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"To Evaluate The Correlation Between The Mesio-Distal Width Of The Maxillary Anterior Teeth And Different Measurements Of The Distal Maxillary Arch Width-An in vitro study."

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ABSTRACT

Introduction: In the absence of pre-extraction records, the selection of maxillary anterior teeth for the edentulous patient is mostly subjective. Several techniques using anatomic landmarks have been suggested for determining the size of maxillary anterior teeth, but there is no universally accepted method that can be used reliably.

Aim: The study aims to find the correlation between the mesiodistal width of the individual maxillary anterior teeth and different measurements of the distal maxillary arch width.

Method: Impressions of fifty dentulous participants were made using irreversible hydrocolloid impression material, and casts were prepared with Type III dental stone. The mesio-distal width of individual maxillary anterior teeth and three maxillary arch width measurements—mesial marginal ridge, central fossa, and distal marginal ridge of first molars—were obtained using a digital vernier calliper. Data were analyzed using Karl Pearson correlation.

Result: The mesial marginal ridge width showed the highest correlation (r = 0.166) with the mesio-distal width of maxillary anterior teeth, suggesting positive linear relationship compared to the central fossa and distal marginal ridge measurements

Conclusion: A positive correlation exists between the mesio-distal width of maxillary anterior teeth and distal arch width, particularly with the mesial marginal ridge. This relationship has substantial implications for prosthodontic and restorative practices, reinforcing the importance of precise measurements for teeth selection.

KEY WORD: Maxillary Anterior Teeth, Mesiodistal Width, Distal Maxillary Arch Width, Correlation, in vitro study."

INTRODUCTION

Ensuring aesthetic satisfaction is a key focus in complete denture fabrication, with the selection of appropriately sized maxillary anterior teeth being particularly challenging in the absence of pre-extraction records [1]. Aesthetic considerations are vital in prosthodontic treatment, with the size and shape of maxillary anterior teeth influencing both dental and facial aesthetics [2]. Despite advances in materials and techniques, there is limited scientific guidance for selecting anterior teeth size and shape [2].

Accurate tooth selection without pre-extraction records remains difficult, often leading to dissatisfaction even with well-fitting dentures [3]. The central incisors play a crucial role in denture aesthetics, where tooth width is often considered more significant than length [4]. To aid in selection, various anatomical measurements such as bizygomatic width, interpupillary distance, interalar width, and intercommisural width have been proposed [4].

However, Scandrett et al. found that no single facial measurement provided clinically reliable predictions, suggesting a multi-variable approach is necessary [5]. Tooth selection for complete dentures remains one of the most complex tasks in prosthodontics due to the lack of universally accepted methods [6]. Smile design for edentulous patients now emphasizes form, size, color, and arrangement of teeth to enhance aesthetics [7]. Historically, tooth molds lacked standardization and were handcrafted without dental input [7].

Although aesthetic priorities have increased in recent decades, there is still no universally accepted selection method [8]. Clinicians must now consider beauty, harmony, and psychosocial well-being when designing dentures [8]. While several facial landmarks have been proposed for tooth selection, soft tissue variability due to aging or body type limits their reliability [9]. Hence, using cast-based measurements could provide a more consistent method for estimating tooth size [10].

METHODOLOGY

A total of 50 dentulous individuals aged 19–25 years were selected based on strict inclusion and exclusion criteria. Inclusion criteria encompassed participants with intact, periodontally healthy, and caries-free permanent dentition; minimal incisal wear; Angle Class I skeletal and occlusal relationship with minimal rotation; straight profile and obvious facial symmetry; and a willingness to participate in the study. Exclusion criteria included a history of orthodontic treatment, dental crowding or spacing, Angle Class II or III relationships, rotated or missing anterior teeth, maxillary pathology, facial or hormonal abnormalities, periodontally compromised or deciduous dentition, and unwillingness to participate.

After obtaining informed consent, participants were seated upright for clinical evaluation. Maxillary impressions were made using irreversible hydrocolloid (Zhermack) in appropriately sized dentulous perforated stock trays. (Figure 1,2) The impressions were immediately poured using Type III dental stone (Goldstone) to fabricate the casts, which were then trimmed and used for measurement.

