 0.32mm in males and 0.13mm in females. As stated by Garn et al., the mean values of teeth on either side of midline are within ± 0.3 mm, confirming that bilateral symmetry is not consistent on individual or group basis. Wazzna^[12] stated that a difference of up to 1 mm between right and left maxillary central incisor is considered normal in appearance. However, women provided a greater index for identical incisors and a decrease in dissimilar teeth.^[13]

The mesiodistal diameter of lateral incisor according to standard textbooks is 6.5 mm and 6.6 mm.^[5,6] Studies done by various authors^[7-9,11,13] vary between 6.32 and 7.61 mm in male subjects. In this study, the mesiodistal width of maxillary right lateral incisor in male subjects was found to be 7.25 mm whereas it was 6.94mm for the left side. The difference in right and left side was 0.31 mm in the present study in contrast of literatures varying in the range -0.02 to 0.02 mm. Various authors have mentioned the range in female subjects varying between 6.45 and 6.95 mm.^[5,7,9,14] In this study, the mesiodistal width of maxillary right lateral incisor in female subjects was found to be 6.62mm whereas it was 6.54mm for the left side. In female subjects, the mean difference in right and left side is 0.08mm in the present study and from various literatures is 0.04 mm approximately.

The mesiodistal width of maxillary canine according to standard textbooks is 7.5 and 7.6mm.^[5,6] The mesiodistal width of right and left maxillary canine of male subjects in present study is 8.22 and 7.97 mm, respectively. The mesiodistal width of maxillary right canine is closer to 8.04 mm mentioned by Lennart and Nils^[9] and on the left side is closer to 7.96 mm mentioned by Garn et al.^[13] The difference in right and left side in the present study is 0.25 mm. In female subjects, the mesiodistal width of right and left maxillary canine in present study is 7.76 and 7.64 mm, respectively. It varies in the range 7.50 ± 0.53 and 7.67 mm on right side and 7.44 ± 0.55 and 7.64 mm on left side as suggested by various authors. The difference in right and left side in the present study was 0.12mm and from previous studies as 0.06–0.03 mm approximately.^[9,12,13]

The standard textbooks also do not mention difference in size between male and female and between right and left side. This variation in readings is one of the reason we face problems in selection of teeth for removable prosthesis. Male subjects have greater mesiodistal width than female subjects this depends largely on genetic predisposition. In the present study, male subjects show greater variability. Lennart and Nils^[9] stated that boys exhibit greater mesiodistal diameter and greater tooth size variability in 20 out of 28 permanent teeth. From the present study also, it was seen that male subjects have larger values than female subjects and that right side is greater than left side. The sex difference in tooth size may be taken as an estimate of the magnitude of the chromosomally-determined and Y influenced size difference.

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Another factor that must be considered during selection of anterior or fabrication of anterior restoration is shade. Patients generally emphasize on the esthetic excellence in anterior restoration and to satisfy their esthetic needs, Selection of appropriate shade and color matching to the natural dentition is critical. Appearance is of great concern to both, the dentist as well as the patient. The results of this study highlight the shade variation seen in different location in the maxillary teeth. In this study, it was observed that the commonest shade for incisal 1/3rd of maxillary incisors was A2 in males for right and left side. Nevertheless, the commonest shade for the incisal portion was A1 for both sides in females. For males, the most common body shade was A3 followed by B2 for the right side and B2 followed by A2 on the left side. However, it was B2 which was more consistent in females in body portion of both the sides.

This shows that the incisal 1/3rd is lighter than the body portion and females have lighter shade than males. This pattern was also observed in canines, which was A3 being the most common shade for incisal 1/3rd in males on the right side whereas, it was A2 for the left side. The commonest shade for body portion in males was A3.5 for both the sides. In females, most frequently observed shade for the incisal portion of the maxillary canine was A2 for both the sides, whereas the body portion shows A3 as the most common shade for right side and A3.5 for the left side. The findings of the study also suggest that the rural procedure of matching uniform shade in a complete denture anterior setup is not desirable as shown in the study.

There is a shade variation within the upper anterior teeth, likewise the canines are darker than the rest of the anterior teeth. This information should be incorporated in the prosthesis. The procedure of selecting one uniform shade should be avoided but rather select different shades for the incisors and canines. Therefore, this observation would particularly useful on the shade selection for the young edentulous patients. This would also break the monotony of having a monochromatic shade distribution in complete denture.

