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RESEARCH ARTICLE

CORRELATING THE CURVE DISTANCE BETWEEN THE DISTAL OF THE CANINES TO THE COMBINED WIDTH OF THE SIX ANTERIOR TEETH WHEN SELECTING THE DENTURE TEETH DEPENDING UPON THE GENDER OF THE PATIENT

Monica S. Bharati, Kishor M. Mahale, Shankar P. Dange and Smita A. Khalikar

Department of Prosthodontics Crown and Bridge, Government Dental College and Hospital, Aurangabad.

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ABSTRACT

Background: Selection of Anterior teeth of complete Denture is selected based on curve distance (CD) of wax rim, but is there any correlation between curve distance (CD) and Combined Width (CW) Values for selection of denture teeth depending upon gender of the patient. **Objective:** The purpose of this study was to investigate whether the curve distance between the distal surfaces of maxillary canines (CD) is related to the combined width of the 6 anterior teeth (CW) when clinicians select denture teeth for patients depending upon the gender of the patients. The null hypothesis tested was that CD and CW measurements would not be correlated in male and female patients. **Methods:** One Hundred and Sixty dentate patients were selected in this study (80 male, 80 female), age ranges from 18-25 years old. The impression of the maxillary arches was made with irreversible hydrocolloid (chromatic alginate impression material, Tropicalgin, Zhermack) and poured in Type IV stone (Kalrock, kalabhai, Class IV dental stone). The width of each maxillary anterior tooth and the curve distance was measured on the casts at the widest surfaces of the tooth with a digital sliding caliper (Zhart Digital Vernier Caliper). The normality of numerical data was checked using the Shapiro-Wilk test. **Result:** CD and CW values was higher in males as compared to females. From the linear correlation measurement between CD and CW values, the linear regression equation obtained for male ($CD = 7.271 + 1.056 \times CW$) and Female ($CD = 6.701 + 0.935 \times CW$). **Conclusion:** The curve distance between distal surfaces of the maxillary canines can be accurately related to the combined width of 6 anterior teeth when selecting the denture teeth for either male or female patients.

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INTRODUCTION

One of the primary concerns in the fabrication of complete dentures is the selection of maxillary anterior teeth that satisfy aesthetics (Fabiana, 2012; Mavroskoufis, 1981; Scandrett, 1982). When the pre-extraction records are not available, the selection of denture teeth with correct size becomes difficult. If the width is to be determined by measurements, the occlusion rims should be contoured for aesthetics and the measurements made around the curve of the labial surface of the occlusion rim. A procedure that can develop reference points on the occlusion rim, consists of dropping a perpendicular from the ala of the nose to the labial surface of the upper occlusal rim on each side. Then a measurement from one point to the other around the curve will approximate the width of the six teeth (Wehner, 1967). Most of the manufacturers of denture teeth provide the mold charts with

the measurements of the 6 anterior teeth as if they are arranged in a straight line and few of them provide the measurement on a straight line as well as on curve (Al Wazan, 2001; Sears, 1938; Clapp, 1955; Grave, 1987). These discrepancies generate confusion and errors during the selection of the appropriate size of teeth. Thus, it is necessary to convert the flat measurement to a curve or vice versa accurately. Some studies suggested that the curve measurement between the distal surfaces of the canines can be converted to the combined width of the 6 anterior teeth by subtracting 4 mm to 7 mm from the curve measurement (Wehner, 1967; La, 1994) but the concern is the selection of denture teeth depending upon the gender of the patient using the curve distance (CD) and combined width (CW) Values. So, the purpose of this study was to investigate whether the curve distance between the distal surfaces of maxillary canines (CD) is related to the combined width of the 6 anterior teeth (CW) when clinicians select denture teeth for patients depending upon the gender of the patients. The null hypothesis tested was that CD and CW measurements would not be correlated in male and female patients.

*Corresponding author: Monica S. Bharati

Department of Prosthodontics Crown and Bridge, Government Dental College and Hospital, Aurangabad.

MATERIALS AND METHODS

One Hundred and Sixty dentate patients were selected in this study (80male, 80 female), age ranges from 18-25 years old. The sample size was determined based on a power analysis, 80 % confidence level, 5 % α error. The inclusion criteria were used to select the individuals: all maxillary anterior teeth present without other developmental defects, anterior teeth without any dental restorations, absence of crowding, spacing, incisal wear, periodontal condition. The impression of the maxillary arches was made with irreversible hydrocolloid (chromatic alginate impression material, Tropicalgin, Zhermack) and poured in Type IV stone (Kalrock, kalabhai, Class IV dental stone). The width of each maxillary anterior tooth was measured on the casts at the widest surfaces of the tooth with a digital sliding caliper (Zhart Digital Vernier Caliper). Two scalpel blades were adopted on the intenal edges of the caliperbeaks to facilitate proper fit in the embrasures. The combined width (CW) of the 6 anterior teeth on a straight line corresponded to the sum of the width of each anterior tooth. The curve distance (CD) between the distal surfaces of the canines was measured on the casts by using dental tape (Oral-B Satin Tape) placed at the greatest curvature of the arch then measured with the caliper. The most prominent portion of the facial surfaces of the anterior teeth determined the greatest curvature, simulating the clinical measurement made along with the wax occlusal rim. The same examiner performed all measurements, which were repeated 3 times. The average of 3 measurements was used in the analyses of this study. The normality of numerical data was checked using the Shapiro-Wilk test & was found that the data followed a normal curve; hence parametric tests have been used for comparisons. Intergroup comparison (2 groups) was done using the t-test. Bivariate correlation was done using Pearson's correlation test.

