Short Communication

Analysis of Width/Length Ratios of Normal Clinical Crowns of the Maxillary Anterior Dentition: Correlation Between Dental Proportions and Facial Measurements

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This study aimed to determine how facial measurements explain the variability of dental proportions. The following measurements were obtained from 90 subjects: width and length of each maxillary anterior tooth, length of the nose, length of the upper lip, facial length (including the lengths of the facial thirds), intercanthal width, interalar width, intercommisural width while smiling, and maximum central incisor exposure while smiling. The combination of all facial measurements explained the variability of maxillary anterior teeth width/length ratios by only 20% to 38% in men and 16% to 27% in women. Within the population tested, the results suggest that the use of facial measurements for the selection of artificial denture teeth is generally inaccurate. *Int J Prosthodont 2007;20:313–315.*

One difficult aspect of complete-denture prosthodontics is the selection of appropriately sized maxillary anterior teeth. Various guidelines have been suggested for determining the size of the teeth, but different opinions have been reported regarding their significance.[1,2] These guidelines include bizygomatic, intercommisural, interalar, interpupillary, and intercanathal width, as well as nose length.[1,3,4] Latta et al[3] suggested the use of more than one facial measurement to estimate the dental width.

The aim of this study was to examine the relationship between facial measurements and the proportions of the maxillary anterior teeth, and to identify facial measurements that significantly explain the variability of dental proportions.

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Materials and Methods

A total of 90 Caucasian subjects participated in the study (35 men, mean age 23 years; 55 women, mean age 22 years). The exclusion criteria in the study were: gingival hyperplasia, inflammation, altered passive eruption, attachment loss, gingival recession, periodontal surgery, prior restorative intervention, prior traumatic injury or occlusal wear into dentin on maxillary anterior teeth, dental malocclusion, or prior orthodontic treatment.

All measurements were performed using a caliper (model CD-6", Mitutoyo) with a precision of 0.01 mm. Each parameter was measured 3 times, and the average value was recorded. One operator performed all of the measurements.

The widest mesial-distal portion and the longest apical-coronal portion of each maxillary anterior tooth were measured on the dental casts, and the width/length ratios (WLRs) (%) were calculated.

The facial dimensions were measured on the subjects, who were seated at an upright position and asked to look straight ahead. The following measurements were obtained: the length of the face; lengths and the upper, middle, and lower thirds of the face; length of

Table 1 Differences in Dental Proportions and Facial Measurements Between Genders

	Men		Women				
	Measurement	SD	Measurement	SD	*t*	*df*	*P**
Central incisor WLR (%)	82.885	7.955	84.252	7.049	-0.853	88	NS
Lateral incisor WLR (%)	78.064	10.623	79.281	7.579	-0.634	88	NS
Canine WLR (%)	81.227	7.856	82.099	7.224	-0.54	88	NS
Face length (cm)	18.7214	1.1636	17.728	1.0807	4.126	88	.0001
Length of upper third of the face (cm)	5.4509	0.6784	5.3109	0.8458	0.824	88	NS
Length of middle third of the face (cm)	6.4069	0.4254	6.122	0.3158	3.638	88	.0001
Length of lower third of the face (cm)	6.8637	0.5774	6.2951	0.3772	5.167	52.536	.0001
Upper lip length (cm)	2.2286	0.1935	2.0367	0.1925	4.6	88	.0001
Intercommissural width (cm)	6.7434	0.5398	6.3411	0.4535	3.808	88	.0001
Maximum incisor exposure while smiling (mm)	7.593	2.167	8.158	1.884	-1.308	88	NS
Nose length (cm)	4.998	0.364	4.6331	0.295	5.218	88	.0001
Interalar width (cm)	3.3931	0.3753	3.0204	0.2736	5.442	88	.0001
Intercanthal width (cm)	1.541	0.14	1.531	0.213	0.245	87.852	NS

*Significance set at $P < .01$.
WLR = width/length ratio; NS = not significant.

Table 2 Multiple Regression Analysis of the Association Between the Width/Length Ratios (WLRs) of Maxillary Anterior Teeth and Facial Dimensions in Men and Women

	R		R^2		*P*		SE	
	Men	Women	Men	Women	Men	Women	Men	Women
Central incisor WLR	0.615	0.462	0.379	0.213	> .05	> .05	7.314	6.85
Lateral incisor WLR	0.56	0.515	0.313	0.265	> .05	> .05	0.444	7.118
Canine WLR	0.444	0.404	0.197	0.163	> .05	> .05	8.21	7.239

the nose; intercanthal and interalar width; length of the upper lip, intercommissural width while smiling, and maximum central incisor exposure while smiling. The same operator repeated all measurements after 1 week, and none of the measurements displayed significant systemic errors (error = $\sqrt{sd^2/2n}$).

The data were analyzed with SPSS 10.0 statistical software (SPSS). Paired *t* tests were used to compare the dental measurements on both sides of the maxillary dental arch ($P < .05$). An independent *t* test was used to compare the mean values of WLRs and all facial measurements between genders ($P < .01$). Multiple regression analyses were used to evaluate the relationship of the facial measurements and each maxillary anterior tooth proportion in men and women.

Results

No statistically significant difference was found between the measurements on both sides of the maxilla ($P > .05$), and the mean values for maxillary anterior teeth were used in further statistical analyses.

The mean facial measurement and dental proportion values between genders are shown in Table 1. A comparison of the WLRs between genders showed no significant differences ($P > .05$).

The face length, lengths of the middle and lower thirds of the face, upper lip length, intercommissural width, nose length, and interalar width were significantly associated with gender ($P < .01$) (Table 1).

In a multiple regression analysis, the combination of all facial measurements in men explained the variability of the WLR by only 38% for central incisors, 31% for lateral incisors, and 20% for canines ($P > .05$) (Table 2). In women, the combination of the same facial measurements explained the variability of the WLR by only 21% for central incisors, 27% for lateral incisors, and 16% for canines ($P > .05$) (Table 2).

Discussion

Many attempts have been made to establish methods for estimating the size of artificial teeth for edentulous subjects.[2] Various facial measurements have been proposed as guidelines for determing tooth size.[1,3]

To the authors' knowledge, no study exists reporting an analysis of 10 facial measurements that could explain the WLRs of maxillary anterior teeth. In this study, the facial measurements explained only 16% to 37% of the variations in the WLRs of maxillary anterior teeth in both genders ($P > .05$). These results are in agreement with those of Latta et al,[3] who also found

no significant correlation. Varjao and Nogueira[1] reported a weak correlation between the distance between the canines and the distance between the corners of the mouth in 4 racial groups. Sellen et al[5] also reported an insignificant correlation between the face, tooth, and arch forms. Therefore, artificial tooth selection using these facial measurements as a guideline must be considered unreliable.

Conclusions

There is no universally reliable method for using facial measurements to determine artificial denture teeth size. The clinical examination in prosthodontic treatment should focus on each patient's individual appearance, as well as on the patient and prosthodontist's opinions regarding the relationship between dental esthetics and overall facial esthetics.

References

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