Elemental polymer wound barrier as an Adjunct to Soft Tissue Healing

Abstract

A wide variety of protocols can be successful employed to replace teeth with dental implants. This article will present an innovative product which provides a more predictable outcome in ridge preservation procedures performed concurrently with early implant placement.

The aim when replacing a failing tooth with an implant supported crown is to remove the tooth with minimal trauma, to preserve the surrounding bone and existing soft tissue contour and to enhance long-term success. Elemental granulate applied as wound barrier after tooth extraction to retain Platelet Rich Fibrin (PRF) and again at early implant placement can shortening healing time, decreasing the number of biomaterials required and decrease complications.

Case Planning

Considerations involved in case planning including patient factors and surgeon's training and abilities. The ITI's SAC Assessment Tool is a valuable aid in preparation. This article will focus on tooth extraction followed by early implant placement (4-8 weeks post extraction) and the use of an innovative new product to stabilize the wound and shorten healing time.

Site Evaluation

Radiographic

Ideally, Cone Beam Computerized Tomography (CBCT) imaging should be obtained as well as intraoral periapical radiographs to evaluate the volume of the patient's anatomy and the distance to important anatomical structures such as the sinus floor and inferior alveolar nerve.

Site Infection

Infected sites can be categorized as chronic or acute. Chronic infections are considered medium risk for bone grafting (or immediate implant placement). Acute infections with suppuration are considered high risk. A safe approach is to delay placement when treating active infections with suppuration. In such cases and in most routine cases, our protocol is to place only PRF in the extraction socket retained by Elemental wound dressing.

Extraction and site management protocol

Minimally traumatic extraction without flap elevation is essential to lessen bone loss and midfacial tissue recession. [1] Tension on bone from sutures used to retain grafting mate-

1 *Rase F, Cosyn J, Crommelinck E, et al. Immediate and conventional single implant treatment in the anterior maxilla: 1-year results of a case series on hard and soft tissue response and aesthetics. J Clin Periodontl. 2011:38(4):385-394.*

rial decreases angiogenesis and contributes to bone loss. [2] Attempting primary closure by displacing keratinized tissue results in an inadequate margin of protective tissue at the crest available to protect the future implant. Lack of keratinized mucosa around dental implants is associated with increased plaque accumulation, recession ≥ 1mm, interproximal bone level ≥ 3mm, and peri-implantitis. [3] It has been shown that the volume of buccal bone required for soft-tissue stability is at least 2mm. [4]

Tooth Extraction Protocol

When hopeless teeth are extracted, often sectioning and segmental tooth removal is required. If 2mm of alveolar bone is maintained circumferentially, PRF plugs are packed to the crest of the intact socket and compressed with a damp gauze for two minutes. Additional PRF plugs may be added if space becomes available after the original plugs are maximally compressed. PRF increases alkaline phosphatase levels, decreasing available ATP and inhibiting osteoclastic activity resulting in less bone resorption. [5] Very little to no loss of alveolar bone volume is observed upon reentry at 4-6 weeks using this approach.

