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Leon's Everted Gingival Pouch Technique: A Minimally Invasive Approach for Achieving Primary Closure and Gingival Revitalization

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Abstract

Patients seeking implant treatment are often periodontally compromised and present with insufficient bone and/or soft tissue volume to ensure predictable implant stability, function and restorative esthetics. Localized infections at the site(s) of planned tooth extraction typically form a layer of granulomatous and epithelialized tissue surrounding the area of the tooth root apex. This article describes Leon's everted gingival pouch (LEGP) technique for making full use of this typically discarded tissue to pouch bone grafts as a barrier membrane, manage soft tissue, and achieve primary closure during a single surgery for tooth extraction and immediate implant placement. Two case examples are also presented.

***Keywords:** Leon's Everted Gingival Pouch Technique; Minimally Invasive Approach; Primary Closure; Gingival Revitalization*

Introduction

Successful osseointegration of dental implants is predicated on achieving primary stability and primary closure, tissue regeneration, and uneventful wound healing [1]. Clinically, primary implant stability is frequently assessed based on implant resistance during insertion, with ideal stability assumed if an abrupt stop is experienced during implant seating [2]. For this reason, torque of at least 20 Ncm has been strongly advocated.

However, many patients seeking implant treatment are periodontally compromised. They often present with hopeless teeth that cannot be maintained due to a lack of bone/root contact, as well as insufficient bone volume for implant placement. For these patients, guided bone regeneration is often necessary to gain vertical bone height in severely resorbed areas, which has typically involved placing bone graft material and a collagen membrane in combination with laterally positioned and coronally advanced flap techniques. As a result, these procedures (e.g. multiple surgeries involved with tooth extraction, bone augmentation, soft tissue regeneration, and implant placement) have traditionally been inherently time consuming, costly, and unattractive for patients, in addition to producing debatable clinical results [3].

In particular, the clinical outcomes of augmentation and regeneration procedures are influenced by the incision techniques, flap design and elevation, flap mobility and stability, and suturing [4,5]. The flap must be able to be fully raised and completely closed for bone regeneration, as well as undisturbed and uninterrupted wound healing [6]. Combined, these requisite capabilities underscore the importance of a flap's ability to achieve primary closure.

Unfortunately, in addition to alveolar bone loss and localized soft tissue infections, many patients also present with soft tissue deficiencies, a thin gingival tissue biotype, and/or otherwise insufficient soft tissue for predictably achieving primary closure. This creates additional challenges to realizing long-term implant survival and establishing ideal esthetics [7].

To date, the techniques that have been applied to achieve primary closure have included soft tissue punch, connective tissue graft, barrier membrane, and soft tissue replacement matrix [8]. These time-consuming procedures attempted to rebuild lost tissue following removal of all tissue underneath the extracted socket. It has long been accepted that in patients with severe local infection at the extraction site, the granulomatous tissue formed during the infection process in the socket is useless for raising a primary closure flap and, therefore, must be thoroughly removed for debridement after tooth extraction.

Significance of granulomatous tissue

However, wound healing in periodontal tissue is a complex process involving inflammation, granulomatous tissue formation, neo-vascularization, re-epithelization, and matrix remodeling [9]. In a typical process, a clot in the wounded tissues is initially formed, after which granulomatous tissue develops as a result of inflammatory, fibroblast, and endothelial cell invasion; migration of epithelial cells subsequently covers denuded surfaces. Finally, in contraction or scarring, the healing tissue matrix matures [10].

Therefore, the formation and maturation of granulomatous tissue result from a series of cellular and molecular mechanisms, including the ingrowth of macrophages, fibroblasts, and new blood vessels to the wound space in a coordinated manner [11]. As a complex reservoir of cytokines and growth factors, granulomatous tissue consists of new capillaries, macrophages, fibroblasts, and some loose connective tissue [10,12]. The chemo-attractive, mitogenic, and other regulatory activities of cytokines and growth factors contribute to its epithelialization.

