

**Original Article****An analysis of the correlation between mesiodistal width of the maxillary and mandibular anterior and posterior teeth in Iranian population**Houman Zarakani<sup>1</sup>, Azade Tadayon Fard<sup>1</sup><sup>1</sup>Department of Prosthodontics, Dental School, Shahid Beheshti University of Medical Sciences, Tehran, Iran<sup>1</sup>Department of Prosthodontics, Dental School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

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**ABSTRACT**

**Background and objective:** Many authors have emphasized the difficulty of choosing suitable replacement teeth for edentulous patients and arranging these teeth in a natural way. In dentures, mesiodistal width of anterior teeth is the most important factor, because complete denture will not be able to provide a real appearance if artificial teeth are too small. For obtaining proper occlusion, maxillary and mandibular teeth must be proportional in size. The purpose of this study is to determine correlation between the average mesiodistal width of posterior teeth and anterior teeth.

**Materials and methods:** The sample consisted of 40 pairs of study casts of both jaws with normal occlusion (50% male and 50% female; aged 18-26). The mesiodistal width was measured directly on plaster models by use of a digital caliper (Mitutoyo, Tokyo, Japan) at the widest level of proximal contact area of the teeth. Measurements were repeated 1 day and 1 week later. Data was analyzed using SPSS 10 (Statistical Package for Social Sciences SPSS Inc., Chicago, IL). Mean and standard deviation values were calculated for each variable. Comparisons between female and male samples were made for each variable using Student's t-test.

**Results:** The mean value for the mesiodistal width ratio of upper anterior to posterior sextant was calculated for female and male samples ( $1.38 \pm 0.1$  and  $1.36 \pm 0.07$  respectively). The mean ratio for mesiodistal width of lower anterior to posterior sextant was calculated for female and male samples ( $1.00 \pm 0.05$  and  $1.02 \pm 0.05$ , respectively).

**Conclusions:** the ratio of mesiodistal width of anterior teeth to posterior teeth can be used as a guideline for choosing correct artificial teeth for partially edentulous patients.

**Keywords:** Mesiodistal width, Posterior teeth, Anterior teeth, Dentures

**INTRODUCTION**

Many authors have emphasized the difficulty of choosing suitable replacement teeth for edentulous patients and arranging these teeth in a natural way. Error in this stage often leads to rejection of otherwise well-made, comfortable and efficient teeth [1]. Therefore, one of the most important considerations in prosthetic treatments is to make dentures with good appearance.

In most cases, the artificial teeth are smaller and whiter than natural teeth [2]. In choosing the tooth size, mesiodistal width is more important than the crown length [3]. In dentures, the mesiodistal width of the anterior teeth is the most important factor, because complete dentures will not be able to provide a real appearance, occlusion and function if artificial teeth are too small [4, 5].

There are several different methods to determine the size of teeth, particularly anterior teeth; however, in posterior regions, inadequate methods used to predict the tooth size could eventually lead to in favorite appearance, speech and function in dentures [6]. For obtaining proper occlusion, maxillary and mandibular teeth must be proportional in size; otherwise, occlusal relationships could not be possible [7]. This is particularly important for partially edentulous patients who have got most of their teeth extracted. Partially edentulous patients may still have a number of anterior and posterior teeth in one or both jaws. It is very important to choose the correct size of artificial teeth considering the size of the remaining teeth besides the posterior to anterior teeth ratio.

There is a dearth of information on the relationship between the size of anterior teeth and posterior teeth in both jaws which could be used as a guideline for choosing the correct artificial teeth,

particularly for partially edentulous patients. Few methods used to choose posterior teeth simply focus on the amount of available space, rather than occlusal relationships and dental ratios of an individual patient. The purpose of this study is to determine the correlation between the average mesiodistal width of posterior and anterior teeth.

## MATERIALS AND METHODS

In this study, the sample included 80 casts of upper and lower jaws of patients with normal occlusion. 80 Out of 177 dental students (50% female and 50% male, aged 18-26) of Shahid, Beheshti Dental School were randomly selected in 2012-2013.

**Exclusion criteria** included patients undergoing orthodontic treatment, history of orthodontic treatment with extraction of permanent teeth, extraction history except the third molar tooth, extensive direct restorations or complete or partial coverage indirect restorations, severe crowding, and dental anomalies in form, structure and size. Prior to impression taking, consent was obtained from all participants. Impressions were taken by use of prefabricated metal trays and irreversible hydrocolloid impression material (Hydrogum, Zhermack and Padua, Italy). Then, the impressions disinfected in 2% sodium hypochlorite solution for 10 minutes and casts were made within 15 minutes of impression with Stone type III (Type III dental stone, Pars Dandan, Iran). After 24 hours, mesiodistal width was measured directly on the casts for all the teeth from the right to the left second molars of both jaws for both genders using an electronic digital caliper ( Mitutoyo, Tokyo, Japan) with precision 0.01 mm at the widest level of mesial and distal contact areas of each tooth perpendicular to the longitudinal axis. Measurements were repeated one day and one week later for all teeth and the mean value of these three measurements considered as the final amount.

**Statistical analysis** was done using SPSS 10 (Statistical Package for Social Sciences SPSS Inc., Chicago, IL). The mean and standard deviation values were calculated for each variable. Differences between the genders were compared for each variable using Student's t-test.  $p < 0.05$  considered as the statistically significance level for the results.