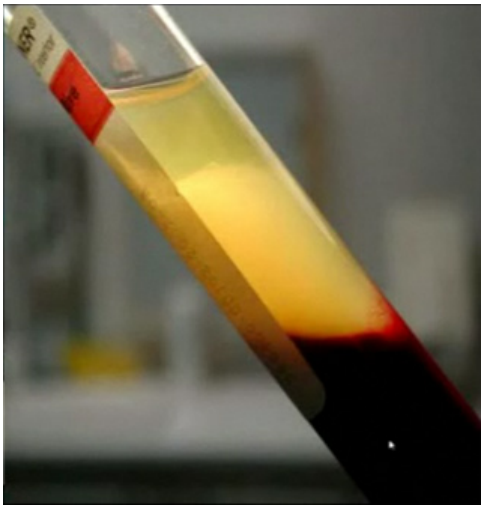

Figure 1. Platelet Rich Fibrin (PRF) formed immediately after centrifugation

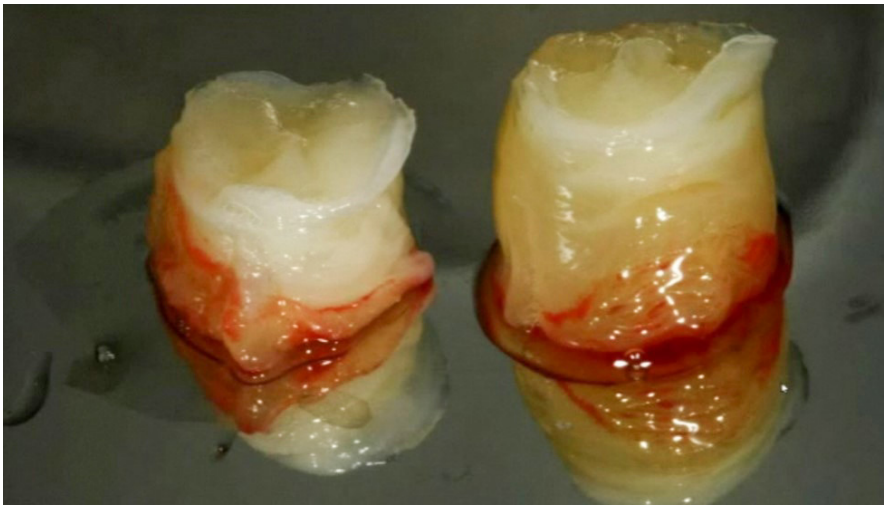

Figure 2. PRF plugs form by compressing fibrin retrieved from centrifugation.

2 *Mammoto A, et al. A mechanosensitive transcription mechanism that controls angiogenesis. Nature Medicine 2009.*

3 *Kungsadalpipob K, Supanimitkul K, Manopattanasoontorn S, Sophon N, Tangsathian T, Sirikarn P, Arunyanak S. The lack of keratinized mucosa is associated with poor peri-implant tissue health: a cross-sectional study. Int J Imp. Dent. 2020:6:28*

4 *Gallucci GO, Hamilton A, Zhou W, et al. Implant placement and loading protocols in partially edentulous patients: a systematic review. Clin Oral Impl Res. 2018;29(Suppl 16):106-134.*

5 *Dohan D, Diss A. Invitro effects of Choukroun's PRF on human gingival fibroblasts, dermal prekeratinocytes, preadipocytes and maxillo-facial osteoblasts in primary cultures. OOOE Sept 2009*

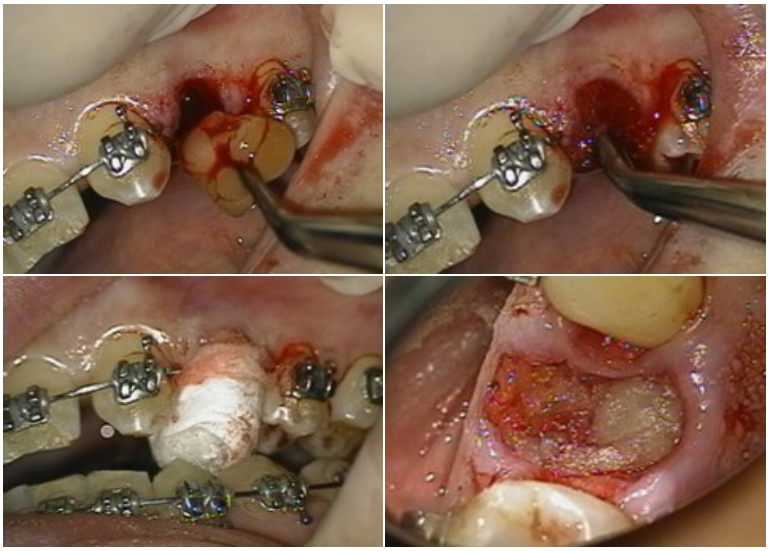

Figure 3. PRF applied to extraction site following minimally traumatic extraction. Additional plugs may be added after site is compressed for two minutes with sterile cotton roll placed end on end.

