



## INTERDENTAL PAPILLA- A CORNERSTONE TO FACIAL AESTHETICS!

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### ABSTRACT

The most common cause of periodontal tissue destruction is plaque induced diseases of the periodontium. The microflora present in the microbial biofilm present on the tooth surface is accountable for the initiation of a host immuno-inflammatory response which indirectly results in the destruction of the underlying periodontal tissues. Apart from periodontal diseases, several other factors are responsible for the appearance of "Black triangle" in the area of interdental papilla, such as position of the tooth in the arch, contour and spacing between two adjacent teeth, improperly contoured prosthesis and restorations and aggressive oral hygiene procedures. Missing or loss of interdental papilla especially in the maxillary anterior region causes difficulty in speech, mastication and aesthetic awareness in the patients. This article reviews the anatomy of interdental papilla and various approaches for the treatment of the same.

**KEYWORDS:** Black triangle, Microflora, periodontium, immuno-inflammatory.

### INTRODUCTION

Since many years, periodontal disease is one of the most common diseases affecting human beings. It was also found in the embalmed bodies of ancient Egyptians.<sup>[1]</sup> The earlier civilizations have given importance to the practice of oral hygiene and considered that the inflammation of gums was caused by accumulation of calculus.<sup>[2]</sup> The interdental papilla plays a very strategic part in the creating facial aesthetics. Its absence results in aesthetic impairment or a cosmetic concern, phonetic problems and increased chances of food impaction.<sup>[3]</sup>

#### Anatomy of the Interdental papilla

The interdental space or the space between two teeth is governed by the morphology and position of adjacent teeth and the course of cemento-enamel junction on the teeth. The interdental space is composed of four embrasures that are pyramidal in shape- buccal, lingual, occlusal and cervical. Out of these four pyramids, only the cervical one is occupied by soft tissue whereas the other pyramids are empty.<sup>[4]</sup> A papilla can be viewed as a balloon that sits on the epithelial attachment, the average distance being 2-3 mm from the junctional epithelium. The dimension of the balloon depends upon the morphology of the gingival embrasure. The wider the embrasure, the flatter the interdental papilla. It is pyramidal in shape in the anterior teeth, however, as the contact area between two teeth is wider in the posterior teeth, the interdental papilla is "col" shaped which is a

valley like depression separating the facial and lingual papilla.

The level of alveolar bone decides the height of the interdental papilla. It extends 4.5 to 5 mm from the alveolar bone crest whereas the distance between facial marginal gingiva and alveolar bone is approximately 3 mm. The biologic width being the same in the interdental area and the facial area, the sulcus depth is more in the interdental area.<sup>[5]</sup>

It was concluded that if the height between the gingival level of interproximal tooth contact and the alveolar bone is 5 mm or less than 5 mm, the interdental papilla regenerates itself completely. As the distance of the contact from the alveolar bone increases, as is the case in periodontal diseases or improper restorations and prosthesis, the interdental papilla is not able to regenerate itself completely which results in the appearance of black triangle. When this contact is at a distance of 6 mm from the bone, only 56% of the papilla could fill the space. When this contact is at a distance of 7 mm from the bone, only 37% of papilla could fill the space.<sup>[3]</sup>

Some morphologic characteristics should be taken into consideration while performing restorative approaches. The contact point between two teeth should be given with caution, as reduction in cervical pyramid of the interdental papilla may favour food impaction.<sup>[6]</sup>

### Factors influencing the presence of interdental papilla<sup>[7]</sup>

1. Distance between the contact point and alveolar crest.
2. Biotype of the periodontium- The thick periodontal biotype is more fibrotic and resilient thus protecting itself from the insults of dental treatment of oral hygiene procedures.
3. Flat gingival scallop since the bone has a congruous relationship with the gingiva and is less prone to recession.
4. Shape of the tooth- Squarer teeth have better interdental papilla health because of lesser distance between the contact point and alveolar crest.

### Etiology of loss of interdental papilla<sup>[8]</sup>

1. Abnormal shape of the tooth.
2. Improper contours of prosthetic crowns or restorations.
3. Traumatic oral hygiene procedures in the interdental area.
4. Periodontal disease.
5. Acute gingival diseases like acute necrotizing ulcerative gingivitis which results in punched out crater like depression of the interdental papilla.
6. As a response to periodontal therapy during healing.
7. Spacing between teeth or loss of teeth.

### Classification of loss of interdental papilla

For the treatment of missing interdental papilla, proper identification and exact description of extent of loss of papillary height is essential. One such generally accepted classification system is presented below given by Nordland WP and Tarnow DP in 1998.<sup>[9]</sup> The anatomical landmarks included in this classification system are interdental contact point, apical extent of Cementoenamel junction (CEJ) on the facial surface, and the interproximal coronal extent of CEJ. The classification is as follows-

**Normal-** Interdental papilla fills embrasure space to the apical extent of the interdental contact point/area.

**Class I-** The tip of interdental papilla lies between the interdental contact point and the most coronal extent of the interproximal CEJ (space present but interproximal CEJ is not visible).

**Class II-** The tip of interdental papilla lies at or apical to the interproximal CEJ but coronal to the apical extent of facial CEJ (interproximal CEJ visible).

**Class III-** The tip of interdental papilla lies in level with or apical to facial CEJ.

Other classification systems are those given by Jemt in 1997<sup>10</sup> for the degree and regeneration of interdental papillae adjacent to single implant restorations and once classification system given by Cardaropoli in 2004<sup>11</sup>

which can be used in the absence of contact points and midline diastema.