Evolving approaches to regeneration and closure

Over the years, a variety of surgical techniques have been proposed to correct or eliminate anatomic, developmental, or traumatic deformities in gingival morphology, position, and/or volume and amount of gingiva [13-15]. Among these is the free gingival graft [16], which incorporates a split-thickness approach to withdraw tissue from an edentulous ridge or the palatal mucosa. An alternative pedicle flap technique, which is essentially a variation of the laterally positioned flap and coronally advanced flap techniques [4,17], has gained in popularity and undergone modifications over the years [18].

However, the manner in which dental implant treatments are undertaken has changed dramatically in more recent years, enabling dentists to embrace a more minimally invasive philosophy predicated on fewer surgeries, procedures, augmentations, and appointments [19,20]. Although the term "minimally invasive" can be considered a subjective term, new and more thoughtful treatment planning and surgical techniques can be credited with allowing patients to receive the most appropriate functional and predictable treatments while undergoing the least amount of dental procedures as possible.

For example, the inverted gingival pouch (EGP) technique represents an innovative and minimally invasive alternative to the multiple surgeries historically involved with tooth extraction, bone augmentation, soft tissue regeneration, and implant placement [21]. Introduced by Chen., *et al*. in 2017, the cornerstone of the EGP technique is making full use of epithelialized granulomatous tissue for primary closure, rather than discarding it.

In particular, after peeling epithelialized granulomatous tissue from the socket immediately following extraction, the released full thickness flap is used to pouch bone grafts as a barrier membrane in guided bone regeneration in order to gain vertical bone height in severely resorbed areas, and/or soft tissue grafts for soft tissue management. With the EGP technique, multiple regeneration surgeries can be eliminated by achieving infection control, flap design, bone augmentation and/or soft tissue management, and implant placement during one surgery at the time of tooth extraction.

The everted gingival pouch (EGP) technique protocol

The IGP technique represents the first approach for achieving primary closure that incorporates the use of typically discarded diseased epithelialized granulomatous tissue [21]. Protocol for the EGP technique include: extraction of the hopeless tooth (i.e. severe bone resorption; attachment loss); thorough socket debridement; making an incision on the alveolar ridge crest (preferably on the highest bone wall); releasing a full thickness flap from the incision on one side of the crest, across the bottom of the socket, to the other side of the crest; immediately drilling for, preparing, and placing an implant; filling the socket with bone substitutes according to the principles of guided bone regeneration; and applying the elevated flap as a barrier membrane and suturing (Figure 1).

