

## Prosthodontic Significance of Incisive Papilla - An Overview

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### Abstract

Many studies have been conducted to determine the relationship between incisive papilla and maxillary central incisor and measured the papilla incisor distance in dentate subjects to extrapolate this distance as a guide to place maxillary central incisors in complete dentures. So incisive papilla can be recognized as an important landmark in complete denture construction. Other recognised roles of the papilla have also been included in this overview.

**Keywords:** Incisive Papilla; Papilla Incisor Distance; Canine-Papilla-Canine Line (C-P-C Line); Maxillary Anterior Tooth Position

### Introduction

Incisive papilla is a fleshy protuberance of the palatal mucosa situated posterior to the maxillary central incisors. It normally appears redder than the surrounding pale pink palatal mucosa. The incisive canal, also known as the nasopalatine canal which transmits the terminal branches of the nasopalatine nerve and the sphenopalatine arteries and veins, is situated just below the incisive papilla [1]. This is readily recognizable and may be used as

a reference point for other features present in the palate and hence termed as an anatomical landmark (Figure 1).

While fabricating complete dentures, selection of maxillary anterior teeth has a profound effect in promoting the acceptance of the patient. However, this has remained as a challenging endeavour for the dentist. Pre extraction records serve as reliable guides in selecting the dimensions of anterior teeth. However, most of the patients report to the clinicians without any record and hence biomet-

**Figure 1:** Anatomy of incisive papilla and nasopalatine canal.

Source: Hansen J. T. (2009). Netter's Clinical Anatomy. 2<sup>nd</sup> edition. Chapter 8: pp. 395.

ric guides are relied upon. It is a fact that the success of a denture greatly depends on the aesthetic fulfilment of the patient's expectations. Positioning of maxillary central incisors can be considered as the starting point of designing anterior aesthetics (Figure 2).

**Figure 2:** Incisive papilla in edentulous maxilla.

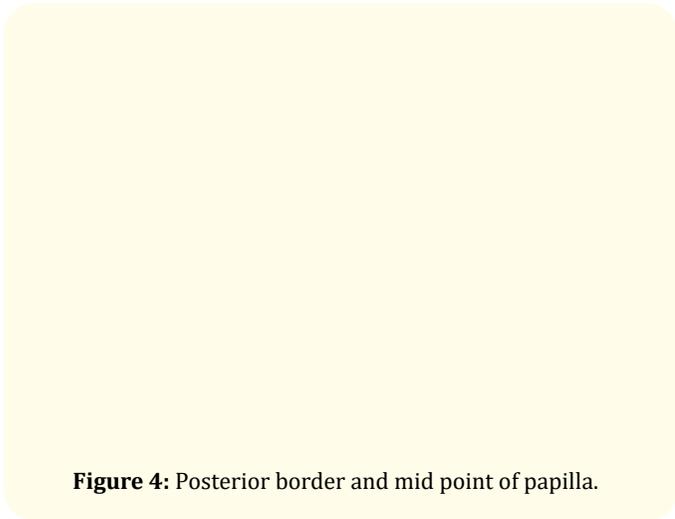
The relationship between incisive papilla and maxillary central incisors has been a subject of interest both as an anatomic land-

mark and as a biometric index. The distance between the papilla and the maxillary incisors served as a guide to position maxillary central incisors in complete dentures. Solomon, *et al.* have found this distance in Indian individuals as 11 to 12 mm [1]. Papilla incisor measurements were made either from the middle or posterior border of the papilla and the central incisors. Many authors had differed in their opinion in suggesting the distance between incisive papilla and the labial surface of the maxillary central incisors. The difference is possibly due to the differences in races and varied anatomic formations. However, the general consensus on the distance is arrived at 8 mm. This will serve good as a starting point but the final decision should rely on the acceptable aesthetics and the soft tissue support. The position of the natural tooth which the patient has enjoyed for a considerable period of time should be the ideal position for the artificial counterpart. But for reasons of stability and retention, the natural tooth position is subjected to compromise in edentulous state. Incisive papilla is considered to be a stable and definitive anatomic landmark. Walt and Likeman stated that the pattern of alveolar resorption can cause superior movement of the incisive papilla and to compensate for this, the posterior border of the papilla has to be considered as the reference instead of the middle or anterior border [2]. The average post extraction positional change appeared to be slightly less in males than in females (Figure 3).

