ORIGINAL RESEARCH

Comparison of Anterior and Posterior Teeth Dimensions between Artificial Teeth and Natural Dentition - An in-vivo Study

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ABSTRACT

Background: The aesthetic and functional aspects of artificial tooth selection are pivotal for an individual's quality of life, a skill paramount to every prosthodontist. It gives a pleasing, expressive and confident life to the patient.

Aim: This study aimed to juxtapose the dimensions of natural maxillary and mandibular anterior and posterior teeth with those of three commercially available denture teeth brands: Acryrock, Biorock, and Ivoclar Vivadent, taking into account gender variations

Materials and methods: Dentate casts from 23 males and 77 females were scrutinized for length and width of the natural anterior and posterior teeth dimensions. These measurements, collected by a single examiner employing a digital vernier calliper and flexible ruler, were subsequently compared to the specifications provided in the respective denture teeth mold charts. like Acryrock, Biorock, Ivoclar vivadent. The dimensions thus obtained are compared between the three systems of artificial teeth and natural teeth for selecting the best system of artificial teeth for complete denture prosthesis.

Results: The study revealed that all three artificial teeth systems matched the width of natural maxillary anterior teeth. However, only the Ivoclar Vivadent teeth set closely resembled the dimensions of mandibular anterior and posterior teeth, as well as maxillary posterior teeth, across both genders.

Conclusion: The findings confirm the feasibility of employing natural teeth dimensions to determine the size of anterior and posterior artificial teeth for complete denture prosthesis fabrication, providing a statistically and mathematically supported approach.

Key words: artificial teeth, aesthetics, complete denture, dentulous subjects, mesiodistal width, prosthesis.

INTRODUCTION

According to Young, "it is apparent that beauty, harmony, naturalness and individuality are major qualities of esthetics". The available Prosthodontic literature lacks evidence, methods, and tools to choose the suitable dimension, and choosing a teeth set with the right artificial molds is alsoconfusing.[1] The function and comfort of the patients are increased when a complete denture is built with the proper knowledge and information. The choice of teeth will improve the patients' look and social well-being in order to meet their aesthetic needs.[2] For a successful fabrication of a complete denture prosthesis, teeth should be chosen that complement the patient's face, sex, and age in terms of color, form, and size. Teeth setting should be accomplished such that they occlude and articulate uniformly with intraoral and circumoral muscle action.[3] The primary consideration for patients undergoing complete denture treatment is aesthetics. The dental literature had scientific data for selecting teeth of proper size and shape.[4] The dentist does not frequently choose the posterior teeth, but the posterior teeth must fit the patient's function and facial appearance. The posterior teeth should be chosen and placed in the neutral zone in accordance with the patient's mouth musculature.[5] This study was conducted in the department of Prosthodontics at J. K. K. Nattraja Dental college and Hospital to determine the better type of commercially available artificial teeth whose dimensions closely match with the natural teeth dimensions. The artificial teeth selected for this study are from three different

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companies namely Ivoclar Vivadent, Acryrock, and Biorock. The hypothesis tested was that which commercially available teeth dimension closely resembles the natural teeth dimensions.

OBJECTIVES OF THE STUDY

1. To investigate the dimensional discrepancies between natural teeth and artificial teeth offered by Ivoclar Vivadent, Acryrock, and Biorock.
2. To identify the best artificial mold of commercially available denture teeth that matches the dimensions of natural teeth
3. To determine the applicability of natural teeth dimensions as a standard measure for selecting anterior and posterior artificial teeth.