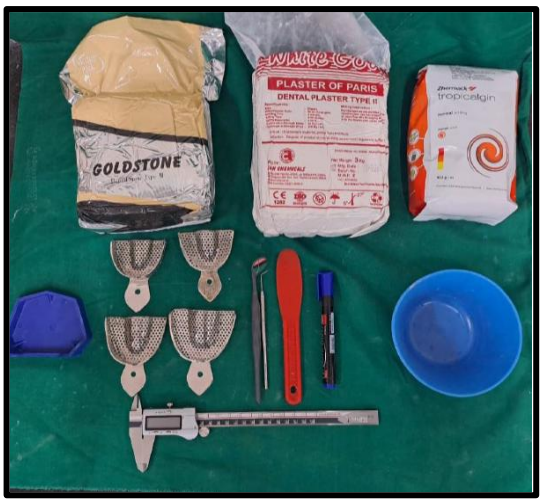


Figure .1 materials

Figure .2 impression making

The mesio-distal width of each maxillary anterior tooth was measured on the casts using a digital vernier calliper by drawing a line perpendicular to the long axis at the widest coronal portion of the crown. (Figure 3,4,5,6,7and 8) The total anterior width was calculated by summing the widths of all six maxillary anterior teeth.

Figue.3 Right maxillary central incisor = 9.70 mm

Figure. 4 Left maxillary central incisors = 9.27mm

Figure.5 Right maxillary lateral incisor = 7.29 mm.

Figure.6 Left maxillary lateral incisor = 7.59mm

Figure.7 Right maxillary canine = 7.13mm

Figure.8 Left maxillary canine= 7.15 mm

Additionally, distal maxillary arch width was recorded using three specific measurements: from the mesial marginal ridge of the right to the left first molar, (Figure-9) from the central fossa of the right to the left first molar,(Figure-10)and from the distal marginal ridge of the right to the mesial marginal ridge of the left first molar.(Figure-11) All measurements were taken with the arms of the calliper in contact with the designated landmarks. The data was compiled into a Microsoft Excel master sheet and subjected to statistical analysis using appropriate soft.

