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An Innovative Surgical Technique For Reconstructing The Papilla Using Platelet-Rich Fibrin.

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Abstract

The loss of interdental papilla can result in phonetic, functional and aesthetic issues. Although various surgical approaches are available, they are often difficult and yield inconsistent results. This case report describes the use of platelet-rich fibrin (PRF) for papilla reconstruction in the maxillary anterior region of a 40-year-old women who experienced papilla loss between teeth 11 and 21. PRF was inserted into a pouch created with a semilunar pedicle flap, allowing the entire gingivopapillary unit to be repositioned upwards. A satisfactory fill was achieved at 3 and 6 months post-operation. Therefore, PRF may offer a promising solution for enhancing interdental papilla.

KEYWORDS:- Papilla Reconstruction, Interdental Papilla, Platelet Rich Fibrin.

INTRODUCTION-

In recent years, there has been a substantial rise in aesthetic awareness. Periodontal plastic surgery advancements have enabled the treatment of gum recession, a common aesthetic concern. However, one of the most difficult challenges is restoring lost interdental papillae in the maxillary anterior region. The absence of interdental papilla (IDP) leads to not only aesthetic and speech issues but also functional challenges, as it encourages food to accumulate in these spaces.

In the incisor area, the interdental papilla generally has a pyramidal shape. Its presence or absence depends on factors such as the height of the crestal alveolar bone, size of the interproximal space, soft tissue type (thick or thin biotype), thickness of the buccal plate, shape of the contact area (triangular or square) and the biologic width.[1] The shape of the papilla and the adjacent interproximal embrasure are closely interconnected. An ideal embrasure allows the papilla to fill the space entirely, reaching the top of the contact point without any gaps, which prevents food trapping and enhances aesthetics. The interdental papilla's position differs from the facial gingival margin; the free gingival margin is typically 2-3 mm above the facial bone, while the papilla tip is

about 4.5-5 mm above the interproximal bone.[1] Tarnow et al[2] observed that the papilla fully fills the space when the distance between the contact point and the crest of the interdental bone is ≤5 mm. When the contact point is 6 mm or 7 mm from the bone, only 56% and 37% of the space is filled by the papilla, respectively.
The interdental area is a primary location for dental caries and periodontitis. It's intricate anatomy and rich blood supply enables rapid progression of periodontal disease, which is the leading cause of black triangles between teeth. However, interdental papillae may also be absent in naturally occurring diastema or in teeth with a tapered shape, where the papilla does not fully occupy the space or in cases of divergent roots that position the contact point too high. Iatrogenically, surgical manipulation of interproximal tissues in areas where the distance between the contact point and interdental bone is ≥5 mm can lead to partial loss of the interdental papillae. While contact point adjustments can be made restoratively or orthodontically in the former situation, loss caused by periodontal disease typically requires surgical intervention.
Platelet-rich fibrin (PRF) is a type of platelet gel made from a matrix of autologous fibrin. It surpasses platelet-rich plasma in terms of its advantageous properties, ease of preparation and cost-effectiveness. PRF aids in wound healing, assists in sealing wounds and promotes hemostasis. As the fibrin matrix is gradually broken down, it releases key platelet cytokines, including platelet-derived growth factor (PDGF), transforming growth factor beta (TGF-β) and insulin-like growth factor-1 (IGF-1), which all play a role in enhancing the healing process.[3]
The presence of leukocytes and cytokines within the fibrin network is crucial for the self-regulation of inflammatory and infectious processes. PRF can be utilized as a membrane or in combination with a bone graft, and it has been demonstrated to enhance bone density. While it has been widely used for augmenting hard and soft tissues, its application for interdental papilla augmentation has not been explored. This case report outlines a surgical technique that employs PRF in conjunction with an advanced papillary flap for complete reconstruction of the papilla in the maxillary anterior region.