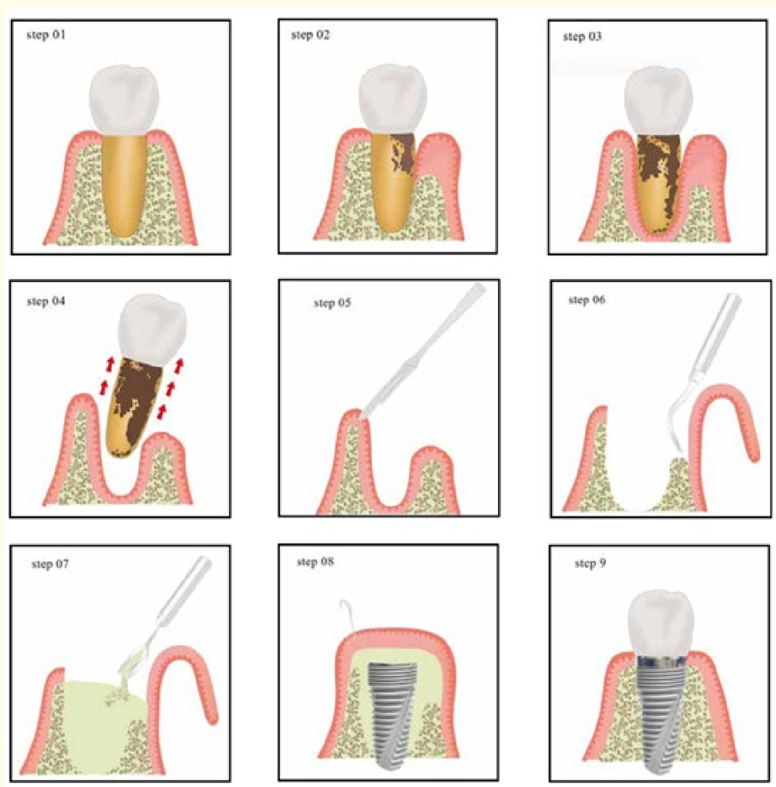

Figure 1: *Step-by-step IGP technique. Step 1: illustration of healthy tooth structure with soft tissue and supporting bone. Step 2: illustration of partial attachment loss and initial bone resorption. Step 3: illustration of complete attachment loss and bone resorption. Step 4: tooth extraction revealing soft and hard tissue contours and intact granulomatous tissue on the bottom of the socket. Step 5: an incision is made on the highest bony wall of the alveolar ridge. Step 6: a full thickness flap of the granulomatous tissue is released from one side of the crest across the bottom of the socket to the other side of the crest and carefully elevated. Step 7: to ensure complete removal of granulomatous tissue, sounding to bone is performed after curettage and before filling with bone grafting material. Step 8: immediately place the implant and perform primary closure. Step 9: illustration of a restored implant after healing.*

However, although the EGP technique is beneficial for providing minimally invasive implant therapy to a variety of patients (e.g. those with gingival recession, tooth mobility, alveolar bone loss, localized gingival infection), there are specific indications and clinical situations that must be understood and appreciated. To clarify and better describe the indications for the LEGP protocol, a novel classification of tooth mobility and clinical symptoms has been developed (Table 1). The most significant factor for determining a specific patient's classification and the suitability of the IGP technique for a given case is the integrity of the granulomatous tissue and keratinized epithelium in the socket.

Classification of Vertical Mobility for Everted Gingival Pouch (LEGP) Technique Indications				
Classification	**Vertical Mobility**	**X-Ray Lucency**	**Clinical Symptoms**	**LEGP Application**
I	< 1 mm	Circumferential root lucency extended all the way down, except the apical root tip area.	Class III horizontal mobility; tooth can be vertically pushed < 1 mm; abscess mixed with bleeding on probing; sensitive to temperature; tooth is mostly vital.	Limited
II	≥ 1 mm		Tooth can be vertically pushed 1-2 mm; abscess mixed with bleeding on probing; no sensitivity to temperature; tooth is mostly non-vital.	Limited-to-Yes
III	≥ 2 mm		Tooth can be vertically pushed > 2 mm; abscess without bleeding on probing; no sensitivity to temperature; tooth is non-vital.	Yes

Table 1

As periodontitis or other local infections progress, a layer of granulomatous tissue forms, and an epithelial lining subsequently develops that encases this tissue at the tooth root apex (i.e. bottom of the affected socket after extraction). If the thickness of this epithelialized granulomatous tissue is ≥ 2 mm and it is intact (e.g. mobility Class III, possibly Class II), then performing the LEGP technique is indicated. This makes sounding the bone and examining the tissue after tooth extraction imperative.

The absence or presence of bleeding after tooth extraction is also a significant consideration. An absence of bleeding suggests that epithelium has developed over and completely covers the bottom of the socket; the LEGP is the preferred approach in such cases.

In fact, the LEGP technique may be the ideal approach when patients have been affected by chronic infections that undoubtedly could jeopardize bone regeneration. This emphasizes the need for complete socket debridement and clean-up of grafting areas. It also underscores the fact that releasing a full thickness flap by peeling the epithelialized granulomatous tissue away from the bony layer is a better approach to primary closure, especially because the epithelialized granulomatous tissue emerged from biological processes associated with wound healing and resisting infection.

On the other hand, according to the classification, mobility class 1 patients lack granulomatous tissue completely covering the socket after tooth extraction and bone sounding. Due to insufficient soft tissue and an inability to raise a complete flap for primary closure (Figure 2), applicability of the LEGP technique for mobility class I patients is limited.