**Figure 3:** Papilla incisor distance.

Incisive papilla overlies the incisive foramen through which passes the nasopalatine nerves and the palatine vessels. Lynn has

observed that pressure on this structure exerted by a denture can lead to pain or a burning sensation. Hence it is advisable to relieve this area [3]. It was found that the papilla in dentate individuals is not always round but seen in several forms. In some individuals, it exists as double papilla and in a few it becomes rudimentary. The center of the papilla also changes from its dentulous to edentulous state. The posterior border is a relatively stable landmark since it undergoes least change after extraction of anterior teeth (Figure 4).



**Figure 4:** Posterior border and mid point of papilla.

**CBCT evaluation of incisive canal**

Craniofacial radiography is essential for the assessment of anatomic and pathologic factors to be used for the planning of craniofacial surgery or restorative dental procedures. Lake., *et al.* have stated that CBCT is the best way to evaluate the incisive canal because it provides high-resolution images. On imaging, the shape of the incisive canal has been observed to be funnel or Y-shaped. Other shapes on radiographic imaging are cylindrical, banana, spindle or hourglass and which have been related to different ethnic groups. Evaluation of distance between incisive canal and central incisor has gained importance recently because of increasing popularity of dental implant treatment. The position of the incisive canal can occasionally interfere with immediate implant placement and provisionalization due to its proximity to the root of the central incisor. Grafting the incisive canal is recommended prior to or simultaneously with implant placement whenever encroachment to this anatomical structure is expected. This requires an additional

surgical procedure to remove the incisive canal contents, followed by placement of particulate graft material into the canal [4]. Depending on the proximity of the incisive canal to the prospective osteotomy site, a two-stage implant placement approach may be required. Incisive papilla and the incisive canal have gained more relevance in the present context of implant treatment and the possibility of large anatomical variations associated with incisive canal dimensions and neurovascular content (Figure 5).

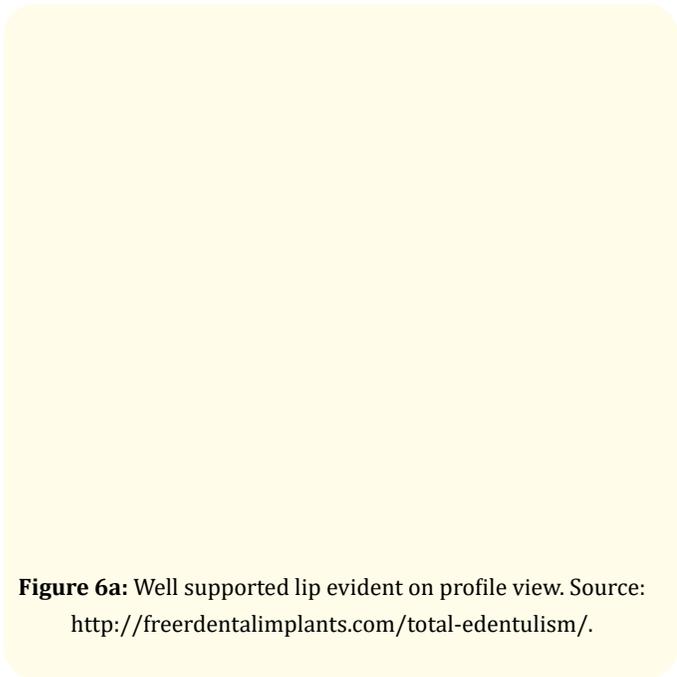


**Figure 5:** CBCT of incisive canal. Source: <https://www.cureus.com/articles/13662-the-incisive-canal-a-comprehensive-review>.

