

Treatment of Black Triangle by Using a Sub-epithelial Connective Tissue Graft

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ABSTRACT

One of the most difficult and elusive goals of periodontics in the field of reconstruction, regeneration and esthetic aspect of periodontal therapy is the surgical reconstruction of the lost interdental papilla. Loss of interdental papilla could result in patient complaints such as phonetic problems, food impaction, functional problems and esthetic concern. It is clinically represented by open embrasures

and is often referred to as the “black triangle”. Periodontal plastic surgery offers both surgical and non surgical approaches in the treatment of “Black triangle”. This case report demonstrates complete reconstruction of the lost interdental papilla following a semilunar coronally repositioned papilla technique with 6 months follow-up.

Key Words: Black triangle, Subepithelial connective tissue graft, Inter-dental papilla, Papilla reconstruction

INTRODUCTION

One of the major aesthetic challenges in periodontal plastic surgery is related to the ability of rebuilding the lost papilla in the maxillary anterior segment. Absence of the papilla with opening of the black spaces result in ‘Black triangles’ and they are one of the most important aspects of the decision making process of a clinician. This condition may create aesthetic impairments and food impactions [1,2].

The common causes of the loss of the inter-dental papilla are midline diastema, diverging roots, tooth extractions, traumatic interproximal oral hygiene procedures, abnormal crown forms and periodontal diseases [1].

Several surgical and non-surgical techniques have been proposed to treat soft tissue deformities and to manage the inter-proximal space. The non-surgical approaches are orthodontic, prosthetic and restorative procedures. They modify the interproximal space, thereby inducing modifications of the soft tissues. The surgical techniques aim to recontour, preserve or reconstruct the soft tissue between the teeth and the implants [1].

This case report highlights the importance of the inter-proximal papilla and its clinical significance and the progress of the papilla augmentation, based on the use of a sub-epithelial connective tissue graft for the treatment of the “Black triangle”.

MATERIALS AND METHODS

This case was undertaken in the Department of Periodontology at the Meenakshi Ammal Dental College and Hospital, Chennai, India. A 21 year old patient with the class I loss of the inter-dental papilla [3] in the maxillary anterior teeth, with the distance between the bone crest and the Contact point as $\leq 5\text{mm}$ and the height of the inter-dental papilla as $< 4\text{mm}$, was selected for the treatment [Table/Fig 1]. The patient had normal alignment of the teeth in the maxillary arch, he was a non smoker and maintained good oral hygiene and no proximal caries or improper restoration were present with respect to the site.



[Table/Fig-1]: Pre-operative view (loss of inter-dental papilla in relation to 11,21)

THE PRESURGICAL PROTOCOL

The treatment protocol was explained to the patient and an informed consent was obtained. After the phase one therapy, the clinical parameters such as the Papilla Index Score and the Height of Interdental Papilla were measured on the 0th-day of the surgery (baseline) and postoperatively on the 90th day and the 180th day.

The Papilla Index Score (Nemcovsky CE 2001) [4]

- PIS 0: No papilla was present and there was no curvature of the soft tissue contour.
- PIS 1: Less than half the papilla height was present as compared to that in the proximal teeth; a convex curvature of the soft tissue contour was observed.
- PIS2: At least half the papilla height was observed, but it was not in complete harmony with the inter-dental papilla of the proximal teeth.
- PIS 3: The papilla filled the inter-proximal embrasure to the same level as in the proximal teeth and it was in complete harmony with the adjacent papilla.

Height of the Inter-dental Papilla (McGuire MK et al 2007) [5]

The height of inter-dental papilla was determined according to McGuire MK et al (2007) [7]. In this procedure, the inter-dental papilla was anaesthetized with 2% lignocaine hydrochloride. A William's periodontal probe was used to measure the distance between the bone crest to the apical end of the contact point (H). Loss of the papilla was determined by measuring the distance between the tip of the inter-dental papilla to the apical end of the contact point (H1). Then, the height of the inter-dental papilla (H2) was determined by subtracting H1 from H.

THE SURGICAL TECHNIQUE

Preparation of the Recipient Site

The surgical area was anaesthetized with 2% lignocaine hydrochloride which contained 1:2,00,000 adrenaline. A semilunar incision was made 3mm apical to the mucogingival junction facial to the inter-dental area, followed by a pouch like preparation towards the inter-dental area [Table/Fig 2]. Intra-sulcular incisions were made around the necks of the adjacent teeth to free the connective tissue attachment from the root surface, to allow the coronal displacement of the gingivo-papillary unit [Table/Fig 3].