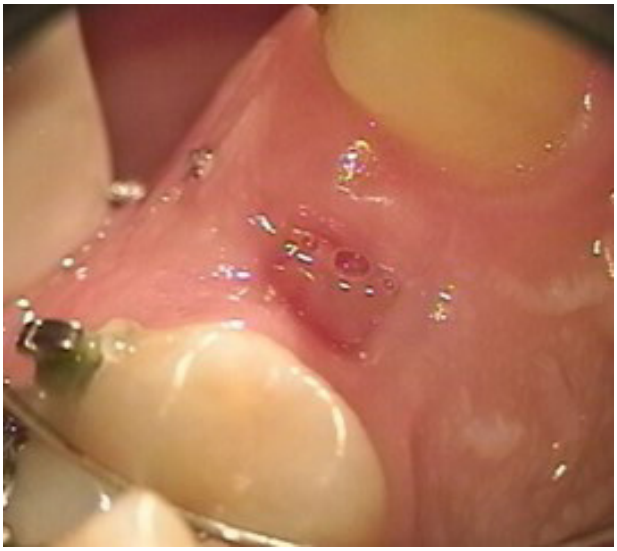

Figure 4. 13 day follow up show accelerated healing.

Preparation of the Elemental granulate

- Elemental granules are in placed in 85C temperature sterile water.
- In a few seconds the granules will congeal allowing formation into a ball which is gently pressed over the wound and into undercuts adjacent to the surgical site for retention. (Figure 10)
- The Elemental polymer barrier will protect the site and stabilize the PRF eliminating the need for suturing as well as provide an antibacterial shield to facilitate rapid healing. [6]

The site may be re-entered in 4-6 weeks for early implant placement.

Early Implant Placement

- A papilla sparing incision [7] is performed and a full thickness flap is retracted to expose the extraction site.
- The site is thoroughly debrided, and the implant is place in ideal position.
- If the gap between the implant and buccal plate is greater than 2mm, if the plate is less than 2 mm thick or if the site has a buccal concavity which requires esthetic improvement, the gap and/or the buccal plate is grafted. In such case, a rigid membrane such as PTFE is effective in space maintenance. Membrane requiring stabilization can be secured with two Masterpins (Meisinger). Depending on the type of graft material chosen a membrane may not be required.
- Apical horizontal mattress sutures as described by Choukroun are place to eliminate tension on the flap (Figure 7). Sutures are placed to position the coronal aspect of the flap. Although primary closure is preferred, no attempt is made to achieve primary closure if the site does not close passively.
- Elemental wound dressing is applied again as described above. See figures 5-11.

6 *Leventis M, Van Stralen K. The Use of an Innovative In-Situ Cured Polymer for the Covering of Extraction Sockets in Alveolar Ridge Preservation Techniques. 40th Anniversary Panhellenic Dental Congress, Athens, 6-8 October 2022*

7 *Greenstein G, Tarnow D. Using Papilla Sparing Incisions in the Esthetic Zone to Restore Form and Function. Compedium May 2014:35(5)315-321.*

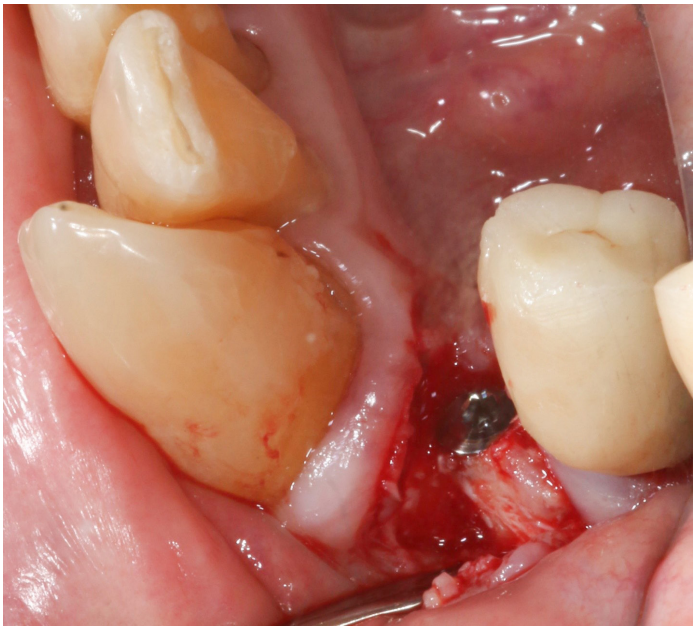

Figure 5. Early implant placement. Papilla sparing impression exposes site for grafting. Buccal wall less than 2mm requires grafting.