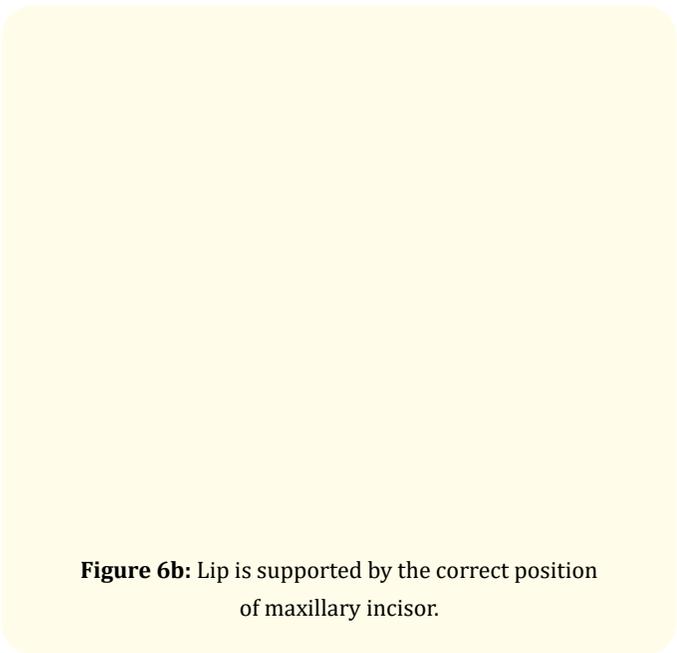
**Soft tissue contour**

An individual gets the dentulous appearance mainly because of the soft tissue contour of the lower third of the face. The contour of the lip is mainly provided by the anterior teeth. Once the teeth are lost, the soft tissue support is provided by the residual ridge which is not at all adequate. It is also a matter of concern that the resorption of the residual ridges is a continuous process or it may be considered as a disease too. When complete dentures are designed, lip support provided by the anterior teeth is the major concern. To be precise, the position of the maxillary central incisors helps the dentist to restore the soft tissue contour [1]. Incisive papilla and its relationship with the central incisors act as a useful guide in designing the anterior segment of the complete dentures. Based on the biometrics of the incisive papilla, the position of the central

incisors is decided and the aesthetics of visibility of teeth during smile is further verified. When all the anterior teeth are arranged, upper lip gets adequate support and the vermilion becomes visible. Incisive papilla gains land mark status in providing adequate soft tissue contour of the lower third of face and thereby aesthetics too (Figure 6a and 6b).



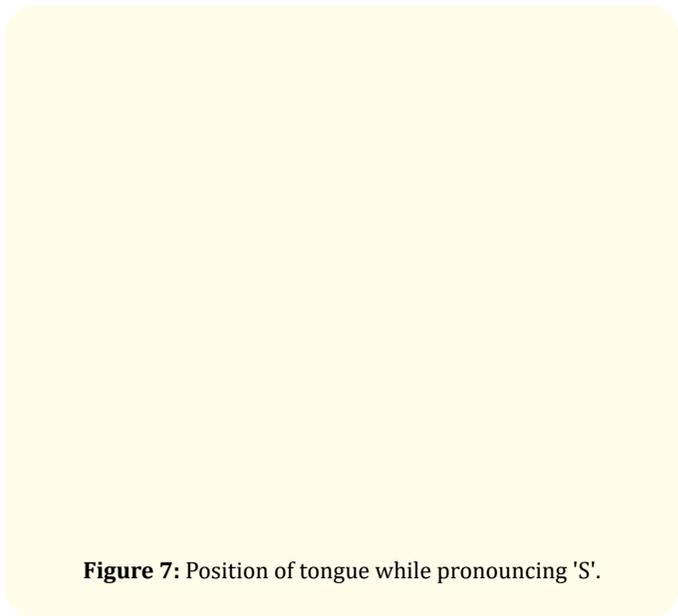
**Figure 6a:** Well supported lip evident on profile view. Source: <http://freerdentalimplants.com/total-edentulism/>.



**Figure 6b:** Lip is supported by the correct position of maxillary incisor.

### Speech and tooth position

Speech also will be affected by the position of the incisors. Tongue contacts specific surfaces of the teeth, alveolar ridge, or hard palate during the production of each consonant. As these structures are covered or replaced by the denture, an appropriate restoration is necessary for undisturbed speech production. Disturbed pronunciation may result as a direct influence of the artificial teeth and palate on air flow but may also be caused by a different tongue position or movement. Displacement of the maxillary incisors in a labial direction can most likely cause speech problems. Pronunciation of the 's' sound is mostly affected by the tooth position. In dentures, it is found that the volume variations caused by the thickness of the palatal plate can also influence the speech [5] (Figure 7).

