ORIGINAL ARTICLE

Determination of distance between incisive papilla to maxillary central incisors in patients with square and ovoid face form

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Abstract

Backgrounds: Accurate positioning of the maxillary central incisors is essential for achieving satisfactory aesthetics and function in complete dentures. The relationship of these teeth to the incisive papilla may provide a useful reference for reproducing the position of the natural dentition.

Methods: A total of 48 dentate individuals aged 20–40 years with intact maxillary arches were included. Facial form was assessed using two imaginary lines extending bilaterally approximately 2.5 cm anterior to the tragus and passing through the angle of the mandible. A relatively parallel orientation of the lines was considered indicative of a square facial form, whereas divergence toward the chin indicated an ovoid form. Results: The mean distance from the incisive papilla to the maxillary central incisors was 10.19 ± 0.51 mm and 9.67 ± 0.57 mm among males and females with a square facial form, respectively. Corresponding values for the ovoid group were 11.50 ± 0.79 mm and 11.25 ± 0.65 mm.

Conclusions: The distance between the maxillary central incisors and the incisive papilla showed a statistically significant variation between individuals with square and ovoid facial forms.

Keywords: *Maxillary central incisors, Incisive papilla, square face form, Ovoid face form.*

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Introduction

For satisfactory aesthetic and functional rehabilitation, the maxillary central incisors in a complete denture should be positioned in a manner that approximates their location in the natural dentition. The incisive papilla can serve as an anatomical reference when establishing this relationship.[1]

Maxillary arch forms have traditionally been categorized into three principal patterns: square, tapered and ovoid.[2] These basic configurations may also occur in various combinations and are commonly considered during prosthodontic tooth arrangement.[5] Arch morphology can be evaluated through geometric characteristics and several investigations have examined these forms in relation to dental anatomy.[2,4,5,6,7,8] A relationship between facial morphology and the corresponding maxillary arch form has also been described, particularly in relation to the upper dental arch.[9]

When pre-extraction records are unavailable, anatomical landmarks become particularly valuable for determining the appropriate position of the anterior teeth. Among these landmarks, the incisive papilla is frequently used as a reference point.[1] Because it is relatively fixed and undergoes limited positional alteration during adult life, it may provide a dependable guide for anterior tooth placement.[10,11] The distance between the maxillary central incisors and the incisive papilla has consequently been investigated as a biometric reference for establishing anterior tooth position.[11,12,13]

Following extraction, progressive resorption of the buccal cortical plate can alter the apparent position of the incisive papilla in relation to the residual ridge. With substantial ridge

resorption, the papilla may appear close to or directly over the crest, while more advanced resorption may cause it to appear anterior to the ridge. Although the center of the incisive papilla is frequently selected as the reference point, its posterior portion is considered relatively more stable because it is subjected to less positional change following tooth loss.[1,10]

The present investigation was undertaken to determine whether the distance between the maxillary central incisors and the incisive papilla in dentate individuals could provide a useful reference for anterior tooth arrangement in complete denture patients with comparable facial forms.

Objective

To determine the distance between the incisive papilla and the maxillary central incisors in individuals with square and ovoid facial forms and to assess its potential usefulness as a reference for anterior tooth arrangement in complete dentures.

Materials and methods

The study was designed as cross sectional and observational. The study was done in department of prosthodontics, Bangladesh Medical University (BMU) From March' 2014 to August' 2014. Patients attended in the department of prosthodontics in BMU for the treatment of the lower arch. It was a nonprobability convenience sampling method. 20-40 years age, 48 males and females' patients were selected with dentate maxillae. Intact maxillary dental arch., periodontally sound maxillary anterior teeth, class I arch relationship, angle's class I occlusal relationship were in inclusion criteria. Patients with supernumerary tooth erupted in maxillary arch, maxillary midline diastema, any degree of crowding in maxillary dentition, visible attrition involving incisal edge, rotation of maxillary anterior teeth, history of previous orthodontic treatment, any soft tissue lesion involving incisive papilla, no history of surgical procedure in maxillary arch were in exclusion criteria. Digital Vernier scale, calibrated transparent protector, Surveyor-Marathon-103, base former, lead pencil, rubber bowl, spatula and impression tray were the equipment's. Alginate, die stone and sticky wax were used as materials. Data are expressed as mean, ± standard deviation. Statistical analysis was done by ANOVA. $P<0.05$ level of significance was selected for all analyses.

Procedures:

Following a detailed medical and dental history, participants were screened according to the predetermined selection criteria. Each participant was seated comfortably in the dental chair with the head maintained in a natural, unrestricted position. Facial form was then evaluated. The face was categorized into three general forms: square, tapering and ovoid. For classification, two imaginary lines were considered, one on each side of the face, extending approximately 2.5 cm anterior to the tragus and passing through the angle of the mandible. Divergence of these lines toward the chin was considered characteristic of an ovoid facial form, whereas convergence toward the chin indicated a tapering form.

