

Evaluation of Mean Vertical Distance Between Mesial Incisal Edge of Maxillary Central Incisors and Incisive Papilla in Various Arch Forms of Patients

Vertical Distance Between Mesial Incisal Edge of Maxillary Central Incisors and Incisive Papilla

Syeda Sameen Zehra Rizvi¹, Aamir Rafique², Muhammad Uzair Riaz³, Naila Zakria⁴ and Aeman Choudhary⁵

ABSTRACT

Objective: To evaluate the mean vertical distance between the mesial incisal edge of maxillary central incisor and incisive papilla in various arch forms.

Study Design: Descriptive/ Cross sectional study

Place and Duration of Study: This study was conducted at the Department of Prosthodontics, de' Montmorency-College of Dentistry/Punjab Dental Hospital, Lahore for 6 months from February 2018 to August 2018.

Materials and Methods: The study consisted of 100 patients attending the Prosthetic outdoor department of Punjab Dental Hospital, Lahore meeting the inclusion criteria. The vertical distance between mesial incisal edges of central incisors and the center of the incisive papilla was evaluated using vernier caliper, after mounting the casts on surveyor. Center of the incisive papilla was transferred on the labial surface of central incisor with the help of carbon marker. Arch forms were assessed by using Diagnostic Orthoform Template as recommended by 3M Unitek. Data was analyzed on SPSS version 21.0. Chi-square test was applied for statistical significance.

Results: The vertical distance between mesial incisal edge of maxillary central incisors and incisive papilla ranged from 6.89 mm to 7.03 mm with the mean vertical distance of 7.00 ± 0.026 mm. The mean papillo incisal distance (PID) was 6.99 ± 0.027 mm in ovoid, 6.98 ± 0.020 mm in square and 7.01 ± 0.018 mm in taper arch form.

Conclusion: The results can be used by the dentist and laboratory technician as a foundation for construction of maxillary occlusal rims that are used for the establishing the occlusal plane in different arch forms, in conjunction with the support of other anatomical landmarks.

Key Words: Vertical distance, incisive papilla, incisal edge, central incisors, arch forms

Citation of article: Rizvi SSZ, Rafique A, Riaz MU, Zakria N, Choudhary A. Evaluation of Mean Vertical Distance Between Mesial Incisal Edge of Maxillary Central Incisors and Incisive Papilla in Various Arch Forms of Patients. *Med Forum* 2021;32(8):12-15.

INTRODUCTION

Restoration of esthetics is an important aspect in the treatment plan of edentulous patients¹. The goals of prosthetics rehabilitation are to restore phonetics, aesthetics and dentofacial harmony.

Display of anterior teeth with the lips in repose or in functional position determine the outcome of any prosthesis in anterior esthetic region². According to Frush and Fisher, placement of anterior teeth near to their natural position almost always provide the best

aesthetic outcome³. So, when artificial teeth are placed correctly speech, esthetics and normal functions will be automatically restored¹.

For tooth positioning, neutral zone theory for setting anterior teeth seems to be logical, but sometimes the desired esthetic outcome may be compromised⁴. So, pre-extraction records may aid in determining the correct positioning of artificial teeth¹. When these records are also not available anatomical landmarks are used to achieve correct placement of anterior teeth.⁵ The incisive papilla is a firm, immovable and reliable milestone in the arrangement of artificial teeth. It acts as a guide to determine midline³, labiolingual⁶ as well as incisocervical arrangement of maxillary central incisors.³

The association, in vertical dimension, between incisive papilla and incisal margins of the central incisors in maxilla in various arch forms would serve as a benchmark for inciso-cervical placement of anterior teeth in denture base according to the individual requirement of the edentulous patients. So, the goal of this study is to evaluate vertical distance between maxillary central incisor and incisive papilla in

¹. Department of Prosthodontics / Periodontology², Dental College-HITEC Institute of Medical Sciences-Taxilla Cantt.

Correspondence: Dr. Syeda Sameen Zehra Rizvi, Senior Registrar, Prosthodontics, Dental College-HITEC Institute of Medical Sciences-Taxilla Cantt.

Contact No: 0333-8700961

Email: syedasamn@gmail.com

Received: March, 2021

Accepted: May, 2021

Printed: August, 2021

different arch forms. This helps in determining the correct incisal display of maxillary central incisors in both removable as well as in fixed prosthesis.

