

ORIGINAL RESEARCH ARTICLE

ESTIMATION OF VERTICAL DISTANCE OF INCISIVE PAPILLA WITH MAXILLARY CENTRAL INCISOR AND THEIR CORRELATION IN VARIOUS ARCH FORM

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ABSTRACT

Background: The relation of incisive papilla to the incisal edges of the maxillary central incisors in a vertical dimension could serve as a guide for inciso-cervical placement of anterior teeth in denture base according to the arch form of the edentulous patient. The aim of this study was to determine the vertical distance between incisive papilla and maxillary central incisor in different arch form.

Methods: A cross-sectional study was conducted among 100 dentulous subjects. The vertical distance between the incisal edges of maxillary central incisor and center of incisive papilla was measured by a digital caliper on casts obtained from dentate subjects meeting inclusion criteria after which statistical analysis of data using SPSS v26 version.

Results: The mean vertical distance between maxillary central incisor and incisive papilla were 5.97 ± 1.03 mm in ovoid, 6.09 ± 0.98 mm in square and 6.23 ± 0.89 mm in taper arch form.

Conclusions: The result obtained in this study can be used as a clinical guideline for the fabrication of maxillary occlusal rim and may aid in determining the position of occlusal plane along with the reference of other anatomical landmarks.

INTRODUCTION

The primary goal of prosthodontic rehabilitation of missing teeth is to restore patient's oral health, function, comfort, and confidence that are biologically compatible and desirable.¹ Besides function, esthetics is another prime concern of patient seeking prosthodontic treatment. The selection and arrangement of maxillary anterior teeth for edentulous patient in a natural and esthetically pleasing form is a challenging task particularly in absence of pre-extraction records. Determination of correct anterior incisal tooth position is important in fabricating complete denture. The proper positioning of artificial teeth lays the foundation for correct natural speech, esthetics and normal function.^{2,3} The incisive papilla, which is a small pear shaped eminence, serves as one of the significant anatomical landmarks that serves as a guide to arrange the maxillary anterior teeth during complete denture fabrication.⁴

If the incisal edges of the maxillary central incisors could be related to the incisive papilla in a vertical dimension in various arch form, this would serve as a guide for inciso-cervical placement of anterior teeth in denture base according to the arch form of the edentulous patient. Thus, the aim of this

study was to determine the vertical distance between incisive papilla and maxillary central incisor in different arch form.

METHODS

This was a cross-sectional study carried out on Department of Prosthodontics & Maxillofacial Prosthetics of Chitwan Medical College from Feb 2020 to Nov 2020. The ethical approval letter was obtained from Chitwan Medical College-Institutional Review Committee (CMC-IRC/076/077-116). Hundred dentulous subjects with full complement of natural teeth along with symmetrical and acceptable alignment of maxillary dentition were included in the study. Subjects with worn/restoration of anterior teeth, tooth with agenesis, crowding, rotation, periodontal diseases were excluded from the study. The consent of the patient for taking the impression was taken and who agreed for voluntary participation were only included. The casts were obtained from impression of maxillary arch and were divided into square, ovoid and taper arch form by using Diagnostic Orthoform Template as advocated by 3M Unitek. The midpoint of the incisive papilla was marked on each stone cast. A digital caliper was fixed perpendicular to the horizontal bar of a surveyor (Saeyang Microtech Co., Ltd, Korea) with the pin of the depth caliper touching the midpoint mark of the incisive papilla

(Figure 1 and Figure 2). The flat edge plane of the depth caliper contacted the mesial incisal edges of the maxillary central incisors and the midpoint of the flat edge plane of the depth caliper matched with the midpoint of the maxillary central incisors. Thus, the vertical distance of incisal edge of maxillary central incisor from incisive papilla was measured. The measurements were done by the same investigator at three separate times using the same instrument. The average values of the measurements were calculated using mean, standard deviation and chi square tests. Statistical Package for the Social Sciences version 26 was used for the analysis.



Figure 1: Vertical distance measurement device

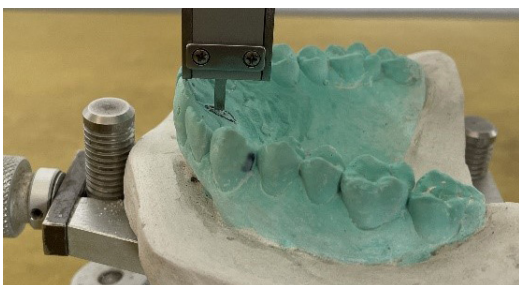


Figure 2: Measurement of the vertical distance between incisive papilla and incisal edge of maxillary central incisors

Table 3: Association of continuous parameters with various arch form

Parameters	Ovoid (mean±sd)	Square (mean±sd)	Taper (mean±sd)	F statistic	p-value
Antero-posterior length of Incisive papilla	6.19±1.03	5.77±1.28	6.29±1.08	1.90	0.15
Vertical distance between Incisive papilla & Central Incisor	5.97±1.03	6.09±0.98	6.23±0.89	1.58	0.21