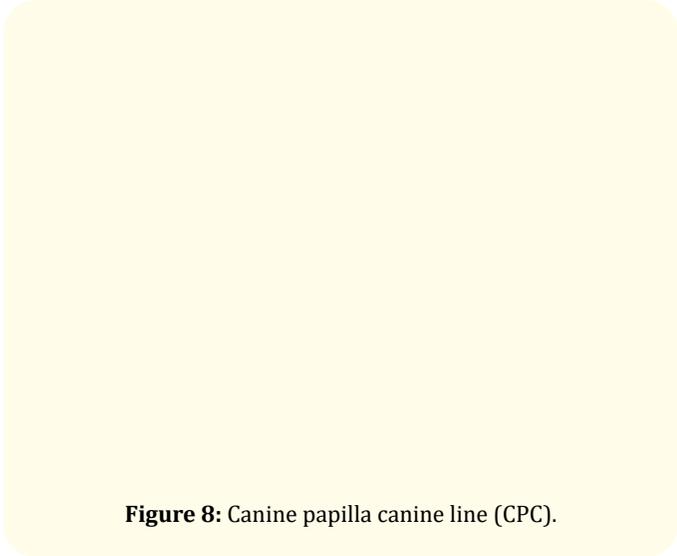


**Figure 7:** Position of tongue while pronouncing 'S'.

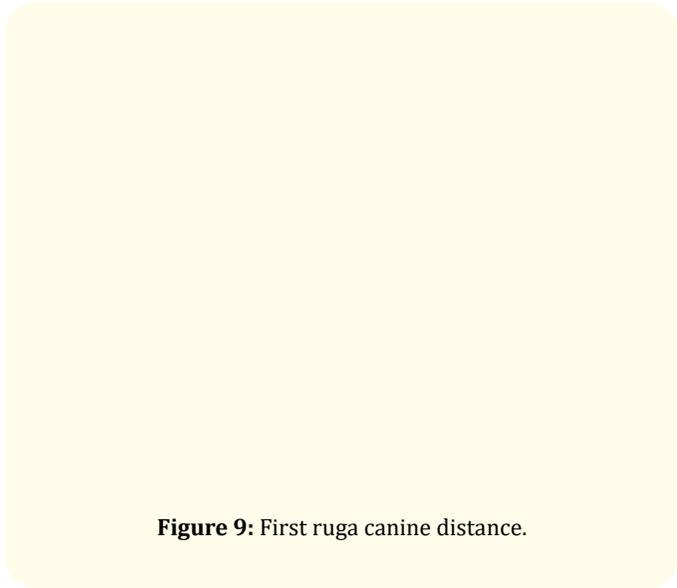
### Canine papilla canine (CPC) line and rugae

Positioning of maxillary canine is also an important factor in gaining anterior aesthetics. Hence canines are also related to incisive papilla through a line connecting the cusp tips of both the canines and the line is designated as Canine-Papilla-Canine (CPC) line. Position of CPC line has been a subject of interest and it remains as a good while fabricating complete dentures. Most of the studies have found that CPC line passes through the middle position of the incisive papilla. In south Indian individuals, nearly 90% of subjects exhibited a relation of CPC line with midpoint of the