CASE REPORT- A 40-year-old healthy, nonsmoking woman visited the Department of Periodontics at Subharti Dental College and Hospital in Meerut. Her primary concern was the unaesthetic appearance of her gums in the upper front teeth area. Clinical examination revealed aesthetically displeasing black triangles between teeth 11 and 21 . There was no visible facial recession on teeth 11 and 21 and the soft tissues appeared healthy without any significant inflammation. Preoperative assessments included measuring the contour of the papilla using a modified version of the Papilla Index Score (PIS) described by Jemt.[4] The papilla was absent with no curvature in the soft tissue contour observed between teeth 11 and 21, resulting in a PIS score of 0. Under local anesthesia with 2% lignocaine hydrochloride, the distance between the contact point and the crest of the alveolar bone was measured using a William's periodontal probe, recording a distance of 7 mm between teeth 11 and 21.

PREPARATION OF PRF- The preparation of PRF was conducted prior to the surgery following the protocol established by Choukron et al.[5] Blood (1 milliliter) was collected from the antecubital vein into sterile 10 ml tubes without any anticoagulant. The samples were then centrifuged at 3000 revolutions per minute (approximately 400 × g) for 10 minutes. As a result, the PRF formed a layer between the platelet-poor plasma (PPP) at the top and the red blood cells (RBC) at the bottom of the tube.

SURGICAL PROCEDURE- The patient underwent intraoral antisepsis by rinsing with 0.12% chlorhexidine digluconate for 30 seconds. Local anesthesia was successfully administered with 2% lignocaine hydrochloride (HCL). A split-thickness semilunar incision was made around 1 mm above the mucogingival junction in the interdental areas between teeth 11 and 21, extending towards the interdental papillae to create a pouch. A curette was used around the necks of teeth 11 and 21 to detach the tissue from the root surfaces, enabling the gingivopapillary unit to be displaced coronally.
The prepared PRF was carefully removed with sterile tweezers, trimmed with scissors, and placed on sterile gauze. A thick fibrin membrane was formed by squeezing out the serum from the PRF clot. This membrane was then inserted into the pouch and pushed coronally to provide bulk to the interdental papillae. The incisions were closed with absorbable sutures with coronal advancement. The patient was instructed to take analgesics (ibuprofen 400 mg twice daily for 3 days) and to use a chlorhexidine digluconate rinse (0.12%) twice daily for 10 days. Postoperative healing proceeded smoothly, with minimal pain. A follow-up on the 10th day revealed partial filling of the interdental area, with the Papilla Index Score (PIS) increasing from 1 to 3, indicating that the papilla now filled the interproximal embrasure to the level of the adjacent teeth, achieving a harmonious appearance with the surrounding papillae.