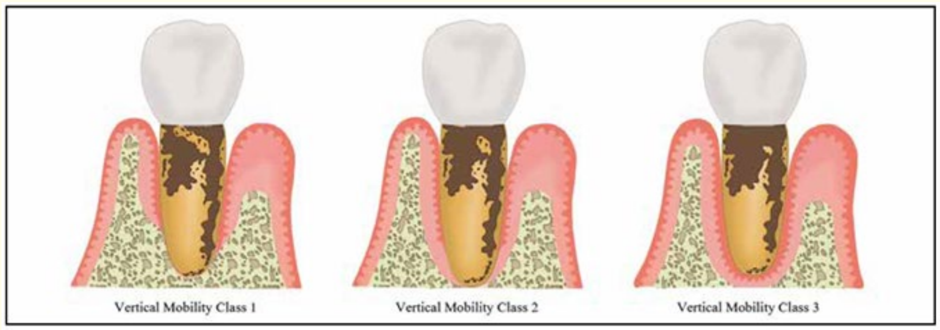

Figure 2: *Illustration of the presentation of the classifications for vertical tooth mobility.*

The following two case presentations demonstrate the manner in which the LEGP technique was performed in mobility class III and class II patients, respectively. Rather than discarding the diseased epithelialized granulomatous tissue-which has been the accepted practice, the authors made full use of this tissue to achieve periodontal infection control, soft tissue regeneration (e.g. increased width and thickness of keratinized tissue), bone augmentation, improved esthetics, and clinical efficiency.

Case Presentation #1

A 66-year-old man presented with severe bleeding on probing and vertical mobility > 2 mm (i.e. class III) of tooth #31 (Figure 3). During the clinical examination, the presence of an abscess was noted, and the patient demonstrated no sensitivity to temperature at tooth #31. A preoperative panographic radiograph was taken to confirm these findings, as well as to assess the extent of compromised tissue (Figure 4, top).

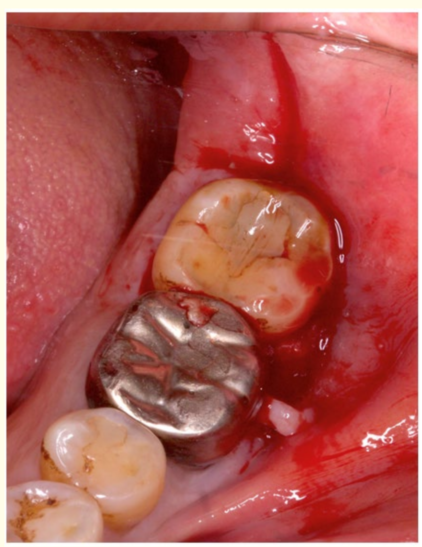

Figure 3: *A 66-year-old man presented with severe bleeding on probing and vertical mobility class III at tooth #31.*

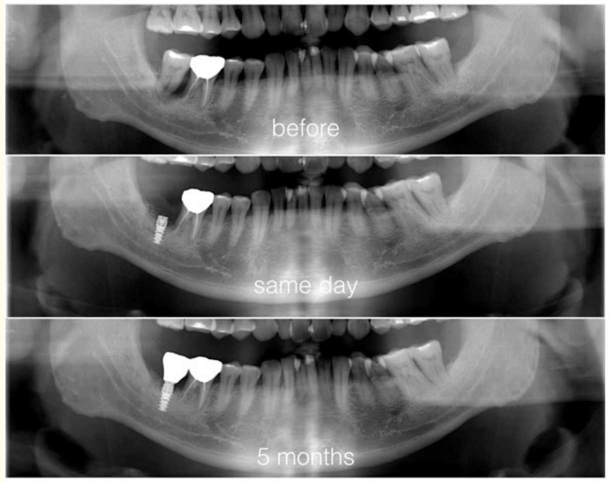

Figure 4: *A preoperative panographic radiograph (top) was taken to confirm the extent of compromised tissue. Following simple extraction of tooth #31 and placement of a NobleActive® (Nobel Biocare™) implant, an immediate postoperative panographic radiograph was taken (middle). Tissue stability and implant osseointegration were confirmed radiographically at five months postoperatively (bottom).*

It was determined that implant treatment could be provided to this patient by incorporating the LEGP technique. Therefore, a simple extraction of tooth #31 was performed (Figure 5, left), after which a full thickness flap of the granulomatous tissue (i.e. LEGP flap) from the socket at #31 was made (Figure 5, middle). This was accomplished using a periosteal elevator to carefully lift the granulomatous tissue as the full thickness flap.