MATERIALS AND METHOD

The subjects were included based on the criteria having 1) 28-32 teeth, 2) no abnormal mobility, 3) no systemic diseases 4) no growth disorders and exclusion criteria were 1) history of orthodontic treatment, 2) wearing any fixed or removable prosthesis and based on that criteria 77 female dentate subjects and 23 male dentate subjects within 18-20 years of age group were selected. The impression was made with irreversible hydrocolloid impression material and cast pouring was done using Type IV gypsum product. A vernier caliper was used to measure the mesiodistal dimensions of individual teeth and readings were tabulated. Similarly measurements were made from commercially available artificial teeth mold namely Acryrock (Ruthinium) , Biorock(Brulon) and Ivoclar Vivadent (Ivostar &Gnathostar) . The same examiner has measured all the casts to avoid errors and measuring and readings were documented. The derived results were subjected to statistical analysis and results were obtained.

SAMPLE SIZE CALCULATION

The sample size was calculated using G*Power software and total sample size was 99.

Total sample size taken=100

Sample collection: Simple random sampling selection method
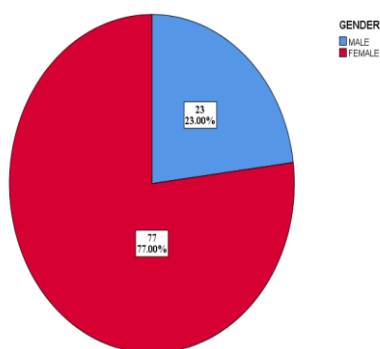
IEC approval no:JKKNDC/IEC/MDS-01/2023

Figure 1: Distribution of study subjects based on gender
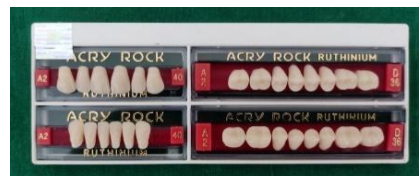

Figure 2: Ivoclar Vivadent

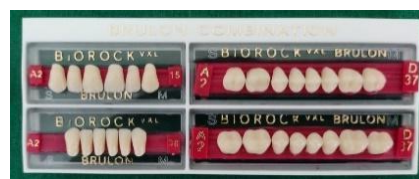*Figure 3: Acryrock*

Figure 4: Biorock VXL

Figure 5: Width of natural teeth measured in the cast using digital calliper

STATISTICAL ANALYSIS

The statistical analysis was done using a test of normality using the Kolmogorov Smirnov test and comparison was done using the Independent t test.

RESULTS

All the parameter values of natural teeth dimensions obtained from dentulous casts of males were significantly higher when compared with females. The average dimensions of maxillary anterior natural teeth presented with 42.04mm for females and 42.38mm for males which closely matches with the average value of maxillary anterior denture teeth molds of Acryrock(42.3mm), Biorock(42.3mm) and Ivoclar Vivadent(42.3mm). The average dimensions of mandibular anterior natural teeth presented with34.48mm for females and 35.86mm for males which closely matches with the average value of mandibular denture teeth molds of Ivoclar vivadent for females(34.5mm) and males(36.0mm).The average values of maxillary posterior natural teeth for females(31.62mm) and for males(32.41mm) which closely matches with the average value of