MATERIALS AND METHODS

The study was carried out in the Department of Prosthodontics of de' Montmorency College of Dentistry, Lahore for duration of six months from February 2018 to August 2018 after approval from CPSP with reference no CPSP/REU/DSG 2015-077-1553. The study consisted of 100 patients attending OPD of Prosthodontic department. Non probability consecutive sampling technique was used to include the patients in study. Subjects included in the study were patients of both genders with age ranging from 20 to 40 years. Patients with aligned full complement of natural permanent teeth up to maxillary 1st molar, class I maxillomandibular relationship and well traceable incisive papilla were involved in the study. Patients with missing, supraerupted or carious central incisors and 1st molars in maxillary arch, midline diastema, attrition/wear of central incisors, gingival hyperplasia or periodontally compromised teeth, history of maxillofacial trauma, orthodontic treatment or restorative treatment of maxillary central incisors were excluded.

After taking consent, patient's demographic information like age and gender was obtained. History was taken, followed by the clinical examination of the patient. Maxillary impressions of the selected subjects were made with irreversible hydrocolloid (Tropicalgin by Zhermack Spa) following the directions given by the manufacturing company for mixing of material. Alginate was hand mixed using rubber bowl and loaded on to stainless steel perforated tray. The tray was then introduced into patient's oral cavity and the material was allowed to set intraorally for three minutes to ensure complete and final setting before removal. The impression was then removed, washed with water and disinfected with suitable disinfectant before pouring casts. Cast was then poured with type 4 dental stone and base was formed using base formers. The casts were homogenized by generating a horizontal base that was parallel to the occlusal plane. Retrieved casts were divided into square, ovoid and taper arch form by using Diagnostic Orthoform Template as advocated by 3M Unitek. Casts were secured on cast holder of the surveyor and tripodding was done. Reference points used were mesiolabial incisal edge of maxillary central incisor anteriorly and mesio-buccal cusp tips of maxillary right and left first molar posteriorly. The center of incisive papilla was marked and transferred to the labial side of maxillary right central incisor with the aid of carbon marker. The line drawn in this region is referred to as "IP line". Measurements were made from IP line to mesial incisal edge of central incisor with the help of Vernier Caliper with precision of 0.01mm. This

recorded measurement is the mean vertical distance between incisive papilla and maxillary central incisor. All the procedure was done by the researcher itself. All this information was recorded in a pre-designed proforma.

Data was entered into SPSS version 21.0 used for analysis. Mean and standard deviation were evaluated for quantitative variables like age and mean vertical distance. Frequency and percentage were calculated for qualitative variables like gender and arch forms prevalence in sample. Chi Square was applied and p-value ≤ 0.05 was considered significant.

RESULTS

A total number of 100 patients of both genders including 53 males and 47 females i.e. 53% and 47% males and females respectively meeting the inclusion criteria were included in the study. Frequency and percentage of gender distribution and arch forms of patients in study is shown in table 1 and table 2 respectively.

Table No.1: Frequency and Percentage of Gender of Patients

	Frequency	Percentage
Male	53	53%
Female	47	47%
Total	100	100%

Table No.2: Frequency and Percentage of Arch Forms

Arch Forms	Frequency	Percentage
Ovoid	49	49%
Tapering	37	37%
Square	14	14%
Total	100	100%

Table 3 mentions the mean age of patient. The mean and standard deviation of age is 29.77 ± 6.19 . Minimum age was 20 years and maximum age was 40 years.

Table No.3 - Mean and Standard Deviation of Age of Patients

Age (years)	N	100
	Mean	29.77
	SD	6.197
	Minimum	20
	Maximum	40

Table No.4: Mean and Standard Deviation of Vertical Distance (Analysis of Gender and Vertical Distance)

	N (No. of Patients)	Mean of Vertical Distance	Standard Deviation of Vertical Distance	p-value
Male	53	6.96	0.045	0.00
Female	47	6.99	0.023	
Total	100	6.97	0.039	

Table 4 shows mean and standard deviation of vertical distance in males and females. Mean vertical distance for males is 7.00 ± 0.024 mm and for females mean and standard deviation is 6.99 ± 0.025 mm.

Table 5 illustrates the mean and standard deviation of vertical distance in different arch forms with significant p-value.