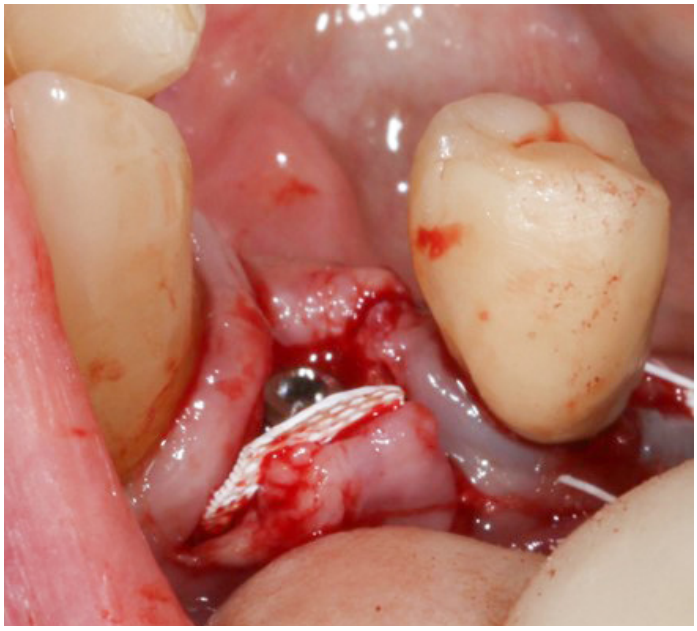

Figure 6. PTFE membrane chosen as stiffness holds space allowing regeneration. The tendency to spring open is lessened by apical mattress sutures and Elemental polymer barrier.

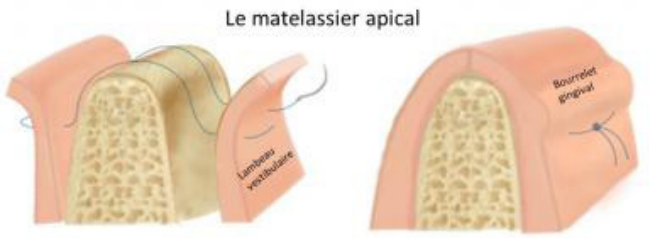

Figure 7. Apical mattress sutures as described by Choukroun. LS 73 - Du Déplacement tissulaire à son immobilization, Choukroun, et al.