maxillary posterior teeth molds of Ivoclar Vivadent

	GENDER	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
MAX CENTRAL INCISOR	MALE	.231	23	.003	.891	23	.016
	FEMALE	.143	74	.001	.951	74	.006
MAX LATERAL INCISOR	MALE	.173	23	.072	.902	23	.028
	FEMALE	.178	74	.000	.932	74	.001
MAX CANINE	MALE	.176	23	.061	.950	23	.298
	FEMALE	.156	74	.000	.948	74	.004
MAX ANTERIOR MEAN	MALE	.140	23	.200*	.970	23	.684
	FEMALE	.091	74	.200*	.982	74	.358
MAX FIRST PM	MALE	.224	23	.004	.920	23	.068
	FEMALE	.226	74	.000	.913	74	.000
MAX SEC PM	MALE	.261	23	.000	.863	23	.005
	FEMALE	.208	74	.000	.884	74	.000
MAX FIRST MOLAR	MALE	.181	23	.050	.922	23	.073
	FEMALE	.150	74	.000	.956	74	.011
MAX SEC MOLAR	MALE	.319	23	.000	.823	23	.001
	FEMALE	.117	74	.014	.968	74	.060
MAX POSTERIOR MEAN	MALE	.122	23	.200*	.962	23	.510
	FEMALE	.156	74	.000	.959	74	.016
MAND CENTRAL INCISOR	MALE	.144	23	.200*	.946	23	.241
	FEMALE	.165	74	.000	.939	74	.001
MAND LATERAL INCISOR	MALE	.163	23	.116	.946	23	.243
	FEMALE	.134	74	.002	.953	74	.008
MAND CANINE	MALE	.210	23	.010	.921	23	.071
	FEMALE	.191	74	.000	.883	74	.000
MAND ANTERIOR MEAN	MALE	.112	23	.200*	.948	23	.263
	FEMALE	.006	74	.087	.977	74	.201
MAND FIRST PM	MALE	.194	23	.025	.901	23	.027
	FEMALE	.199	74	.000	.936	74	.001
MAND SEC PM	MALE	.241	23	.001	.889	23	.015
	FEMALE	.179	74	.000	.950	74	.005
MAND FIRST MOLAR	MALE	.157	23	.147	.950	23	.294
	FEMALE	.141	74	.001	.962	74	.026
MAND SEC MOLAR	MALE	.219	23	.005	.911	23	.044
	FEMALE	.164	74	.000	.929	74	.000
MAND POSTERIOR MEAN	MALE	.141	23	.200*	.948	23	.269
	FEMALE	.108	74	.031	.966	74	.046

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 1: Tests of Normality

Mesiodistal width	GENDER	Mean	Overall mean	Denture teeth	SD	95% Confidence Interval		Independent t-test value	P value
						Lower bound	Upper bound		
MAXILLARY ANTERIOR	MALE	7.05	42.38	Ivoclar/Acryrock/Biorock	0.59	6.79	7.31	0.28	0.78
	FEMALE	7.00	42.04	Ivoclar/Acryrock/Biorock	0.71	6.83	7.16		
MAXILLARY POSTERIOR	MALE	8.12	32.41	Ivoclar/Acryrock/Biorock	0.44	7.93	8.31	1.49	0.14
	FEMALE	7.91	31.62	Ivoclar/Acryrock/Biorock	0.63	7.78	8.07		

Table 2: Comparison of Mean Mesiodistal width of Maxillary anterior and posterior permanent dentition with commercially available denture teeth based on gender using Independent t test

Mesiodistal width Mean	GENDER	Mean	Overall mean	Denture teeth	SD	95% Confidence Interval		Independent t test value	P value
						Lower Bound	Upper Bound		
MANDIBULAR ANTERIOR	MALE	5.91	35.86	Ivoclar/Acryrock/Biorock	0.83	5.56	6.27	0.97	0.33
	FEMALE	5.73	34.48	Ivoclar/Acryrock/Biorock	0.76	5.55	5.90		
MANDIBULAR POSTERIOR	MALE	8.16	32.93	Ivoclar/Acryrock/Biorock	0.80	7.82	8.51	1.56	0.12
	FEMALE	7.86	31.51	Ivoclar/Acryrock/Biorock	0.83	7.66	8.05		

Table 3: Comparison of Mean Mesiodistal width of Mandibular anterior and posterior permanent dentition with commercially available denture teeth based on gender using Independent t test

Mean value	Gender	Mean value	Commercially available teeth value	Commercially available artificial mould
Maxillary anterior	Males	42.38mm	42.3mm	Acryrock, Biorock, Ivoclar Vivadent
	Females	42.04mm	42.3mm	Acryrock, Biorock, Ivoclar Vivadent
Mandibular anterior	Males	35.86mm	36.0mm	Ivoclar Vivadent
	Female	34.48mm	34.5mm	Ivoclar Vivadent
Maxillary posteriors	Males	32.41mm	32.3mm	Ivoclar Vivadent
	Females	31.62 mm	-	-
Mandibular posteriors	Males	32.93mm	33.13 mm	Ivoclar Vivadent
	Females	31.51 mm	-	-