CONCLUSION: The present study was undertaken in a sample of Central Indian population to determine the mesiodistal width of six anterior natural teeth in maxilla. It was observed that there is variation in mesiodistal width in right and left side signifying that the anterior teeth are not mirror images of one another. The artificial teeth in market also do not differ in size for right and left sides and there is no variation for male and female subjects. This is one of the major factors leading to artificial look in prosthesis. The finding of the present study indicates that male subjects have greater mesiodistal width than female subjects. Right side dominates in most of the readings indicating that mesiodistal width is greater on right side than on left side.

Overall least variability was seen in female subjects. Maximum variability of 0.32% between right and left side was found in maxillary central incisor. The findings of the study also suggest that there is shade variation between the maxillary anterior teeth and thus this information should be incorporated in the prosthesis. This study can prove helpful in replacement of artificial teeth of prosthesis in Central indian population in a better way.

ACKNOWLEDGMENTS: We would like to acknowledge Dr. Samrat Mankar and Dr. Mahesh Bagrecha for their timely help and guidance.

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GROUP	Mdw 11	Mdw 21	Diff in Mdw 11 & 21	Mdw 12	Mdw 22	Diff in Mdw 12 & 22	Mdw 13	Mdw 23	Diff in Mdw 13 & 23
Male	8.78	8.46	0.32	7.25	6.94	0.31	8.22	7.97	0.25
Female	8.08	7.95	0.13	6.62	6.54	0.08	7.76	7.64	0.12

Table 1: Mean mesiodistal dimensions of 11, 12, 13 and 21, 22, 23, the total and differences of each tooth on both the sides and combined mesiodistal widths

(Mdw Mesiodistal width; 11 maxillary right central incisor; 21 maxillary left central incisor; 12 maxillary right lateral incisor; 22 maxillary left lateral incisor; 13 maxillary right canine; 23 maxillary left canine.)

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GROUP	Total Mdw 11, 12, 13	Total Mdw 21, 22, 23	Diff in 11, 12, 13 & 21, 22, 23	Mean Mdw
Male	24.25	23.37	0.88	47.62
Female	22.46	22.13	0.33	44.59

Table 2: Difference in combined mesiodistal widths in males and females

Mean Mdw Males	Mean Mdw Females	Diff	Mean Mdw Males (right side)	Mean Mdw Females (right side)	Diff	Mean Mdw Males (left side)	Mean Mdw Females (left side)	Diff
47.62	44.59	3.03	24.25	22.46	1.79	23.37	22.13	1.24

Table 3: Difference in Mean Mesiodistal Width (mm). Combined Mesiodistal Width on Right and Left side of group I & II

Group	11		12		13	
	MCS	%	MCS	%	MCS	%
Group I (Male)	I - A2 B - A3	I - 37 B - 36	I - A2 B - B2	I - 30 B - 29	I - A3 B - A3.5	I - 28 B - 30
Group II (Female)	I - A1 B - B2	I - 39 B - 38	I - A1 B - B2	I - 28 B - 32	I - A2 B - A3	I - 36 B - 33

Table 4: The most common shade and its percentage in central incisor, lateral incisor and canine of right side in subjects

(MCS – most common shade, I-Incisor 3rd, B-Body)

Group	21		22		23	
	MCS	%	MCS	%	MCS	%
Group I (Male)	I - A2 B - B2	I - 28 B - 32	I - A2 B - A2	I - 36 B - 31	I - A2 B - A3.5	I - 23 B - 32
Group II (Female)	I - A1 B - B2	I - 33 B - 29	I - B1 B - B2	I - 27 B - 35	I - A2 B - A3.5	I - 39 B - 32

Table 5 - The most common shade and its percentage in central incisor, lateral incisor and canine of left side in subjects

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Graph 1: Mean mesiodistal dimensions of 11, 12, 13 and 21, 22, 23 in male and female subjects:

Fig. 1: Vernier caliper

Fig. 2: Measurement of maxillary teeth using Vernier caliper

Fig. 3: Shade selection

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Date of Submission: 03/01/2015.
Date of Peer Review: 04/01/2015.
Date of Acceptance: 27/01/2015.
Date of Publishing: 04/02/2015.