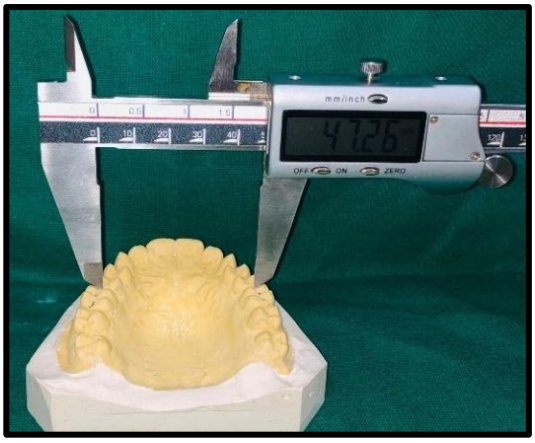


Figure.9 Mesial marginal ridge=47.26mm

Figure.10 Central fossa = 49.72mm

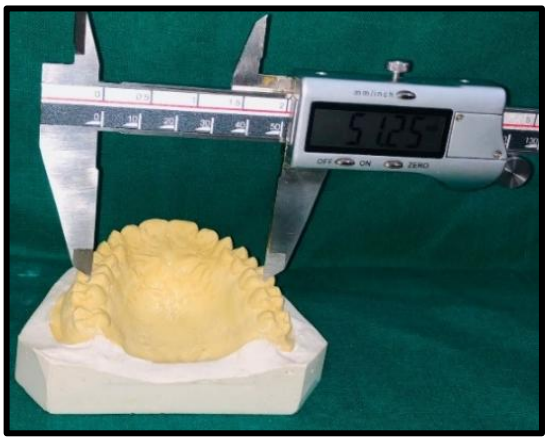
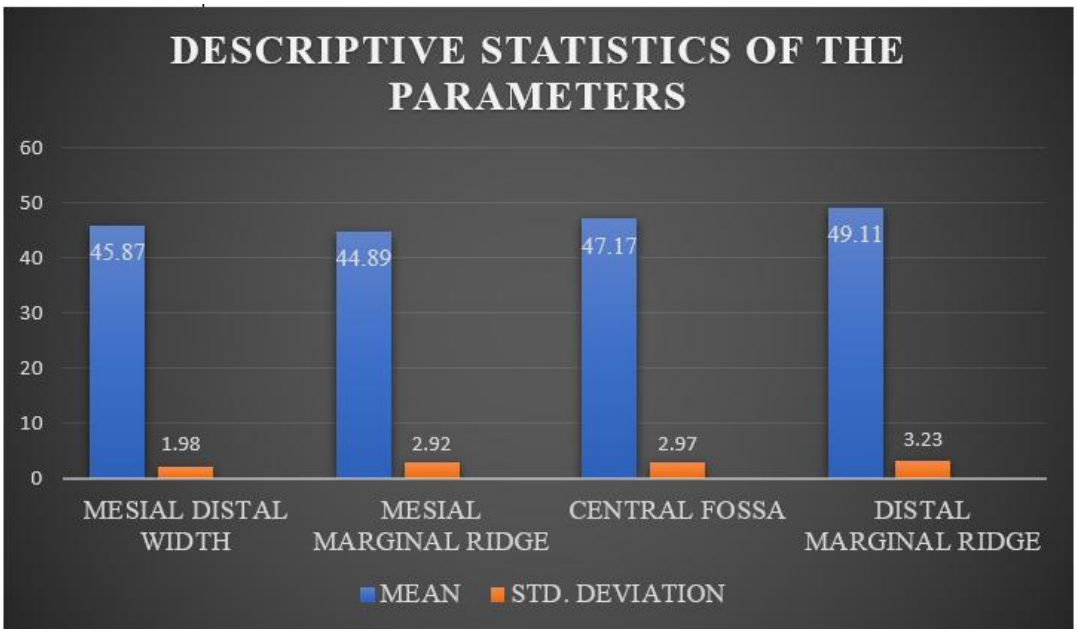


Figure .11 Distal marginal ridge =51.25mm

RESULTS

Table 1: Descriptive Statistics of the Parameters

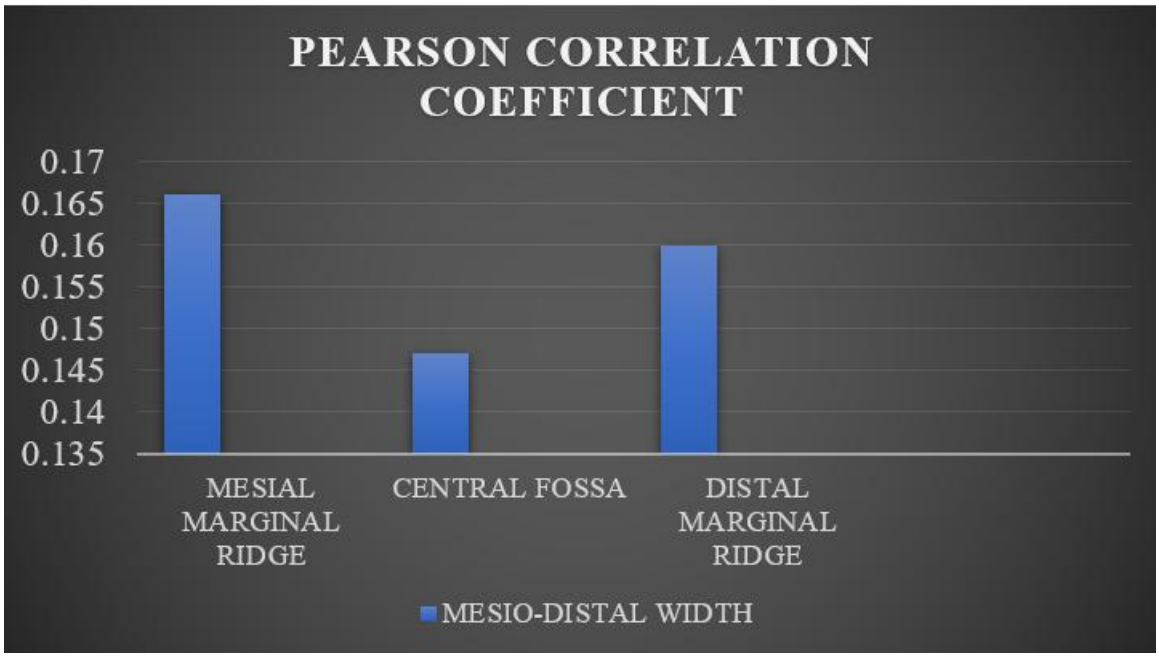
Parameter	Mean	Std. Deviation	N
MESIO- DISTAL WIDTH	45.87	1.98	50
MESIAL MARGINAL RIDGE	44.89	2.92	50
CENTRAL FOSSA	47.17	2.97	50
DISTAL MARGINAL RIDGE	49.11	3.23	50