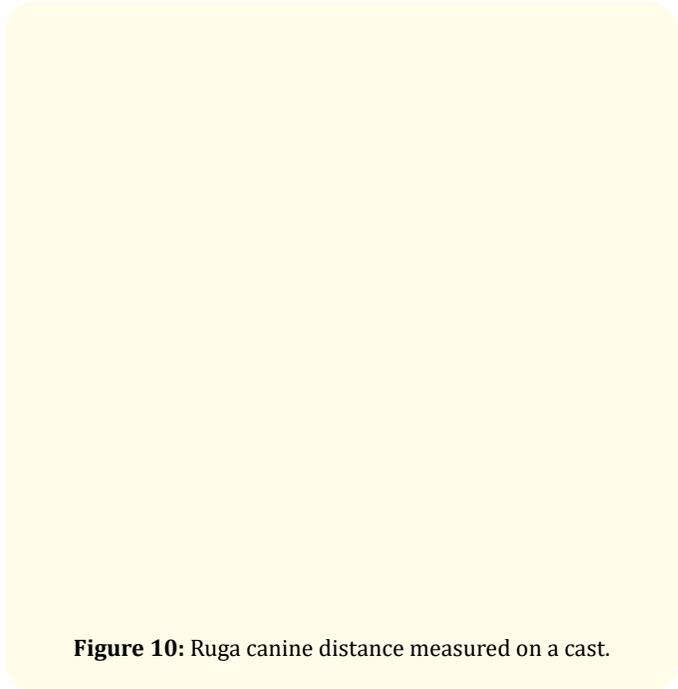
papilla [6]. The distance between the tip of the first ruga to the tip of the canine ranges from 10 to 12 mm. Length of the first rugae on one side is approximately 10 mm. The calculated distance from the midpoint of the incisive papilla to the tip of the canine will be approximately 20 mm. This guide line will help the dentist and the technician to position the canines and it will also help in selecting the anterior teeth. An appropriate anterior arch in a denture will ensure aesthetics as well as phonation space (Figure 8-10).



**Figure 8:** Canine papilla canine line (CPC).



**Figure 9:** First ruga canine distance.



**Figure 10:** Ruga canine distance measured on a cast.

#### Hamular notch-incisive papilla plane

Plane connecting incisive papilla to both the hamular notches has a relationship with the occlusal plane connecting the incisal edge of the maxillary central incisor and mesio buccal cusp tip of the maxillary second molar. Singh K., *et al.* [7] have evaluated this relationship in fifty dentulous and twenty edentulous individuals and found a positive relationship.

#### Discussion

In an extensive review on incisive papilla Jain A R, has included the observation of Harper who stated in 1949 that the position of the incisive papilla remains fairly constant in the edentulous patient since resorption since resorption has already taken place in anteroposterior direction. He was the first to suggest the use of incisive papilla as a guide to the placement of maxillary anterior teeth [8]. An ideal reference point should be easy to distinguish *in vivo*, in casts and in radiographs. It should also be unaffected by the position of the teeth or by its absence or by the forces which influence them. Being a part of the skeleton, influence by the genetic factors supersede rather than environmental [5]. Incisive papilla is a useful anatomical landmark to locate the position of canine

too in maxillary complete dentures. Watt, *et al.* stated that canines should be located in a coronal plane passing through the posterior border of the papilla. The labial contour of maxillary occlusal rim can be determined and the central incisors and canine teeth can be positioned with incisive papilla as a cardinal reference in complete denture designing [9].

Studies have proved that the posterior border of incisive papilla is a more stable landmark in comparison to the other portions of the papilla because of the possible resorptive changes that are common during the transition from dentulous to edentulous phases. Though incisive papilla is a valuable landmark to locate the position of incisors and canines, very often it gets covered by the record base and occlusal rim. Hence it is desirable to scribe the CPC line passing through the posterior border of the incisive papilla and extending it over to the land area of the cast. Another method is to temporarily expose the incisive papilla through a window.

In dentate individuals, incisive papilla - maxillary central incisor distance has been calculated as 10 - 12 mm. In different races, marginal changes have been observed in this distance. While designing complete dentures, there is a constraint in adopting the natural papilla-incisor measurement, for reasons of jeopardizing retention caused by the leveraging effect of forces generated during incision. Hence most of the dentists prefer to use 8 mm as the papilla-incisor distance in dentures. However, a clinical judgement based on aesthetics, phonation and soft tissue contour will be a valuable adjunct in positioning maxillary anterior teeth.

## Conclusion

Among the different intra-oral landmarks, the incisive papilla has been a matter of interest to many researchers. This is because it provides valuable guidelines for establishing the positional relationship of anterior teeth in dentures. It can be concluded that there exists a definite relationship between the incisive papilla and the labial surface of incisor teeth and between the distal ends of the first rugae to the canine. Positioning of anterior teeth has unquestionable influence on speech and esthetics and incisive papilla is a useful reference both to the dentist and the technician. There is enough scope for multi centric research in evaluating the landmarks in Indian individuals and to find out possible correlations with facial and dental measurements.

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