### Treatment of missing interdental papilla

The regeneration and reconstruction of lost interdental papilla is one of the most challenging and least predictable periodontal treatments for the clinicians. Therefore the periodontal integrity of the interdental papilla should be maintained at all costs while performing any dental treatment. Nowadays, the prime concern of the patient after dental treatment is aesthetics. Hence, the key indications for treatment of lost interdental papillae are cosmetic concern of the patient, phonetic problems because of the passage of air, food or saliva from the space and food retention in the interdental area.

### Non-surgical techniques<sup>[6]</sup>

1. Resolution of gingival inflammation by scaling and root planing prior to any treatment procedures if the primary cause of loss of interdental papilla is periodontal disease. In such cases, treatment of periodontal disease is more important than the reconstruction of lost papillae.
2. Reinforcement of oral hygiene procedures if the etiology of the absence of interdental papilla is traumatic or aggressive oral hygiene methods. Overzealous toothbrushing is not advisable as it results in injury to the soft tissues as well as the hard tissues of the teeth.
3. Correction and relocation of the contact point in cases where the papilla is missing because of malpositioning of the tooth.
4. In situations where there is spacing between the teeth for example midline diastema, the interdental papilla is missing as no contact point is present between two teeth. Orthodontic treatment can be carried out in such cases. Creation of a contact point by orthodontic treatment results in the creeping of the interdental gingival tissues and conception of an interdental papilla results.
5. Repeated curettage of the interdental papilla performed every 15 days for 3 months resulted in the regeneration of papilla after approximately 9 months in some cases whereas other cases did not show any response.

### Surgical techniques

1. Gingivectomy and gingivoplasty- In cases of gingival enlargements, if the enlarged tissue does not subside by nonsurgical therapy, gingivectomy is carried out to remove the excess tissue and gingivoplasty is done to recontour the gingival tissues including the interdental papilla. In diseases such acute necrotizing ulcerative periodontitis, after the clinical signs have subsided, gingivoplasty and reconstruction of interdental papilla is needed as the interdental papilla are characteristically involved in this disease.

2. Papilla preservation flap- Papilla preservation technique as suggested by Takei et al in 1985<sup>[12]</sup> is used for preventing the destruction of interdental papilla with the use of full thickness flap that includes the interdental papilla. Simplified papilla preservation flap (SPPF) as suggested by Cortellini in 1999<sup>[14]</sup> and Modified papilla preservation flap<sup>[13]</sup> are also modified techniques for the preservation of interdental papilla.
3. Method to coronally displace the gingivopapillary unit with the use of connective tissue graft (CTG) by technique given by Han and Takei in 1996.<sup>[15]</sup> A semilunar incision is given just above the interdental area and an envelope flap is created. A CTG is placed within this pouch and is sutured in place. Another technique given by Robert Azzi in 1998<sup>[16]</sup> makes use of CTG which is placed in contact with the alveolar bone after elevation of flap by giving sulcular incision.
4. Roll technique<sup>[17]</sup> - The use of Pedicle flap ensures a predictable blood supply to the graft derived directly from the base of mobilized flap.
5. Buccal and palatal split thickness flap with CTG from tuberosity area.
6. Subepithelial CTG from tuberosity area placed at the level of mucogingival junction. An envelope flap is prepared by giving an incision at the level of mucogingival junction. The graft is placed in this pouch which allows coronal displacement of the gingiva.<sup>[18]</sup> This approach can be used to treat gingival recession as well as missing interdental papilla.
7. Bone graft harvested from tuberosity area and CTG from palate. The same technique presented above can be performed with the addition of bone graft from tuberosity area and CTG from the hard palate. The bone graft will give an additional volume to the interdental tissue.<sup>[19]</sup>
8. Buccal displacement of full thickness flap raised from slightly palatal aspect with coronal pull sutures. This technique is performed adjacent to dental implants with missing interdental papilla.<sup>[20]</sup> The buccal displacement of the flap is followed by vestibuloplasty after 4-5 weeks.
9. Surgical recontouring of the gingiva followed by use of ovate pontics in cases of fixed partial dentures in the anterior area of dentition.
10. Use of biomaterials such as Platelet rich fibrin (PRF) or Platelet rich plasma (PRP) that consist of growth factors derived from the patient itself. Their use promotes wound healing and hemostasis. PRP or PRF can be used a membrane or bone graft in the periodontal surgical procedures. They have mechanical adhesive properties as well as biologic functions like that of fibrin glue.
11. Use of hyaluronic acid. Hyaluronic acid is a glucosaminoglycan (GAG) present in the extracellular matrix of tissues. It plays an important role in cell migration and stimulation of connective tissue cells. Case report showing the use of HA as

infiltration in the interdental papilla every 7 days for 4 weeks is present in the literature.<sup>[21]</sup>

12. Use of microsurgical approach for performing periodontal surgeries.<sup>[22]</sup>

The literature available on the regeneration of interdental papilla lacks long term randomized clinical trials with sufficient number of subjects. Only case reports depicting the surgical techniques are present. Therefore, a conclusion cannot be drawn as to which technique gives a predictable result and should be preferred over the other.

## CONCLUSION

Several factors are responsible for the loss of interdental papilla and appearance of black triangle, the most common reason being periodontal disease. The reconstruction of interdental papilla is very perplexing with low certainty. For that reason, the integrity of the interdental papilla should always be preserved. Proper care should be taken during fabrication of prostheses and restorations, proper oral hygiene instructions should be given to the patient to avoid overzealous brushing or flossing and patients coming to the clinics should be educated regarding the importance of oral hygiene and the consequences of periodontal disease.

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