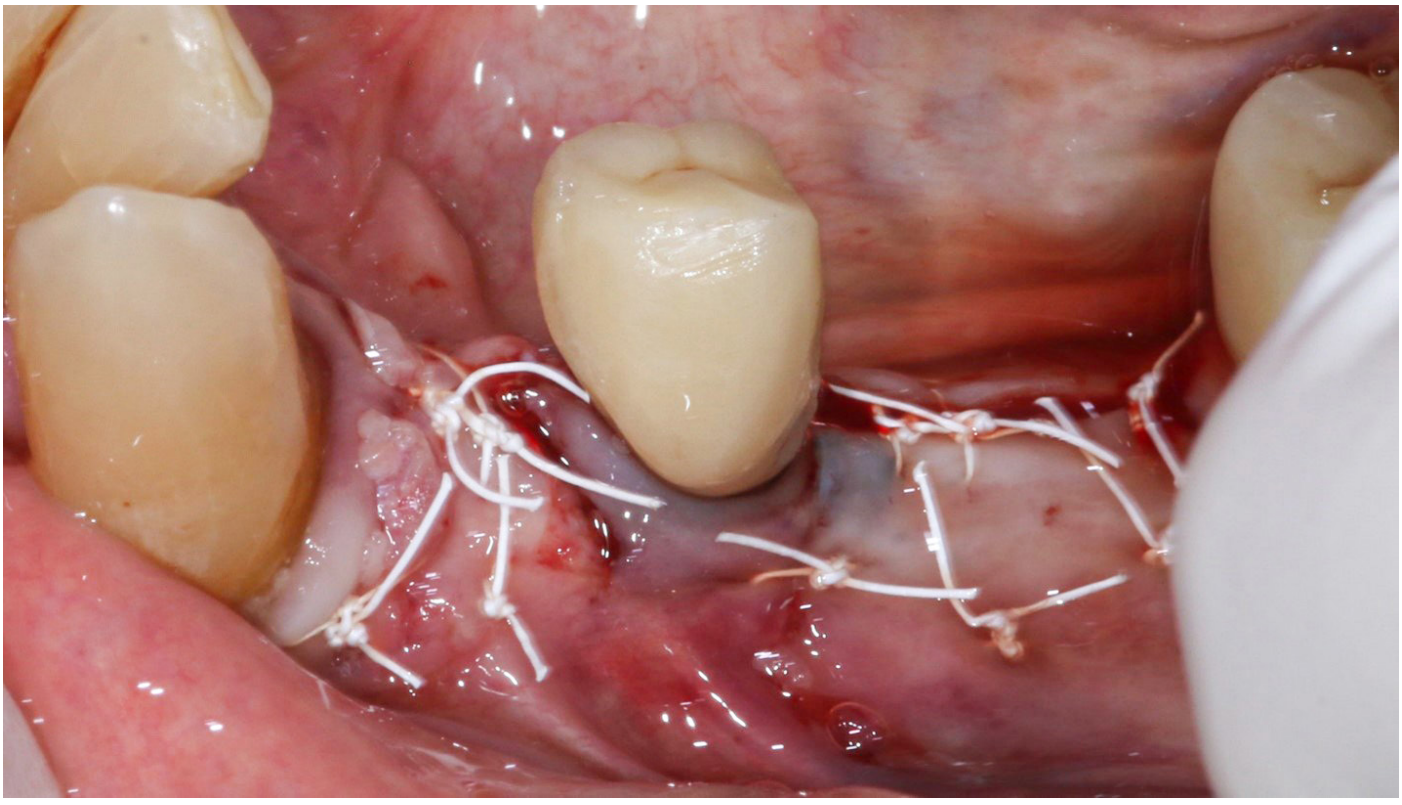

Figure 8. Apical mattress sutures placed to alleviate tension from grafted site. Interrupted sutures used to achieve primary closure.