Table No.5: Mean and Standard Deviation of Vertical Distance in Different Arch Forms

Arch forms	Genders		Mean	Standard deviation	P-value 0.00
	Males (n %)	Females (n %)			
Ovoid	26 (49%)	23 (48.9%)	6.99	0.027	
Tapering	21 (39.6%)	16 (34.0%)	7.01	0.018	
Square	6 (11.3%)	8 (17.0%)	6.98	0.020	

DISCUSSION

Restoration of natural appearance of edentulous patients that need rehabilitation with complete dentures either removable or implant supported, especially in upper arch, is an essential part of treatment. Although prosthesis cannot exactly replace the natural dentition, however if some measurable parameters are used in correct manner for the prosthesis fabrication, the resulting prosthesis will not only be functionally secured but also biologically and aesthetically workable⁷.

Arrangement of artificial teeth close to their natural position can be guided to a certain extent by available pre-extraction records such as pre-extraction radiographs, anthropometric records, casts, and photographs. Various other guidelines such as phonetics, upper lip, lower lip and smile line are used to establish the maxillary incisal edge position⁸. Most commonly used parameter is phonetics, where "S," "Z," and "C," "F" and "V" sounds were proposed by Payne and Pound and Robinson for position of incisal edges of upper teeth. Sharry, Heartwell, Ellinger, et al. and Landa proposed that the occlusal plane of maxillary occlusal rims should extend approximately 1-2 mm below the upper lip in resting position and then phonetics should be used to adjust this vertical position.⁹

Although, above mentioned guidelines had been utilized for anterior teeth setting but they vary greatly depending on anatomy of individual. In the present study, vertical position of maxillary central incisal edge was determined from incisive papilla. The incisive papilla is an important landmark¹⁰ and a useful guide for positioning of the anterior teeth as referred by Harper RN, Martone AL and Hickey J, et al^{11,12,13}. They studied pre-extraction casts as well as post resorption models over a period of seven years. As a result, they concluded a stable incisive papilla, thereby forming a

reliable basis for replacing the maxillary central incisors in correct horizontal and vertical position.¹⁴ The anterior part of the incisive papilla is usually destroyed and scarred during extraction of maxillary anterior teeth. Another reason is the bone resorption that takes place following the loss of teeth making the anterior part of papilla less reliable guideline. On the contrary, the center and posterior part of the papilla is more likely to remain constant¹. For this reason, center portion of papilla is used as reference point in this study.

Guldag et al in his study on Turkish population found the mean vertical distance between maxillary central incisors and incisive papilla to be 6.70 ± 0.81 mm. The range of vertical distance was 5.51 mm to 8.89 mm¹⁵. Chalsuthipan and Boonsiri evaluated the vertical distance between maxillary central incisors, canines and the incisive papilla in Thai population. They found that vertical distance between posterior part of the incisive papilla to incisal edge of the maxillary central incisors was ranging from 6.94 to 7.23 mm. The mean vertical distance in their study was 7.08 mm¹⁶. The mean value variation between Chalsuthipan and Boonsiri and present study is 0.08 mm. The reason behind this difference is maybe the differences in reference points on the incisive papilla because the most posterior border of the incisive papilla was used by authors, but in the present study, we used the center portion as a reference.

In literature, several methods have been proposed to define the arch forms by using the partitioning around medoids clustering and silhouette method¹⁷. Some authors prefer to classify dental arches into ovoid, tapering and squarish, this classification of arch forms was used in the present study by using Diagnostic Orthoform Template as advocated by 3M Unitek. The majority of the subjects had an ovoid arch form 49% where as 37% had tapering and 14% had squarish arch.² A study by Mersel et al on Israeli patients investigated vertical distance in different arch forms. The vertical distance range from 5-14 mm in ovoid arch form, 6-11 mm in square arch form and 6-10 mm in tapered arch form.¹⁸ The result of present study gave the vertical distance of 6.99 ± 0.027 mm in ovoid, 7.01 ± 0.018 mm in tapering and 6.98 ± 0.020 mm in square suggesting the positive correlation of vertical distance between the two landmarks with the p-value of 0.00. A direct comparison of the two studies between the results cannot be made because of the difference in reference points i.e. Mersel took posterior border while present study used mid part of incisive papilla.

Further, a long term prospective study with larger sample size and their variation with age, race, dental and skeletal morphology is required to authenticate IP line as a landmark for arrangement of maxillary anterior teeth.