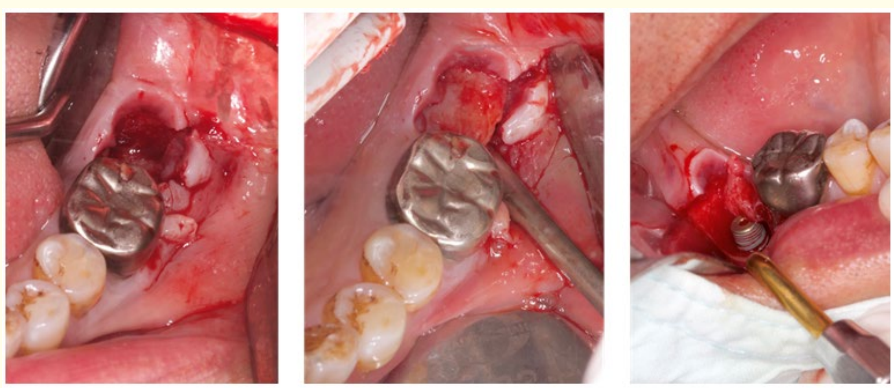

Figure 5: *A simple extraction was performed to remove tooth #31 (left), after which a full thickness flap of the granulomatous tissue from the socket at #31 (i.e. LEGP flap) was made (middle). A NobleActive® implant was then immediately placed (bottom).*

The socket was then curettaged, and sounding of the exposed bone surface was performed to confirm complete removal of the granulomatous tissue. Anorganic bovine bone grafting material (Bio-Oss®, Geistlich Pharma North America, Inc.) was placed into the socket to enhance osseointegration and long-term stability.

Subsequently, a tapered implant (NobleActive®, Nobel Biocare™) was immediately placed (Figure 5, right). The body design of the selected implant condensed the bone gradually, while the apex with drilling blades enabled a smaller osteotomy. Additionally, primary stability was achieved by vertical thread locking of the apical 3 mm, just shy of the mandibular cortical nerve canal. Proper implant positioning was confirmed via panographic radiograph (Figure 4, middle).

Bone graft material (e.g. Bio-Oss) was then placed beneath the granulomatous LEGP flap (Figure 6) and primary closure achieved. Because the LEGP flap achieved passive primary closure, placement of an artificial membrane was not required.

Figure 6: *Bio-Oss® bone graft material was placed under the granulomatous tissue, and the LEGP flap was used to achieve passive primary closure, without the need for an artificial membrane.*

At the 4-week follow-up appointment, esthetic and healthy keratinized gingival tissue was observed (Figure 7). After five months of healing (Figure 4, bottom), the implant was restored with a crown restoration (Figure 8).

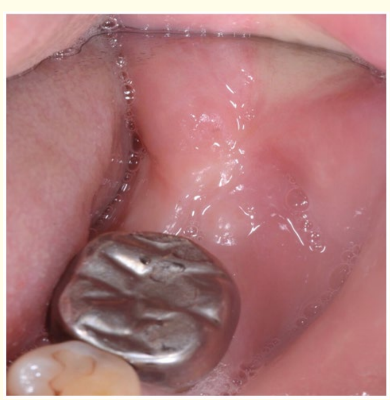

Figure 7: *Esthetic and healthy keratinized gingival tissue was observed after four weeks.*

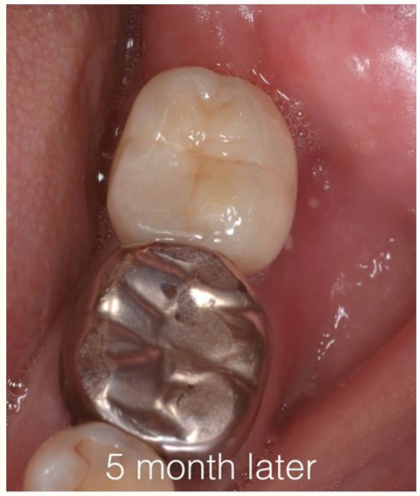

Figure 8: *View of the implant crown restoration at #31 following five months of healing.*

Case Presentation #2

A 58-year-old man presented with severe palatal root recession and vertical mobility of ≥ 1 mm (i.e. class II) at tooth #2 (Figure 9). The clinical examination revealed the presence of an abscess and bleeding on probing, and the patient demonstrated no sensitivity to temperature at tooth #2. A preoperative panographic radiograph was taken to confirm these findings (Figure 10, left), as well as to assess the extent of compromised tissue.