Obtaining the Graft from the Donor Site

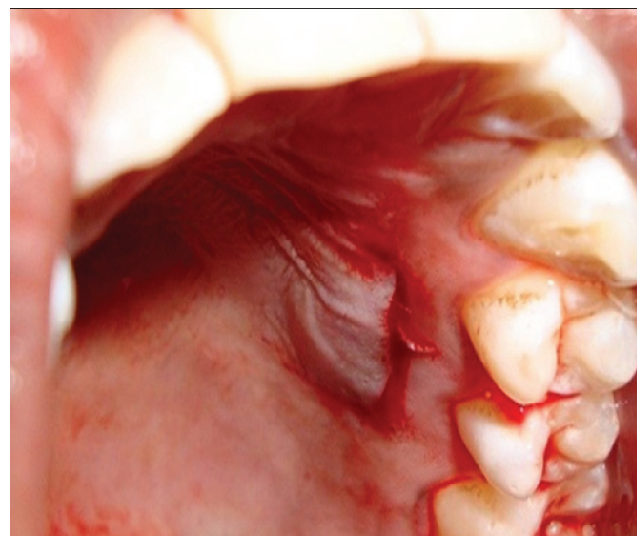
The sub-epithelial connective tissue graft was harvested from the palate [Table/Fig 4], following a "trap door" flap design [6]. A No.



[Table/Fig-2]: Semilunar incision placed 3mm apical to the mucogingival junction



[Table/Fig-3]: Intrasulcular incisions given and tunnel prepared



[Table/Fig-4]: Palatal donor site with trap door flap design



[Table/Fig-5]: Harvested connective tissue graft from the Palate

15 B.P. blade was used to make a partial thickness horizontal incision, about 3mm apical to the gingival margin of the first premolar, extending towards the first molar. Two vertical incisions were made mesiodistally [Table/Fig 5]. A tissue forcep was used to lift the prepared palatal flap edge. It was reflected towards the centre of the palate and the underlying connective tissue was exposed. An incision which was perpendicular to the bone was made around the edge of the connective tissue, facilitating its reflection from the bone. A small periosteal elevator and an Urban's knife were used to reflect the connective tissue which was harvested. After harvesting the graft, the wound was closed by using 4-0 black silk sutures.

Transferring and Immobilizing the Graft

The donor sub-epithelial connective tissue graft which was harvested from the palate was tucked in and pushed coronally within the prepared pouch to support and provide bulk to the coronally positioned interdental papilla [Table/Fig 6]. The gingivo-papillary unit was then sutured [Table/Fig 7], a tin foil was placed over the surgical site and a periodontal dressing was applied. The patient was prescribed analgesics (Ibuprofen 400mg bid for 3 days) and 0.2% chlorhexidine digluconate mouthrinse twice daily for 2 weeks.



[Table/Fig-6]: Gingivo-papillary unit coronally repositioned and sutured



[Table/Fig-7]: 90th day post-operative view

Follow Up

Post-operatively, the patient was instructed to rinse the mouth with 0.12% chlorhexidine mouthwash for 10 days and to refrain from flossing or interdental brushing for 4 weeks. The sutures were removed after 10 days [Table/Fig 8]. The surgical site was evaluated on follow up visits post-operatively on the 90th and the 180th day. Both the clinical parameters were recorded and the post-operative clinical photographs were taken. For clinical and statistical analyses, the measurements at 0-day (baseline), the 90th day and the 180th day were taken into consideration.

RESULTS

The papilla index score (PIS) of the patient on the day of the surgery was PIS 2. The PIS on the 90th day was 3, which remained the same on the 180th day. Hence, there was an increase of 1 PIS unit in the patient on the 180th day. The height of the interdental papilla was 3mm on the day of the surgery, which increased to 4mm on the 90th day and remained the same on the 180th day. There was an increase of 1mm in the height of the inter-dental papilla from the 0th day to the 180th day. A 100% papilla fill was obtained on the 180th day.

DISCUSSION

The success and the predictability of any surgical procedure for treating papilla loss is based on the amount of the papilla fill. This procedure is the first of its kind as it records the height of the interdental papilla, in accordance with the method of McGuire MK et al (2007) [5].

In this case, there was a complete fill of the papilla in the site due to the stability of the connective tissue graft and the maintenance of good oral hygiene.

This procedure was employed in accordance with that of Han TJ and Takie HH (1996) [7]. A semilunar coronally repositioned papilla was combined with a sub-epithelial connective tissue graft and it was found to be an effective method of achieving predictable and stable results for treating papilla loss. The success of this grafting procedure was mainly due to the dual blood supply from the underlying connective tissue base and the overlying recipient flap. An excellent colour match and a donor site with a closed wound which provided less post-operative discomfort were the advantages of this technique.

The main advantage of using a tunnel or a pouch like design for this case was that it avoided a horizontal or vertical releasing incision,



[Table/Fig-8]: 180th day post-operative view

which helped in maximizing the papillary and the lateral blood supply to the submerged connective tissue graft. The atraumatic management of the tissues, respect for the blood supply and avoidance of tension and pressure are critical for the viability of the tissues and the success for the procedure. This flap design maximizes the soft tissue vascularity and the primary wound closure. The sub-epithelial connective tissue graft was procured by the "Trap door" technique, as described by Edel A (1974) [6]. The grafted tissue receives a flow of plasma and an ingrowth of capillaries from the periosteum, the underlying connective tissue and the overlying flaps.

The use of a sub-epithelial connective tissue graft for interproximal papilla augmentation offers a reliable solution to an aesthetic problem. The papilla augmentation procedure is relatively easy and it is based on the principles of plastic surgery techniques.

Future research is indicated to examine the total volume of the embrasure space and also in the use of novel methods to measure the treatment effect in such periodontal plastic procedures.

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