An impression of the maxillary arch was subsequently obtained using high-viscosity alginate. The manufacturer's recommended powder-to-liquid ratio and mixing procedure were followed to ensure consistency. The impression was washed under running water after removal and subsequently subjected to sterilization.

The impression was poured in die stone within 15 minutes of impression making. To standardize the casts, a base was formed using a cast base former. The completed cast was removed from the former after approximately 45 minutes. The dental arch form was then evaluated on the resulting cast. In the square arch configuration, the anterior teeth are positioned relatively close to an imaginary line extending through the canines, producing a broad anterior arrangement that corresponds with a square facial form. In contrast, the central incisors in an ovoid arch are positioned anterior to the canines, occupying an intermediate position between the square and tapered configurations and producing a broader, rounded anterior appearance compatible with an ovoid facial form.

The incisive papilla was identified on each cast and its boundaries were outlined with a hard lead pencil to establish the anatomical reference area.

Each cast was firmly positioned on a dental surveyor. The horizontal measurement between the surveyor's vertical pin and the embrasure between the maxillary central incisors was obtained with the aid of a calibrated transparent protector. The protector was positioned so that its 90° marking was approximately aligned with the surveyor's vertical pin, while the pin contacted the posterior border of the incisive papilla. Once the appropriate position had been established, sticky wax was used to secure the protector to the vertical pin and prevent displacement during measurement.

The horizontal distance was then determined using a caliper on the calibrated transparent protector. One end of the measurement corresponded to the position of the surveyor's vertical pin, while the opposite end was aligned with the incisal edge of the maxillary central incisors.

The same standardized procedure was followed for measurement involving the maxillary central incisors. The transparent protector was aligned with the surveyor's vertical pin, which was positioned at the posterior border of the incisive papilla. Sticky wax was applied to maintain the established orientation and minimize movement during recording. The horizontal distance was subsequently read from the calibrated protector using the caliper, with one reference point corresponding to the vertical pin and the other to the incisal edge.

Fig 1: Armamentarium for study

Fig 2: Prepared cast

Fig 3: Some samples

Fig 4: Cast secured on the surveyor

Fig 5: A protector is placed on the cast to maintain parallelism

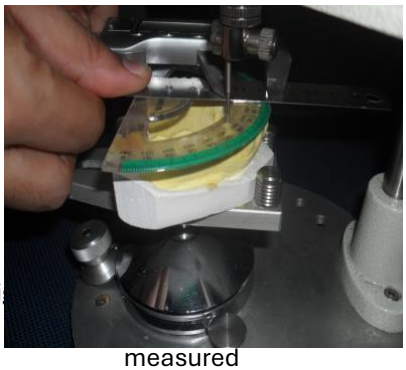

Fig 6: Distance from incisive papilla to central incisor is measured

Fig 7: Distance is measured by digital Vernier calipers

Result:

Total 48 males and females with 20-40 years old patients were observed for the result of square and ovoid face form.

Face Form	Gender	Range	Mean ±SD
Ovoid	Male	10.50-12.50	11.50±0.79
	Female	10.50-12.00	11.25±0.65

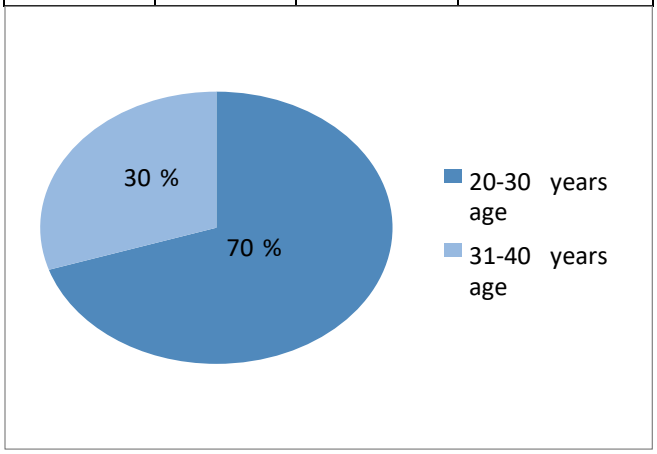

Fig-1: Distribution of patients by age

Fig-1 showed, 70% patients were in the age group of 20-30 years and 30% were in the age group of 31-40 years.