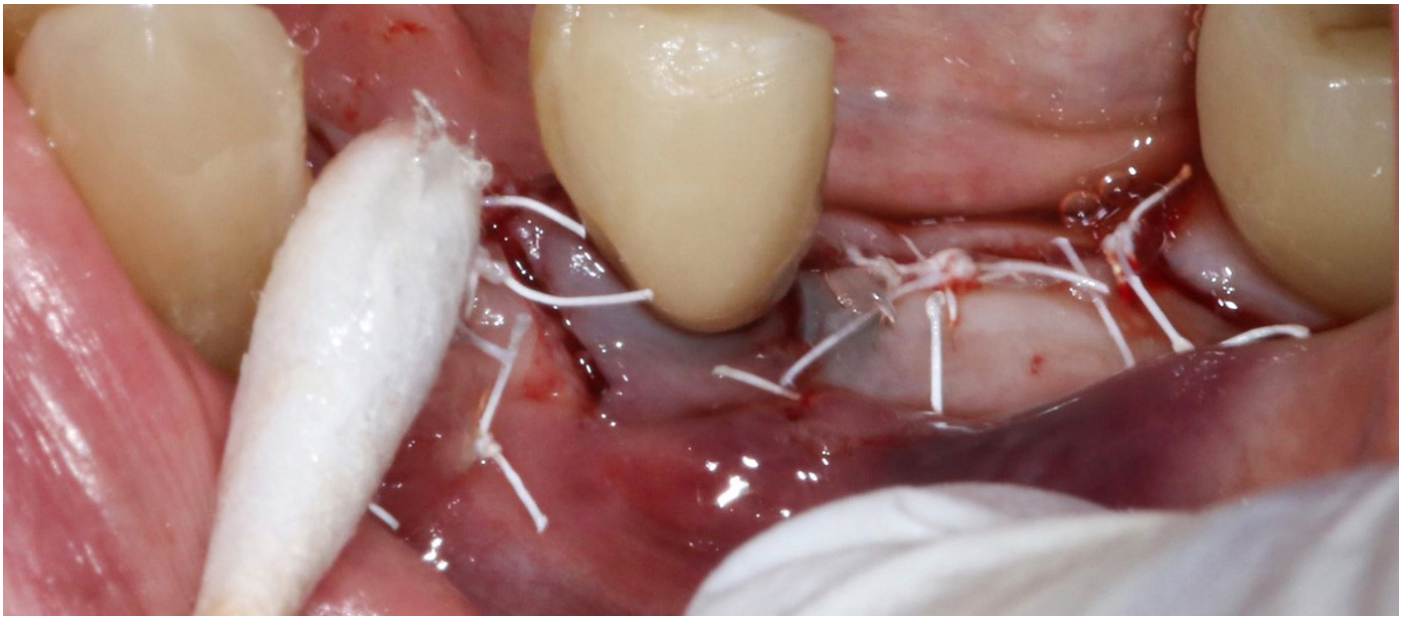

Figure 9. Vaseline is applied to sutures to decrease adhesion to Elemental polymer barrier

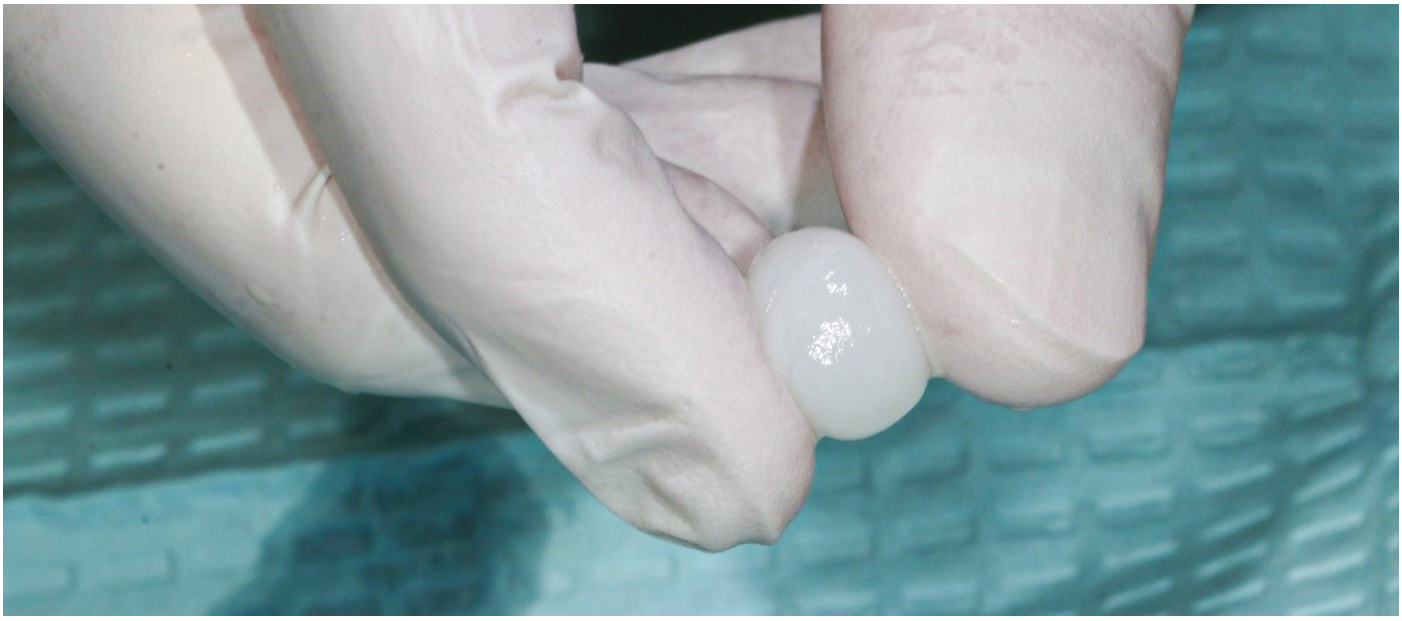

Figure 10. Elemental granules placed in heated water and formed into a ball which is compressed over closed site.