FIG 1. PRE-OPERATIVE VIEW

FIG 2. SULCULAR INCISION GIVEN

FIG 3.T-PRF PREPARED

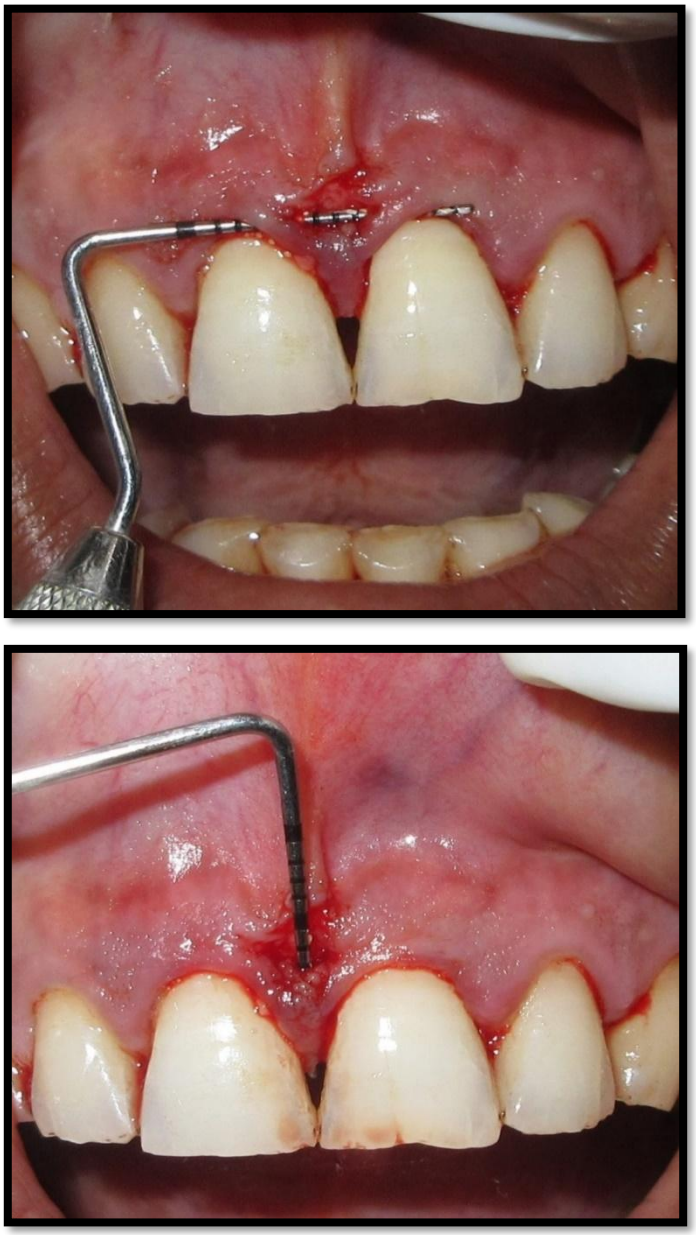

FIG 4A and FIG 4B: POUCH PREPARED

FIG 5A AND 5B: T-PRF INSERTED

FIG 6: SUTURES GIVEN

FIG 7: 3 MONTHS POST-OPERATIVE

DISCUSSION-

Various surgical techniques have been attempted for papilla reconstruction. Shapiro et al[6] repeated curettage as a method to promote the regrowth of interdental papillae in cases of necrotizing ulcerative gingivitis. Techniques such as the roll method and the pedicle graft[6] with coronal repositioning of the gingivopapillary unit, as well as subepithelial connective tissue grafting, have been documented.[7] Additionally, subepithelial connective tissue grafting, along with buccal and palatal split-thickness grafts, have also been employed.[8] Some approaches focus on the interdental papilla while reconstructing the interdental bone to provide necessary support for the gingival papilla.

Despite the variety of surgical techniques and flap designs available, results in papilla reconstruction remain inconsistent, often lacking predictability and long-term stability. A significant limitation of these methods is the inadequate blood supply to the area. Any graft placed in this confined anatomical space must survive in a challenging environment, bordered on both sides by nonvascularized tooth surfaces.[9] Consequently, many researchers have recommended using pedicle or advanced flaps, which tend to yield better outcomes compared to free grafts.

This case, utilizing PRF in combination with a pedicle flap, demonstrates a promising solution. PRF membrane functions as both a mechanical adhesive and a biological enhancer, similar to fibrin glue; it helps to stabilize the flap, promotes new blood vessel formation, minimizes flap necrosis and shrinkage and holds the gingival flap in an optimal position.[10] PRF is easy to obtain, cost-effective and can be prepared within minutes, offering ideal healing conditions. The fibrin matrix, rich in platelets, leukocytes and cytokines, supports the remodeling of the interdental papilla. Organized as a dense fibrin scaffold, PRF gradually releases growth factors such as TGF-1β, PDGF-AB, and VEGF, along with glycoproteins like thrombospondin-1, over a period of seven days or more, which is essential for the successful integration of the grafted PRF membrane.[11]

Careful case selection is crucial to the procedure's success. In this case, there was no improper root angulation or disproportionate crown size, although significant interdental bone loss was present. While this made the situation less than ideal, optimal filling of the interdental space was still achieved. Additionally, harvesting PRF immediately before surgery, using an atraumatic technique, and ensuring primary closure likely contributed to the overall success. A key advantage of this approach is that it eliminates the need for a second graft harvest site, greatly enhancing patient compliance and reducing postoperative discomfort.

In summary, this case report demonstrates an innovative surgical approach using PRF to regenerate a lost interdental papilla. The reconstructed papilla remained stable at follow-ups conducted 3 months postoperatively. However, further studies with extended follow-up periods are needed to assess the procedure's long-term success and predictability. Additionally, among all techniques, true and stable papilla reconstruction is best achieved when interdental bone regeneration occurs. Thus, combining PRF with a bone graft may enhance clinical outcomes.

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