RESULTS

Intergender comparison for CD and CW values (Table 1) showed a statistically significant difference seen for the values between the groups ($p < 0.01, 0.05$). CD and CW values was higher in males as compared to females. From the linear correlation measurement between CD and CW values, the linear regression equation obtained for male ($CD = 7.271 + 1.056 \times CW$) and Female ($CD = 6.701 + 0.935 \times CW$) Table 2(a) & (b). For all the statistical tests, $p < 0.05$ was considered to be statistically significant, keeping α error at 5% and β error at 20%, thus giving a power to the study as 80%. * = statistically significant difference ($p < 0.05$); ** = statistically highly significant difference ($p < 0.01$); # = non significant difference ($p > 0.05$) ... for all tables.

DISCUSSION

As per the results found in this study, the null hypothesis that CD and CW measurements would not be correlated was rejected. A clear relationship between the CD and CW measurements was observed in male and female groups studied. Clinical studies concerning teeth and other anatomic landmark measurements imply subjective measurements, which could influence the results. Although this represents one limitation of this study, the result of this study indicates that from the CD measurement, CW can be accurately calculated for either female or male patients. As results found in the current study CD values are much more in a male patient as compare to females. One can successfully apply the results obtained for linear regression equation to individualize the association between the curve and straight measurements for a given patient according to the CD Measurements, linear regression for Male $CD = 7.271 + 1.056 \times CW$; Female patient ($CD = 6.701 + 0.935 \times CW$).

Table 1. Intergender comparison for CD and CW

	Sex	N	Mean	Std. Deviation	Std. Error Mean	T value	the p-value of the t-test
CD (mm)	M	80	53.91	2.388	.267	16.332	.000**
	F	80	47.10	2.867	.321		
CW (mm)	M	80	44.183125	1.9575447	.2188602	2.525	.013*
	F	80	43.227000	2.7644320	.3090729		

Table 2(a) Dependent Variable: Males CD (mm)

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.749	232.796	1	78	.000	7.271	1.056

CD: Curve Distance (mm); CW: Combined Width of six maxillary anterior teeth.
 The independent variable is Males CW (mm).
 If we know one of the variables, we can predict the value of the variable by this equation
 $CD = 7.271 + 1.056 \times CW$, Where CD is the dependent variable and CW is the independent variable

Table 2(b): Dependent Variable: Females CD (mm)

Equation	Model Summary					Parameter Estimates	
	R Square	F	df1	df2	Sig.	Constant	b1
Linear	.812	337.429	1	78	.000	6.701	.935

CD: Curve Distance(mm); CW: Combined Width of six maxillary anterior teeth.
 The independent variable is Females CW (mm).
 If we know one of the variables, we can predict the value of the variable by this equation
 $CD = 6.701 + 0.935 \times CW$
 Where CD is the dependent variable and CW is the independent variable

Literature shows that the inter-alar nasal width is a reliable guide for selecting the mold of anterior teeth, the mesiodistal width of the set of anterior teeth should be determined by adding 7 mm to the patient's nasal width.² Some manufacturers also use this approach when providing measurement on a straight line and a curve. In Previous studies, generally suggest that CW value can be calculated by subtracting few millimeters from CD.¹ Present study shows the range which needs to subtract from the CD to get CW also differs in a female and male patient, For male patients that number ranged from 5-7 mm while for the female patients it is 3-5 mm.

While selecting the teeth set for the female patient is a task, because generally, they are more concerned about their appearance. The size and shape differ in a female patient as compared to a male patient. Although there is a difference in characteristics of male and female patients, the result obtained confirm that sexual variations exist and that should be considered while selecting the teeth size for edentulous patients.

Conclusion

Within the limitation of this study, data suggest that the curve distance between distal surfaces of the maxillary canines can be accurately related to the combined width of 6 anterior teeth when selecting the denture teeth for either male or female patients.

Conflict of Interest and Funding Statement: Non Declaired.

Key points: Selection of maxillary anterior teeth, Curve Distance(CD), Combined Width(CW), most prominent portion of facial surfaces.

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