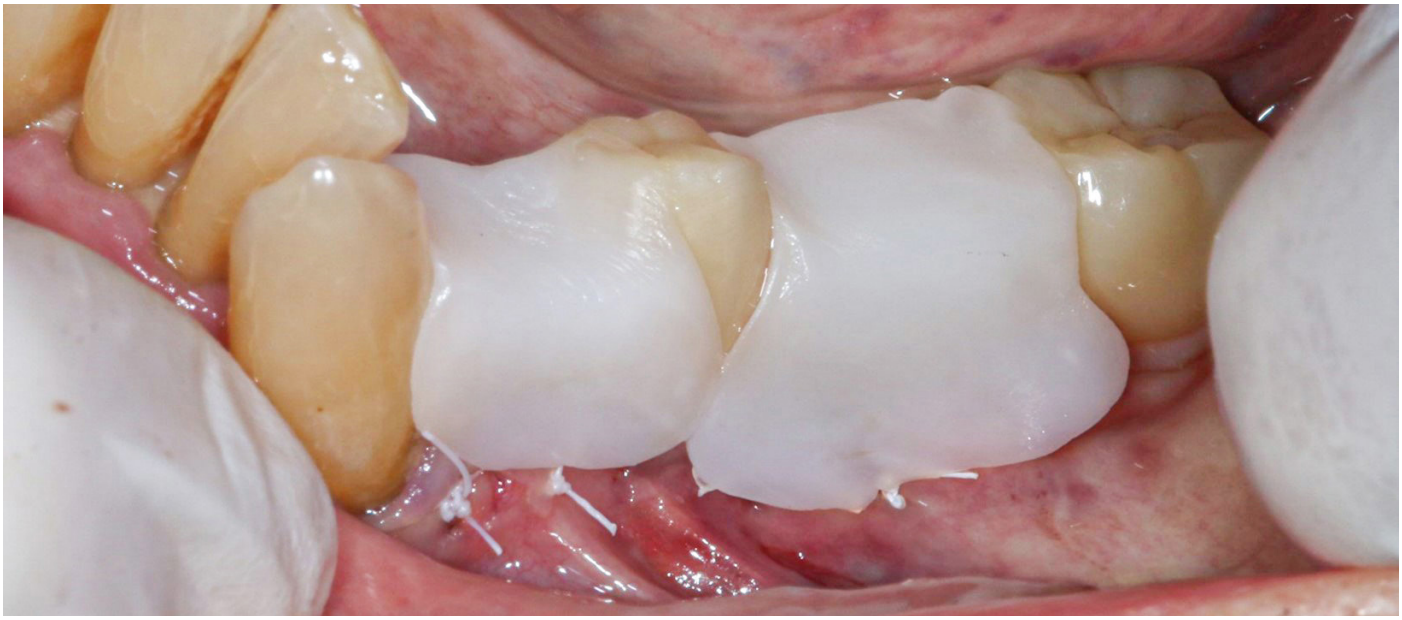

Figure 11. Elemental applied to protect site and avoid membrane exposure as healing tissue shrinks.

Role of Elemental Granulate as wound barrier in Optimizing Onlay Bone Grafting

In early implant placement, soft tissue is allowed 4-6 weeks to epithelize the extraction site. When bone is grafting buccally the added volume often does not allow for primary closure without releasing incisions or displacing keratinized tissue.

Although the elastic memory of rigid membranes provides stiffness that holds space well, the same property can cause the coronal aspect of the membrane to spring open during the healing process leading to loss of graft material or premature implant exposure. (Figure 6).

Elemental granulate as a wound barrier prevents early wound opening, contains graft material and lowers contamination.

Conclusion

Early implant placement following site preparation with only PRF and Elemental polymer was demonstrated. Elemental provides a simple to use, economical wound barrier which improves treatment outcomes in any case that involves soft tissue healing.