- Table. 1 shows mesio distal width has a mean value of 45.87 with a relatively small standard deviation of 1.98, indicating that the values are clustered closely around the mean.
- Mesial marginal ridge has a slightly lower mean of 44.89 and a larger standard deviation of 2.92, suggesting more variability.
- Central fossa has a mean of 47.17 with a standard deviation of 2.97, indicating similar variability to mesial marginal ridge.
- Distal marginal ridge has the highest mean of 49.11 and the largest standard deviation of 3.23, suggesting the widest range of values among the four parameters.

Table 2: Correlation Coefficient and its P value

Parameter	STATISTICAL METHOD	MESIAL MARGINAL RIDGE	CENTRAL FOSSA	DISTAL MARGINAL RIDGE
MESIAL DISTAL WIDTH	Pearson correlation	0.166	0.147	0.160
	P value	0.248	0.310	0.268



- Table 2 shows among these correlations, **mesial marginal ridge** has the highest Pearson correlation coefficient (0.166) with mesio-distal width. This suggests that the mesial marginal ridge has a slightly stronger positive linear relationship with the mesio - distal width than the central fossa and distal marginal ridge.
- all p-values (0.248, 0.310, and 0.268) are greater than 0.05, indicating that none of the correlations between mesio distal width and the other parameters are statistically significant at the 0.05 level.

DISCUSSION

Aesthetic appeal is a priority for patients of all ages and genders, especially following tooth loss, where restoring a natural appearance becomes essential. Anterior teeth are central to dental and facial aesthetics, and their size plays a critical role in smile design for both dentulous and edentulous patients. Even a functionally sound denture may be rejected if it fails to meet aesthetic expectations.

The literature shows a lack of precise methods for selecting anterior teeth without pre-extraction records. Various techniques have been explored, but none have proven entirely dependable. Scandrett et al. [5] emphasized that no single anthropometric measurement—such as ICW, IAW, BZW, sagittal cranial diameter, IBFD, or philtrum width—is sufficient. They advocated for using multiple variables.

Few studies have explored correlations between maxillary anterior tooth width and intraoral landmarks. Notably, no research has examined the correlation between the mesiodistal width of maxillary anterior teeth and distal maxillary arch width (DMAW) using landmarks like the central fossa and mesial and distal marginal ridges. This study aimed to fill that gap, assessing correlations between these distal landmarks and anterior tooth width.

Impressions were made using irreversible hydrocolloid, which has shown good dimensional accuracy when poured immediately [11,13]. Measurements were taken on dental casts, which offer stability, eliminate soft tissue interference, and allow repeatable and accurate assessments [14]. Digital vernier calipers were used for their high precision (up to 0.02 mm), making them ideal for detailed dental measurements. The Karl Pearson correlation coefficient was used for analysis.

While none of the p-values (0.248, 0.310, 0.268) reached statistical significance ($p > 0.05$), a slight positive correlation was observed between mesiodistal anterior tooth width and all three distal landmarks. The mesial marginal ridge had the highest Pearson coefficient (0.166), indicating a marginally stronger linear relationship.

Supporting findings by Petricevic et al. [11] showed a slight correlation between the anterior tooth width and distal maxillary arch width, though not statistically significant. Ellakwa et al. [12] also reported weak positive correlations between mesiodistal incisor width and various intraoral measurements, consistent across genders. Additionally, Ravi Raj et al. [10] found a highly significant correlation between anterior tooth width and DMAW, specifically from the mesial fossa of the right to the left first molars.