CONCLUSION

The suggested mean vertical distance between central incisor and incisive papilla for placing prosthetic central incisors is 7.00 mm. There is a higher presentation of ovoid arch forms. Arch form parameter being statistically significant according to gender can also be considered. The statistical information obtained from the study can be an exemplary point to start fabrication of occlusion rims and vertical placement of central incisor in different arch forms.

Author's Contribution:

Concept & Design of Study: Syeda Sameen Zehra Rizvi
 Drafting: Syeda Sameen Zehra Rizvi, Aamir Rafiq
 Data Analysis: Muhammad Uzair, Naila Zakria, Aeman Choudhary
 Revisiting Critically: Syeda Sameen Zehra Rizvi, Aamir Rafiq
 Final Approval of version: Syeda Sameen Zehra Rizvi

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

- Shin SY, Kim TH. Correlation between the size of the incisive papilla and the distance from the incisive papilla to the maxillary anterior teeth. *J Dental Sci* 2016;11(2):141-5.
- Naz A. Comparison of Distance Between the Most Prominent Part of Labial Surface of Maxillary Central Incisors With The Posterior Limit of The Incisive Papilla In Various Arch Forms. *JPDA* 2014;23(02):76.
- Karthigeyan S, Ali SA, Koruthu AV, Mohan K. Incisive papilla as a bio-metric guide in the arrangement of teeth. *Pak Oral Dental J* 2012;32(2).
- Solomon EG, Arunachalam KS. The incisive papilla: A significant landmark in prosthodontics. *J Ind Prosthodontic Society* 2012;12(4):236-47.
- Misch CE. *IMPLANTOLOGY-Clinical Guideline for the Vertical Position of the Maxillary Incisal Edge: The Key is the Canine*. *Oral Health* 2011;101(8):10.
- Shah M, Verma AK, Chaturvedi S. A comparative study to evaluate the vertical position of maxillary central incisor and canine in relation to incisive papilla line. *J Forensic Dental Sci* 2014;6(2):92.
- Sapkota SM, Singh SK, Thakur SN, Khanal B, Pandey BR. Estimation of vertical distance of incisive papilla with maxillary central incisor and their correlation in various arch form. *J Chitwan Medical Coll* 2021;11(1):34-6.
- Khan F, Abbas M. The Mean Visible Labial Length of Maxillary and Mandibular Anterior Teeth at Rest. *J Coll Physicians and Surgeons Pakistan* 2014;24(12):931-4.
- Shrestha S, Joshi SP, Yadav SK. Relationship of Incisive Papilla to Maxillary Incisors and Canines. *J Contemp Dent Pract* 2016; 17(4):306-12.
- Ehrlich J, Gazit E. Relationship of the maxillary central incisors and canines to the incisive papilla. *J Oral Rehab* 1975;2:309-12
- Harper RN. The incisive papilla-The basis of a technique to reproduce the positions of key teeth in Prosthodontia. *J Dent Res* 1948;27:661-68.
- Martone AL. The phenomenon of function in complete denture Prosthodontics. Clinical application of concepts of functional anatomy and speech science to complete denture prosthodontics. Part VII, recording phases of denture construction. *J Prosthet Dent* 1963;13:211.
- Hickey JC, Boucher CD, Woelfel JB. Responsibility of the dentist in complete dentures. *J Prosthet Dent* 1962;12:649.
- Guldag MU, Sentut F, Buyukkaplan US. Investigation of Vertical Distance between Incisive Papilla and Incisal Edge of Maxillary Central Incisors. *Eur J Dent* 2008;2:161-6.
- Guldag MU, Sentut F, Buyukkaplan US. Investigation of Vertical Distance between Incisive Papilla and Incisal Edge of Maxillary Central Incisors. *Eur J Dent* 2008;2:161-6.
- Chalsuthipan S, Boonsiri I. Relationship of central incisor and canine to incisive papilla. *Chulalongkorn Univ Dent J* 1993;16:29-40.
- Lee SJ, Lee S, Lim J, Park HJ, Wheeler TT. Method to classify dental arch forms. *Am J Orthodontics and Dentofacial Orthopedics* 2011; 140(1):87-96.
- Ortman HR, Tsao DH. Relationship of the incisive papilla to the maxillary central incisors. *J Prosthetic Dentistry* 1979; 42(5):492-6.