## RESULTS

This study was conducted on 80 samples (50% female and 50% male, aged 15-26). Table 1 lists the descriptive statistics for the average mesiodistal

width of upper and lower posterior teeth in right and left and anterior sextants of dental arches and also anterior to posterior sextant ratio for both genders. Although in most cases, teeth in the left sextant were larger than the right sextant, there was no significant difference between the mesiodistal width of upper posterior teeth in the right and left sextants in both genders ( $P = 0.27$  and  $P = 0.19$ , respectively). Moreover, there was no significant difference between mesiodistal width of lower posterior teeth in the right and left sextant in both genders ( $P = 0.7$  and  $P = 0.3$ , respectively). Therefore, the ratios were calculated using the values obtained for the right upper and lower sextant.

**Table 1: Mesiodistal width of teeth in the upper and lower right and left posterior sextant and anterior sextant of dental arches and anterior to posterior sextant ratio for both genders**

Dental Arch	Gender	No.	Anterior sextant (Mean $\pm$ SD)	Posterior sextant (Mean $\pm$ SD)	Sextant Left (Mean $\pm$ SD)	Anterior to posterior ratio (Mean $\pm$ SD)
Upper Jaw	Female	40	44.7 $\pm$ 4.59	32.51 $\pm$ 3.37	32.71 $\pm$ 3.11	1.38 $\pm$ 0.1
	Male	40	46.04 $\pm$ 2.55	33.79 $\pm$ 1.45	33.85 $\pm$ 1.43	1.36 $\pm$ 0.07
Lower Jaw	Female	40	34.75 $\pm$ 3.11	34.83 $\pm$ 2.66	34.83 $\pm$ 2.66	1.00 $\pm$ 0.05
	Male	40	35.93 $\pm$ 1.97	35.24 $\pm$ 1.41	35.23 $\pm$ 1.31	1.02 $\pm$ 0.05

The mean ratio of mesiodistal width of upper to lower anterior sextant was calculated for female and male samples ( $1.29 \pm 0.06$  and  $1.29 \pm 0.10$ , respectively).

In this study, the mean values for the upper central incisor mesiodistal width were calculated for female and male samples ( $8.38 \pm 0.83$  and  $8.60 \pm 0.66$ , respectively). Moreover, the mean values of mesiodistal width for lower central incisor were calculated for female and male samples ( $5.24 \pm 0.71$  and  $5.29 \pm 0.30$ , respectively). In addition, the mean ratio of mesiodistal width of upper to lower central incisor was calculated for female and male samples ( $1.61 \pm 0.14$  and  $1.63 \pm 0.16$ , respectively).

The mean mesiodistal width ratio for the upper anterior sextant to the upper central incisor was

calculated for female and male samples ( $5.33 \pm 0.29$  and  $5.35 \pm 0.25$ , respectively). The mean ratio for mesiodistal width of upper posterior sextant to the upper central incisor was calculated for female and male samples ( $3.82 \pm 0.26$  and  $3.95 \pm 0.32$ , respectively). The mean ratio of mesiodistal width for the lower anterior sextant to the upper central incisor was calculated for female and male samples ( $4.16 \pm 0.24$  and  $4.2 \pm 0.4$ , respectively). The mean ratio of mesiodistal width of lower posterior sextant to the upper central incisor was calculated for female and male samples ( $4.17 \pm 0.25$  and  $4.12 \pm 0.36$ , respectively).

## DISCUSSION

One of the most common prosthetic errors is to use very small artificial teeth, leading to no favorite appearance. In choosing the tooth size, mesiodistal width is more important than the crown length [3]. The purpose of this study is to determine the correlation between mesiodistal width of posterior and anterior teeth as a guideline for choosing the correct size of artificial teeth for partially edentulous patients.

Mesiodistally, men have larger teeth than women in both anterior and posterior sextants. This finding is consistent with many other studies [8, 9, 10]. In another study, a difference was observed in the size of the teeth in both total mesiodistal width ratio and the anterior teeth ratio in people with normal occlusion [11].

In our study, Mesiodistal width of the upper central incisor was 8.5 mm [12] and 8.6 mm [13]; according to literature, this value ranged from 8.36 to 9.33 mm in different ethnic groups [14-18]. The values obtained in this study for both genders are consistent with the values reported by Julian WB et al [13].

Mesiodistal width of the lower central incisor was 5.0 and 5.3 mm [12, 13]; according to literature, this value ranged from 5.39 to 5.83 mm in men [14, 16]. The values obtained in this study for both genders are consistent with the values reported by Julian WB et al [13].

In this study, mesiodistal width ratio of upper to lower anterior sextant was determined to be 1.29 for both genders; this finding is consistent with the values obtained by Pamecha et al in a similar Indian population [19].

This study has some limitations; for example, mesiodistal width was measured directly on plaster models in which human error is possible and also errors in measurement may occur due to expansion

of the model. The sample size was relatively small and participants were only selected from people with normal occlusion; Moreover, different studies used various methods and levels of measurement on teeth; therefore, caution is required generalizing the results. Further studies are required for patients with other occlusal relationships and malocclusions and different ethnicities to determine the relationship between posterior and anterior teeth.

## CONCLUSION

Within limitations of this study, mesiodistal width ratio of anterior to posterior teeth can be helpful as a guide for choosing the correct artificial teeth for partially edentulous patients. Since there is no significant difference in the mesiodistal width of posterior teeth on the right and left sides, the size of the right teeth can be helpful in choosing the correct size for the left artificial teeth and vice-versa.

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