LIMITATIONS

• While this study provides valuable insights, several limitations must be acknowledged. The relatively small sample size may restrict the generalizability of the findings, and variations in measurement techniques could introduce biases. To strengthen the robustness of future studies, it is recommended that researchers aim to standardize measurement methods and increase sample sizes.

• This approach would allow for more comprehensive data analysis and validation of the results.

FURTHER RESEARCH

• Future studies could expand on these findings by longitudinal studies could examine how changes in dental arch width over time affect the dimensions of anterior teeth. Furthermore, the potential of integrating computer technology into the measurement and selection process could enhance precision. Utilizing 3D scanning and modelling could provide more accurate representations of a patient's dental anatomy, facilitating better matching of tooth sizes and shapes.

CONCLUSION

- In conclusion, the study highlights a positive correlation between the distal maxillary arch width (mesial marginal ridge) and the mesio-distal width of maxillary anterior teeth.
- This relationship has substantial implications for prosthodontic and restorative practices, reinforcing the importance of precise measurements in treatment planning.
- Continued research in this area will enhance our understanding of dental arch dimensions and their clinical relevance, ultimately improving patient care

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Number of figures: 11
Conflict of interest: none

REFERENCES

1. Varjao FM, Nogueira SS. Correlating the curve distance between the distal of the canines to the combined width of the six anterior teeth when selecting denture teeth for different ethnic groups. J Prosthet Dent. 2012 Jun;107(6):400-4.
2. Hasanreisoglu U, Berksun S, Aras K, Arslan I. An analysis of maxillary anterior teeth: facial and dental proportions. J Prosthet Dent. 2005 Dec;94(6):530-8.
3. Varjao FM, Nogueira SS. Nasal width as a guide for the selection of maxillary complete denture anterior teeth in four racial groups. J Prosthodont. 2006 Nov-Dec;15(6):353-8.
4. Al Wazzan KA. The relationship between intercanthal dimension and the widths of maxillary anterior teeth. J Prosthet Dent. 2001 Dec;86(6):608-12.
5. Scandrett FR, Kerber PE, Umrigar ZR. A clinical evaluation of techniques to determine the combined width of the maxillary anterior teeth and the maxillary central incisor. J Prosthet Dent 1982; 48:15-22.
6. Hoffman W Jr, Bomberg TJ, Hatch RA. Interalar width as a guide in denture tooth selection. J Prosthet Dent. 1986 Feb;55(2):219-21.
7. Dubey S, Patil R. A comparative study for the selection of anterior teeth by correlating the combined width of six maxillary anteriors to the curved distance measured on occlusal rims for Indian and Malaysian population. Indian j health sci 2016; 9:210-6.
8. Al-Johany SS, Alqahtani AS, Alqahtani FY, Alzahrani AH. Evaluation of different esthetic smile criteria. Int J Prosthodont. 2011 Jan-Feb;24(1):64-70. Erratum in: Int J Prosthodont. 2011 Mar-Apr;24(2):103. PMID: 21210007.8.
9. Al-el-Sheikh HM, al-Athel MS. The relationship of interalar width, interpupillary width and maxillary anterior teeth width in Saudi population. Odontostomatol Trop. 1998 Dec;21(84):7-10.
10. Ravi Raj, Indrajeet, Madhu Ranjan, I Krishna Chetan, Ritu Kumari, Rohit. A study to correlation between distal maxillary arch width and mesio-distal width of maxillary anterior teeth among dakshina kannada population. International Journal of Contemporary Medical Research 2016;3(12):3575-3578.
11. Petričević, Nikola; Stipetić, Jasmina; Antonić, Robert; Borčić, Josipa Strujić, Mihovil; Kovačić, Ivan; Čelebić, Asja. Relations between Anterior Permanent Teeth, Dental Arches and Hard Palate. Collegium antropologicum, (2008) Nov, 4; 1099-1104.
12. Ellakwa A, McNamara K, Sandhu J,James K, Arora A, Klineberg I, El-Sheikh A, Martin FE. Quantifying the Selection of Maxillary Anterior Teeth Using Intraoral and Extraoral Anatomical Landmarks. J Contemp Dent Pract 2011;12(6):414-421.