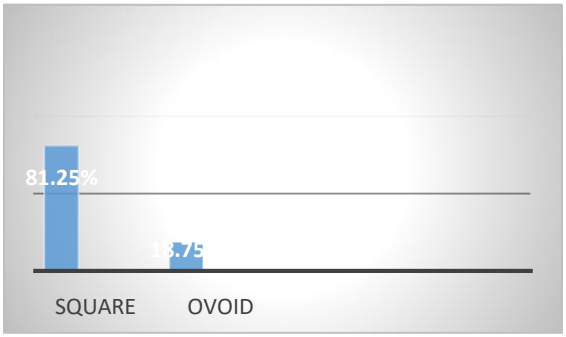

Fig-2: Distribution of patient in percentage

In figure-2 showed that, 81.25% in square group and 18.75% in ovoid group

Table 1: Measurement of distance between the central incisor and the incisive papilla in patients of square face form

Face Form	Gender	Range	Mean ±SD
Square	Male	9.50-11.00	10.19±0.51
	Female	9.00-10.50	9.67±0.57

Table-1 showed, the distance between the central incisor and the incisive papilla in patients of square face form, where in case of male mean ±SD were (10.19±0.51) and in case of female it was (9.67 ±0.57).

Table 2: Measurement of distance from central incisor to incisive papilla in patients of square face form

Table-2 showed the distance from central incisor to incisive papilla in patients of ovoid face form, where in case of male mean ±SD (11.50±0.79) and in case of female it was (11.25±0.6).

Table 3: Comparison of distance from incisive papilla to maxillary central incisors in patients of different face form.

Distance from Central Incisor to Incisive Papilla (mm)				
Face Form	Range	Mean	SD	P-value
Square	9.50-11.00	9.99	.58	0.001
Ovoid	10.50-12.50	11.39	.69	

In table-3 showed, central incisor to incisive papilla distance of all patients (n=48) was shown in mean. Among the patients' square face form patients had mean distance of incisive papilla to central incisor 9.99 mm with SD 0.58, ovoid face form patients had mean distance of incisive papilla to maxillary central incisor 11.39 with SD 0.69.

Discussion

The present investigation included 48 dentate individuals representing square and ovoid facial forms. Following participant selection, maxillary impressions were obtained and the resulting casts were standardized before measurements were recorded. The distance between the posterior border of the incisive papilla and the embrasure between the maxillary central incisors was determined after positioning each cast on the dental surveyor.

A broadly comparable approach was reported by Majid et al.,[15] although their measurement was taken from the posterior border of the incisive papilla to the mesial edge of the maxillary central incisors. In contrast, Lau et al.[14] used photographic analysis to determine the distance between the labial surface of the central incisors and the posterior margin of the incisive papilla. Therefore, direct comparison of measurements among these investigations should take into account the differences in the anatomical reference points used on the central incisors.

In the present sample, the square facial form was more frequently observed than the ovoid form, accounting for 81.25% of the participants. This distribution differs from findings reported in some previous investigations, including those of Majid et al., Kook et al. and Nakatsuka et al. Majid et al.[15] reported ovoid arches as the most frequently observed arch configuration, whereas the present study identified a greater proportion of individuals with the square facial form. The participants were between 20 and 40 years of age. Of the study population, 70% belonged to the 20–30-year age group and the remaining 30% were aged 31–40 years. Previous investigations examining the relationship between the incisive papilla and maxillary central incisors have also frequently included individuals within a comparable age range.[5,14,15] This age restriction is relevant because natural dentition and the associated anatomical relationships are expected to remain comparatively stable during early and middle adulthood.[15]

The present measurements demonstrated differences between the two facial-form groups. Among participants with a square facial form, the mean distance was 10.19 ± 0.51 mm in males and 9.67 ± 0.57 mm in females. In the ovoid group, the corresponding mean values were 11.50 ± 0.79 mm and 11.25 ± 0.65 mm, respectively. Majid et al. reported mean distances of approximately 11.2 mm in males and 10.5 mm in females with an ovoid arch form.[11] Lau et al. reported distances from the posterior border of the incisive papilla to the labial surface of the maxillary central incisor of 12.65 mm, 12.45 mm and 13.18 mm among individuals with Class I, Class II and Class III incisal relationships, respectively.[14] Differences between these values and those observed in the present investigation may partly reflect differences in measurement methodology and the anatomical reference points selected.

A statistically significant difference was identified in the distance between the maxillary central incisors and the incisive papilla when square and ovoid facial forms were

compared ($p < 0.05$). Majid et al.[15] also reported a significant difference in the corresponding measurements when different arch forms were compared, although their findings did not demonstrate a significant difference within the square arch group. In another investigation, Lau et al.[14] found that differences in the distance between the incisive papilla and central incisors among individuals with Class I, Class II and Class III malocclusions did not reach statistical significance. The variation among studies should therefore be interpreted in light of the fact that the measurements were not obtained from precisely identical reference points on the central incisors.

Conclusion

The mean distance from the incisive papilla to the maxillary central incisors was 10.19 mm in males and 9.67 mm in females with a square facial form. In participants with an ovoid facial form, the corresponding mean values were 11.50 mm for males and 11.25 mm for females. The study demonstrated a statistically significant difference in the incisive papilla-to-central incisor distance between the square and ovoid facial-form groups. These findings suggest that facial form may be considered when using the incisive papilla as an anatomical reference for positioning the maxillary anterior teeth during complete denture fabrication.

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