Figure 9: *A 58-year-old man presented with severe palatal root recession and vertical mobility class II at tooth #2.*

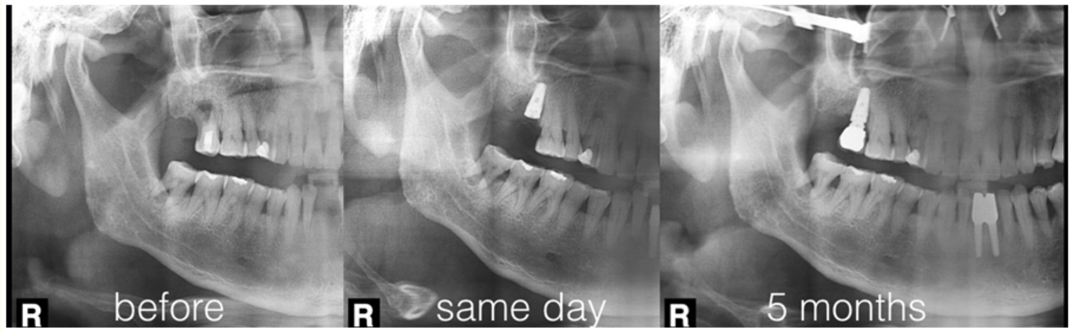

Figure 10: *A preoperative panographic radiograph (left) was taken to confirm the extent of compromised tissue. Following atraumatic extraction of tooth #2 and immediate placement of an OsseoFuse implant, a postoperative panographic radiograph was taken (middle). Tissue stability and implant osseointegration were confirmed radiographically at five months postoperatively following placement of a crown restoration at #2 (right).*

It was determined that tooth #2 could be atraumatically extracted (Figure 11, left), which subsequently revealed intact granulomatous gingival tissue beneath the palatal root that would be ideal for the LEGP technique. Therefore, a full thickness flap of the granulomatous tissue (i.e. LEGP flap) was made using a periosteal elevator and carefully lifting the granulomatous tissue.

The socket was curettaged, and sounding of the exposed bone surface was performed to confirm complete removal of the granulomatous tissue. Anorganic bovine bone grafting material (Bio-Oss) was then placed into the socket, after which a streamlined and specially threaded and cut implant (OsseoFuse) was placed. The vertical and horizontal locking threads of the implant helped to achieve predictable primary stability (Figure 11, center).

Additional bone graft material (e.g. Bio-Oss) was placed, after which passive, primary closure was achieved with the granulomatous LEGP flap (Figure 11, right). By incorporating the LEGP technique, implant placement and closure was accomplished without the need for either a buccal gingival releasing incision, vertical incision, or artificial membrane. Proper implant positioning was confirmed via panographic radiograph (Figure 10, middle).

Figure 11: *Following atraumatic extraction of tooth #2, intact granulomatous gingival tissue was observed under the palatal root (left). A full thickness flap of granulomatous tissue (i.e., LEGP flap) was made, after which an OsseoFuse implant was immediately placed (center). After placing bone graft material, primary closure was achieved with the LEGP flap (right).*

After five months of healing, the implant was restored with a crown (Figure 12). Complete integration was confirmed radiographically (Figure 10, right).

Figure 12: *View of the implant crown restoration at #2 after five months of healing.*

Conclusion

The introduction of new implant therapy techniques to address bone and soft tissue deficiencies-such as Leon's everted gingival pouch (LEGP) technique can be beneficial to both dentists and patients when cases involve compromised periodontal conditions and severe local infections. The first approach to make full use of the typically discarded granulomatous tissue for achieving primary closure, the LEGP technique represents a clinically efficient and safe alternative to the multiple surgical procedures traditionally required for achieving periodontal infection control, soft tissue regeneration, and bone augmentation when implants are planned.

