

# A study on the Relationship of Maxillary Central Incisors to Incisive Papilla in Nepalese Population

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## ABSTRACT

**Introduction:** When natural teeth lost, it becomes difficult to arrange the teeth in their original position in the complete denture. Variety of guides has been suggested for arrangement of artificial teeth. Incisive papilla is recognized as an important landmark to locate the maxillary anterior teeth position in complete denture fabrication. The objective of this study was to find the relation between the distance of incisive papilla and maxillary central incisor in Nepalese population which maintains the natural teeth position in removable prosthesis and guides the laboratory procedures.

**Material and method:** Maxillary stone cast were collected from 100 Nepalese subject comprising 50 males and 50 females. Incisive papilla (IP) was identified in cast and marked by HB bonded lead pencil. Computer scanner imaging technique with Photoshop was used for all dental cast measurement. A screen caliper was used to measure the distance from center and posterior border of incisive papilla to maxillary central incisors (MCI) on scanned images of dental cast. Student's t- test was used to analyze the data.

**Results:** The result showed that the mean distance from MCI to center of IP was 8.23mm and from MCI to posterior border of IP was 11.49mm. Distance between the center and posterior border of incisive papilla to maxillary central incisors were statically significant ( $p < 0.05$ ) in both male and female.

**Conclusion:** It was found that there is a relationship between the maxillary central incisors and incisive papilla aiding in their antero posterior position. Gender has significant effect on it. In males, the average distance from center of IP to MCI is 8.52mm and from posterior border of IP and MCI is 11.96mm. In females, the average distance from center of IP to MCI is 7.94mm and from posterior border of IP to MCI 11.02mm. The result of this study can apply as a starting point in preliminary location of maxillary incisors during fabrication of removable prosthesis.

**Keywords:** incisive papilla, maxillary central incisors

## INTRODUCTION

Esthetics is a very important and challenging component of complete denture prosthodontics which helps to restore the lost natural appearance of edentulous patients. Aesthetic aspects of complete denture construction depend on many factors combining 'scientific' and 'artistic' principles.<sup>1</sup>

Among the various factors, teeth alignment plays the most important tooth factor in

producing a natural appearing artificial restoration.<sup>2</sup> A pleasing lip support for edentulous patients is achieved by the correct placement of the anterior teeth and their matrix, with the burden being placed on the central incisors.(ref). Finding the most suitable position for artificial anterior teeth presents a new challenge in every denture. The most obvious landmark that appears to have survived intact from the dentate state is the incisive papilla (IP),

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and it has received a great deal of attention.<sup>3</sup> Harper<sup>3</sup> suggested that the incisal edges of the maxillary central incisors should be 5 to 8 mm in front of the center of the papilla.<sup>4</sup> McGee preferred 7.7mm for this measurement<sup>5</sup> whereas Hickey et al. Martone<sup>6</sup>, Martone,<sup>7</sup> and Murry<sup>8</sup> suggested a value of 8 to 10 mm for this distance.

More detailed studies on the changes in the maxillae following the loss of the teeth include the work of Johnson, who found that resorption was quite marked during the first 3 years and extended lingually to include the anterior part of palate.<sup>9</sup> Watt and Likeman pointed out that incisive papilla migrates an average of 1.6mm forward and 2.3mm upward as a result of remodeling of the region. The relationship between the incisive papilla and the incisive fossa changed slightly so that the fossa lies slightly posterior to the papilla in the edentulous mouth. To compensate for this alteration, they suggested use of the posterior border of the papilla.<sup>10</sup> Erlich and Gazit found that the labial surface of the central incisor was an average of 12 to 13 mm anterior to this point.<sup>11</sup>

Many studies has been done among the various population groups in different countries on the relationship of maxillary central incisors (MCI) to incisive papilla(IP) but no such research has been performed yet in Nepalese population. Hence, the purpose of this study was to know this distance of central incisor to incisive papilla in Nepalese population as this can be referred as a guide line for tooth alignment for removable prosthesis.

## MATERIALS & METHODS

The present study was conducted in the Department of Prosthodontics, Peoples Dental College and Hospital. A total of 100 Nepalese subjects (n=100) comprising of 50 males and 50 females of the age ranging from 20 to 30 years were selected. The inclusion criteria of subjects have dentition in class I angle's classification. Subjects with gross mal-alignment, supra-erupted teeth, history of orthodontic, endodontic or restorative treatment in anterior teeth, attrition of teeth, swelling or damaged

incisive papilla or who refused to provide informed consent were excluded from the study. A proper maxillary perforated metal stock tray was selected for each subject. Impression of the maxillary arch was made with irreversible hydrocolloid (Zelgan, 2002, Dentsply) following the manufacture's instruction. Impressions were poured with dental stone (Kalstone, Kalabhai Karson) using a dental vibrator and allowed to set for 1 hour before being removed. All the above procedures were performed by a single clinician to ensure uniformity. Any defective casts (damaged by air bubbles or voids on important landmarks) were excluded. Bases of the cast were made by using a base former and were coded.

The Incisive papilla was identified in the cast, and boundary around incisive papilla and incisal edge of maxillary incisors were marked by using sharp HB bonded lead pencil (Champ 877, Creations). The pencil was sharpened for each cast independently.