DISCUSSION

Restoration of natural appearance of an individual is one of the primary objectives of prosthodontic rehabilitation in patients requiring complete dentures. Though prostheses cannot exactly substitute the natural teeth, however if fabricated in correct manner based upon some measurable parameters, they are not only functionally stable but also biologically and aesthetically viable.^{5,6}

The positioning of anterior teeth is one of the key factors for esthetics of complete denture. This can be guided to a certain extent by available pre-extraction records such as pre-extraction radiographs, anthropometric records, casts, and photographs that have been used in the past. Additionally extra-oral landmarks such as the philtrum, ala of the nose, pupils, canthus of the eye

RESULTS

The mean vertical distance between incisive papilla & central incisor was found to be 5.97±1.03 in ovoid, 6.09±0.98 in square and 6.23±0.89 in tapering arch form showing the greatest mean vertical distance between incisive papilla & central incisor in tapering arch form. However, the distance was not statistically significant (p value 0.15). The study showed the mean anteroposterior length of incisive papilla to be 6.19±1.03 in ovoid, 5.77±1.28 in square and 6.29±1.08 in tapering arch form with no significant variation in different arch form (Table 1-3).

Table 1: Descriptive statistics for continuous study variables

Study variables	Mean ± SD
Age	31.10 ± 5.57
Antero-posterior length of Incisive papilla	6.03 ± 1.16
Midpoint of Incisive papilla	3.02 ± 0.58
Vertical distance between Incisive papilla & Central Incisor	5.99 ± 0.99

Table 2: Association of sex and the various types of arch forms

Arch Forms	Sex		χ ²	p-value
	Male (n,%)	Female (n,%)		
Ovoid	15	26	7.13	0.028*
Square	28	15		
Taper	7	9		

Comparison of arch forms according to the gender of the patient was found to be statistically significant (p value 0.028). Square arch form was common in male whereas ovoid arch form in female, the tapering arch form being the least common in both the gender (Table 3).

etc. have been related to the size and shape of teeth and arch form to obtain values which would guide in the selection and arrangement of teeth in the complete denture.^{7,8}

Incisive papilla, being a stable landmark, can be used as a biometric guide to determine the midline, anteroposterior position of the anterior teeth, as a starting point for occlusal rim fabrication and for the determination of parallelism of occlusal plane when used in conjunction with hamular notch.^{9,10} According to Harper, a stable incisive papilla was obtained by caliper measurements on pre-extraction and post resorption models over 7 years thereby stating the incisive papilla as a dependable basis for reproducing the horizontal and vertical position of the maxillary central incisors.² Although the shape of the papilla shows a wide range of variation, the middle or center of the papilla is commonly used as a point of reference in many

studies.¹¹ Although, the horizontal relationship between incisive papilla and the maxillary central incisors had been investigated by several studies^{12,13} there are very few specific information in the literature relative to vertical distance between the incisive papilla and the maxillary central incisors.

Fu et al used a three-dimensional precise measuring device,¹⁴ Mersel et al used caliper to measure the horizontal distance and the vertical pin of the parallelometer along with caliper to measure the vertical distance.¹⁵ Guldag et al., used digital Vernier's caliper on the surveyor to measure the vertical distance.⁴ In the present study surveyor and digital Vernier's caliper was used to measure the horizontal and vertical distance of midpoint of incisive papilla and the mesial incisal edges of maxillary central incisors.

Chalsuthipan and Boonsiri investigated the relationship between the incisive papilla, maxillary central incisors and canines in Thai population. They found the vertical distance from the most distal point of the incisive papilla to incisal edge of the central incisors ranging from 6.94 to 7.23 mm with the mean of 7.08 mm.¹⁶ Guldag et al found the mean vertical distance between maxillary central incisors and incisive papilla to be 6.70±0.81 mm. The vertical distance range was 5.51 mm to 8.89 mm.⁴ The present study supports the finding of Guldag et al while the mean value variation with Chalsuthipan and Boonsiri may be caused by the reference point differences on the incisive papilla because the authors used the most posterior border of the incisive papilla.^{4,16}

A study done by Mersel et al on Israeli patients gave a range

of vertical distance of 5-14 mm in ovoid arch form, 6-11 mm in square arch form, 6-10 mm in tapered arch form.¹⁵ The result of present study gave the vertical distance of 5.97±1.03 in ovoid, 6.09±0.98 in square and 6.23±0.89 in tapering arch form suggesting the positive association of vertical distance between Incisive papilla and Central Incisor with the arch form despite the p-value of 0.15. Mersel et al took the posterior border of the papilla as a point of reference for the measurement whereas in the present study we had taken midpoint of papilla, hence a direct comparison between the results cannot be made with the present study.¹⁵ Also, the study done by Agrawal et al suggested the variation of distance between incisive papilla and central incisors according to the arch form.¹⁷

CONCLUSION

Within the limitations of the study, the vertical distance between central incisor and incisive papilla determined in various arch form can be used as a guideline for the fabrication of occlusal rim and to locate the vertical placement of central incisor. Arch form parameter being statistically significant according to gender can also be considered. As the study is carried out in small group of population, further studies including different races and different age groups can be conducted for the more reliable findings.

CONFLICT OF INTEREST: None

FINANCIAL DISCLOSURE: None

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