Although further clinical and histological studies will help to validate the LEGP technique for routine practice, the two cases discussed in this article have demonstrated long-term predictable results and effective clinical outcomes. Combined with previous studies, these results suggest that the LEGP technique may be indicated for the implant therapy of patients suffering from periodontal diseases.

Bibliography

1. Lioubavina Hack N., *et al*. "Significance of primary stability for osseointegration of dental implants". *Clinical Oral Implants Research* 17.3 (2006): 244-250.

2. Sennerby L and Meredith N. "Implant stability measurements using resonance frequency analysis: biological and biomechanical aspects and clinical implications". *Periodontology 2000* 47 (2008): 51-66.

3. Baelum V and Ellegaard B. "Implant survival in periodontally compromised patients". *Journal of Periodontology* 75.10 (2004): 1404-1412.

4. Kassab MM., *et al*. "Treatment of gingival recession". *Dental Clinics of North America* 54.1 (2010): 129-140.

5. Cairo F., *et al*. "Treatment of gingival recession with coronally advanced flap procedures: a systematic review". *Journal of Clinical Periodontology* 35.8 (2008): 136-162.

6. Wang H-L and Boyapati L. "PASS" principles for predictable bone regeneration". *Implant Dentistry* 15.1 (2006): 8-17.

7. Mengel R and Flores-De-Jacoby L. "Implants in patients treated for generalized aggressive and chronic periodontitis: a 3-year prospective longitudinal study". *Journal of Periodontology* 76.4 (2005): 534-543.

8. Hammerle CH., *et al*. "Evidence-based knowledge on the biology and treatment of extraction sockets". *Clinical Oral Implants Research* 23.5 (2012): 80-82.

9. Murakami S., *et al*. "Regeneration of periodontal tissues by basic fibroblast growth factor". *Journal of Periodontal Research* 34.7 (1999): 425-430.

10. Aukhil I. "Biology of wound healing". *Periodontology 2000* 22 (2000): 44-50.

11. Sporn M and Roberts AB. "Peptide growth factors and inflammation, tissue repair, and cancer". *Journal of Clinical Investigation* 78.2 (1986): 329-332.

12. Martin P. "Wound Healing--Aiming for perfect skin regeneration". *Science* 276.5309 (1997): 75-81.

13. Miller PD and Allen EP. "The development of periodontal plastic surgery". *Periodontology 2000* 11 (1996): 7-17.

14. Chen L., *et al*. "Root coverage with enamel matrix derivatives". *Compendium* 23.9 (2002): 797-802.

15. Allen EP and Miller Jr PD. "Coronal positioning of existing gingiva: short term results in the treatment of shallow marginal tissue recession". *Journal of Periodontology* 60.6 (1989): 316-319.

16. Miller Jr PD. "Root coverage with the free gingival graft: factors associated with incomplete coverage". *Journal of Periodontology* 58.10 (1987): 674-681.

17. Bernimoulin JP., *et al*. "Coronally repositioned periodontal flap". *Journal of Clinical Periodontology* 2.1 (1975): 1-13.

18. Roccuzzo M., *et al*. "Periodontal plastic surgery for treatment of localized gingival recessions: a systematic review". *Journal of Clinical Periodontology* 29.3 (2002): 178-194.

19. Wang F., *et al*. "Minimally invasive flapless vs. flapped approach for single implant placement: a 2-year randomized controlled clinical trial". *Clinical Oral Implants Research* 28.6 (2016): 757-764.

20. Hayashi J., *et al*. "Minimally invasive surgical approaches for esthetic implant dentistry: a case report". *Journal of Oral Implantology* 42.1 (2016): 93-97.

21. Chen L., *et al*. "Gingival revitalization by inverted gingival pouch (IGP) technique". *Journal of Implant and Advanced Clinical Dentistry* 9.8 (2017): 12-25.

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