A two dimensional computer scanner imaging technique was used in conducting all dental cast measurement. The dental cast along with metallic scale adjusted adjacent to the cast were scanned using a CanoScan 4400F scanner (model no. K10293, Canon inc., China) in scale ratio 1:1. Images from image scanner were saved and were transferred to Photoshop CS6 (fig 1). The image was scaled at ratio 1:1 with screen caliper software (Version 4). Screen caliper was calibrated to the scanned image of metallic ruler placed adjacent to the cast. 5 lines were placed on the scanned image of cast (fig 2). First line passed through the incisal edge of maxillary central incisors. The second line passed through anterior border of IP paralleling the first line. Third line passed through the posterior border of IP paralleling the second line. Fourth line passed through center of maxillary two central incisors and fifth was passed through the center of IP paralleling the third line. Centre of IP was taken as the half of the length of IP and the following measurements were then carried out with screen caliper software. Fig(3)

The distance between incisal edge of maxillary central incisors and center of IP,

The distance between incisal edge of maxillary central incisors and posterior border of IP Measurements were recorded.



Fig 1

Fig 2

Fig 3

**RESULT**

Student’s t-test was performed to compare the mean differences of distance between center of IP to Max central incisor and Distance between posterior border of IP to Max central incisor in Nepalese male and female samples where p value is less than 0.05 is significant

The mean distance from MCI to the center of IP was 8.23mm and a standard deviation of 1.41mm (Table 1). The mean distance from MCI to center of IP was 8.52mm in male and 7.94mm in female. The difference was statically significant (p=0.04) (Table 2)

When the posterior point of IP was used as reference point, its mean distance from MCI was 11.49mm and standard deviation of 1.80mm (Table 1). The difference between the mean value for male (12.96mm) and for female (11.02mm) was statically significant (p=0.008) (Table 3)

**Table -1 Mean distance between MCI and incisive papilla in Nepalese sample (n=100)**

	Mean(mm)	SD
MCI and center of incisive papilla	8.23	1.41
MCI and posterior border of IP	11.49	1.80

**Table -2 Mean distance between MCI and center of incisive papilla in male (n=50) and female (n=50) in Nepalese sample**

Gender	Mean (mm)	SD	P
Male	8.52	1.24	0.04
Female	7.94	1.52	

**Table -3 Mean distance between MCI and posterior border of IP in male (n=50) and female (n=50) in Nepalese sample**

Gender	Mean(mm)	SD	P
Male	11.96	1.75	0.008
Female	11.02	1.74	

**Table -4 Length of incisive papilla**

Sample	Number in sample	Mean (mm)
Mixed (n=100)	100	5.91
Male (n=50)	50	6.65
Female (n=50)	50	5.18

**DISCUSSION**

Prosthodontist who treat a large number of edentulous patients realize that there are a number of patients whose aesthetical and

functional needs are sometimes difficult to satisfy. However, for the majority of edentulous patients, a simple objective technique involving anatomical measurements would provide at

least a starting point for tooth alignment. This is most valuable for patients who request denture fabrication and have no previous denture or dental records to utilize for this process.<sup>12</sup>

The significance of the relationship between the maxillary anterior teeth and the incisive papilla in prosthetic dentistry is that it provides a guide for the setting of artificial teeth in the construction of dentures, especially complete dentures. Therefore it is important to orient the dental casts in a standardized manner during measurements so that the results achieved can be applied when artificial teeth are being set in complete denture bases.<sup>13</sup>

In this study, two dimensional computer scanning imaging technique was employed because linear measurement between two objects in three dimensional relationships impose problem when the objects are not aligned on the same plane in three dimensions. To reduce this error a computer scanning technique was used which was accurate and reliable.<sup>14</sup>

The center point and posterior point of IP were used as anatomical landmarks in horizontal measurements in this study. The anterior border may be affected or damaged during extraction of maxillary anterior teeth, or because of the resorption that take place following loss of teeth. The center and posterior part of papilla will be more likely to remain constant. Therefore, the center and posterior part of IP were used as reference points in this study.<sup>11</sup>

The results obtained in this study for the mean distance from MCI to midpoint of IP, was 8.20mm. This figure falls within the recommended range of 8 to 10mm although it is near the lesser end of the average, it is comparable to the finding of Sawris (8.50mm) and Marvroskoufis and Ritchie (10.2mm).<sup>13</sup>

The mean distance from MCI to posterior point to IP is 11.47mm which is not consistent to the previous studies; as in Jordanian , Amin & Gnzawi, it was 12. 93mm<sup>14</sup>, in Ortman and Tsao, it was 12.45mm<sup>5</sup> and Grave and Becker, it was 13.17mm.<sup>3</sup> This difference is probably due to small length of IP (5.91mm) in Nepalese

population as compared to southern Chinese which was 7.08mm<sup>13</sup>.

This study shows that there is significant difference between male and female on the distance between MCI and Centre as well as posterior border of IP which was contrast to other<sup>13, 14</sup>. This may be due to difference in length of IP, in arch form or difference in premaxillary prominence. Thus the result of this study can be applied to Nepalese patient in clinical application along with the use of combination of biometric guides, phonetic tests to reproduce the relationships established between natural teeth and the orofacial investing tissue. A dental technician, without the chance of seeing the patient, should make use of such anatomic landmarks in the construction of wax occlusal rims, so that they approximate the final position of the artificial teeth. This will help reduce the clinical time of both the dentist and the patient.

## CONCLUSION

Within the limitation of this study we can conclude that in Nepalese population, while aligning anterior teeth

- a) Gender has significant effect on the relationship of the incisive papilla to the maxillary anterior teeth.
- b) In males, the distance from center of IP to MCI ranges from 7.7- 9.7mm(average -8.52mm) and from posterior border of IP to MCI ranges from 10.2 to 13.7mm(average-11.96mm)
- c) In females, the distance from center of IP and MCI ranges from 6.4- 9.4mm(average-7.94) and from posterior border of IP to MCI ranges from 9.2- 12.7mm (average-11.02mm)

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