Table 4: Comparison of artificial teeth dimensions with natural teeth dimensions

for males(32.3mm).The average values of mandibular posterior teeth for females(31.51mm) and for males(32.93mm) which closely matches with the average value of mandibular posterior teeth of molds Ivoclar Vivadent for males(33.1mm). All the parameters of anterior and posterior teeth obtained from maxillary and mandibular casts closely matches the values of commercially available denture teeth and the majority of the company provides various anterior molds which have anterior teeth of different mesiodistal width which matches the natural teeth dimensions. So maxillary anterior teeth selection has favored by all the commercially available denture teeth such as Acryrock, Biorock and Ivoclar Vivadent. But no other commercially available denture teeth have more mandibular anterior molds and posterior molds which is helpful in selecting artificial teeth other than Ivoclar vivadent.

DISCUSSION

Both anterior and posterior teeth selection plays a vital role for success of a complete denture prosthesis. Definitive methods are available for teeth selection, more clarity has to be there to select a particular mold to suit every patients.[6] So in this study 23 male subjects and 77 female subjects were selected and the natural teeth dimension were tabulated. After statistical analysis, in this study there was no significant difference was found between the mean value of maxillary anterior teeth of males (42.38mm) and females (42.04mm) (p=0.78) and maxillary posterior teeth of males(32.41mm) and females(31.62mm) (p=0.14). Then, there was no significant difference between the mean value of mandibular anterior teeth of males (35.86mm) and females(34.48mm) (p=0.33) and maxillary posterior teeth of males(32.93mm) and females(31.51mm)(p=0.12). Srivastava et al., did a comparative study to identify the mean value of natural anterior teeth with four commercially available denture teeth and concluded the mean values of artificial teeth are predominantly narrower than natural teeth.[7] Baer and Reynolds conducted a study with 451 dental casts and compared with dentsply mold chart and found females match with the most number of artificial teeth molds.[8] Ricardo Guimaraes Neves et al., conducted a study with 41 males and 55 females and the anterior natural teeth dimension with three different artificial mold which closely matches more for the females when compared with males.[9] Arthur M LaVere conducted a study with 488 dental students and their anterior teeth measurements were made and compared with 13 brands of commercially available natural teeth and the 22.5% matches the artificial teeth mold.[10] Dentists must be aware of the denture teeth molds before selecting a tooth for the denture. However there was no significant difference between the gender and the molds available that suit both males and females. The maxillary and mandibular anterior teeth match the available molds of all the three commercially available denture teeth such as Ivoclar, Acryrock, Biorock. But the maxillary and mandibular posterior teeth match the available Ivoclar molds. In future the denture companies should produce an increase in the number of

posterior teeth molds for easy selection of the denture teeth.

CONCLUSION

Selecting the artificial teeth is an art, every prosthodontist should learn the art to fulfil the esthetic and functional requirement of the patient. It gives a pleasing, expressive and confident life to the patient. Each patient should be evaluated carefully and the prosthodontist should select the commercially available teeth with perfect size and shape to make the complete denture unique to the person. Selection of artificial teeth plays a vital role in providing rehabilitation and esthetic solution. There are wide variety of commercially accessible artificial teeth for complete denture fabrication and that should be selected based on the patient's facial shape, arch shape, and arch size to establish the proper esthetics and function of the resulting prosthesis .There are numerous options available for choosing the teeth, but in this study, the best artificial teeth mold for fabricating the complete denture prosthesis was determined by using a simple and straightforward method of comparing it with the natural teeth dimensions obtained from dentate subjects.

CONFLICT OF INTEREST:

There was no conflict of interest

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