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Treatment of Infrabony Defects in Generalized Periodontitis Stage III Grade C Patients with Guided Tissue Regeneration: Case Reports

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Abstract

The application of periodontal regenerative surgery techniques can improve the long- term clinical outcomes of teeth with infrabony defects. Different surgical techniques are recommended for the treatment of infrabony defects. Guided tissue regeneration is an appropriate technique that can be used to treat deep infrabony defects. The success of the combined techniques (barrier membrane plus bone replacement graft) will lead to the healing of the vertical component of bone defect by bone fill and clinical attachment level gain. This case report aims to describe the treatment of Infrabony Defects in stage III, Grade C, generalized periodontitis with guided tissue regeneration. Case I is a 21-year- old female patient who came with complaints of bleeding gums easily over the past year. Patients also complain of bad breath. Clinical examination: 6 mm periodontal pocket and infrabony defect. Case II is a 28-year-old woman who has come with complaints of frequent bleeding gums when brushing her teeth since four years ago. Patients also complain that the molars and anterior teeth of the maxillary and mandibles are mobility. Clinical examination: 6 mm periodontal pocket and infrabony defect. Vertical infrabony defects are formed. Combined regenerative therapy (xenograft with membrane vs platelet-rich fibrin with xenograft and collagen membrane) reduces depth and achieves clinical attachment level and bone gain. The conclusion is that the clinical impact is better seen in the additional application of PRF with xenograft and membrane in treating periodontal infrabony defects than using xenograft and membrane alone

Keywords: Periodontitis; Periodontal Regeneration; Bone Graft; Membrane

1. Introduction

Regeneration is the ideal goal of periodontal therapy. Regeneration is reorganizing organs or tissues lost or injured due to injury or infection. Periodontal tissue regeneration involves the formation of new alveolar bone, cement, and periodontal ligaments. Most periodontal therapy focuses on disease prevention and corrective surgical treatment to remove deep pockets. Regeneration differs from tissue repair and is characterized by replacing damaged tissue with something that may be inferior to the original tissue, both structurally and functionally[1,2] Currently, a variety of treatment modalities are available for periodontal regenerative therapy, including bone graftings, guided tissue regeneration, the use of growth factors, tissue engineering applications, or a combination of two or more regenerative therapies.[3,4]

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GTR combined with various grafts showed promising effects in improving clinical and radiography parameters. The main goal of GTR is to regenerate periodontal tissue lost due to severe periodontal disease. The principle of GTR is the selective repopulation of periodontal cells, especially fibroblasts, that help form new periodontal tissue. In addition, the membrane barrier can provide space for optimal wound stability necessary for periodontal tissue regeneration.[1,5]

This case report aims to describe Infrabony Defects' treatment in periodontitis stage III grade C with guided tissue regeneration.

2. Case Report

2.1. Case 1

A 21-year-old female patient has come with complaints of bleeding gums since the past year. Patients also complained of bad breath. The clinical picture includes a reddish- pink gingiva, swollen, with bleeding on examination and a depth of clinical examination in the left anterior maxillary jaw on the mesial teeth number 21 and 22 (Figure 1) recorded at 6 mm. Vertical defects are found radiographically with infrabony defects (Figure 1). Phase 1 treatment is carried out with scaling and root planing (SRP), then moved to phase 2, namely kuretase. The following treatment for mesial teeth 21 and 22 is conventional flap surgery with bone grafts (xenograft) and placement of collagen membranes for bone regeneration.

Figure 1. (A) Clinical Photo, (B) Periapical radiographic.

After performing an intrasulcular incision, open flap debridement is performed to gain access to the root perforation area and remove the granulated tissue with curettage, then scaling and root planning is carried out over the entire tooth surface until it is completely clean when irrigated with a saline solution.

The defect is filled with mineral granules of porous bone of cows with a particle size of 0.25 mm. After grafting, a bioresorbable collagen membrane is cut and adjusted over the defect to cover 2-3 mm of surrounding alveolar bone to ensure the stability of the graft material. Finally, the mucoperiosteal flap is repositioned coronally, and a phrenectomy is also performed to relieve tension at the flap closure. The flap is fixed with a simple cut mattress seam, and a hyaluronic acid gel is applied to the surgical area, which is then closed with a periodontal pack. Patients are given post-operative instructions, chlorhexidine mouthwash, and medication prescriptions.

The periodontal pack is opened one week after surgery, and the stitches are removed 14 days after surgery. Control is done three months after surgery, and extraoral and intraoral examinations are performed to ensure there is no bleeding, infection, or swelling. Next, periapical radiography is taken.

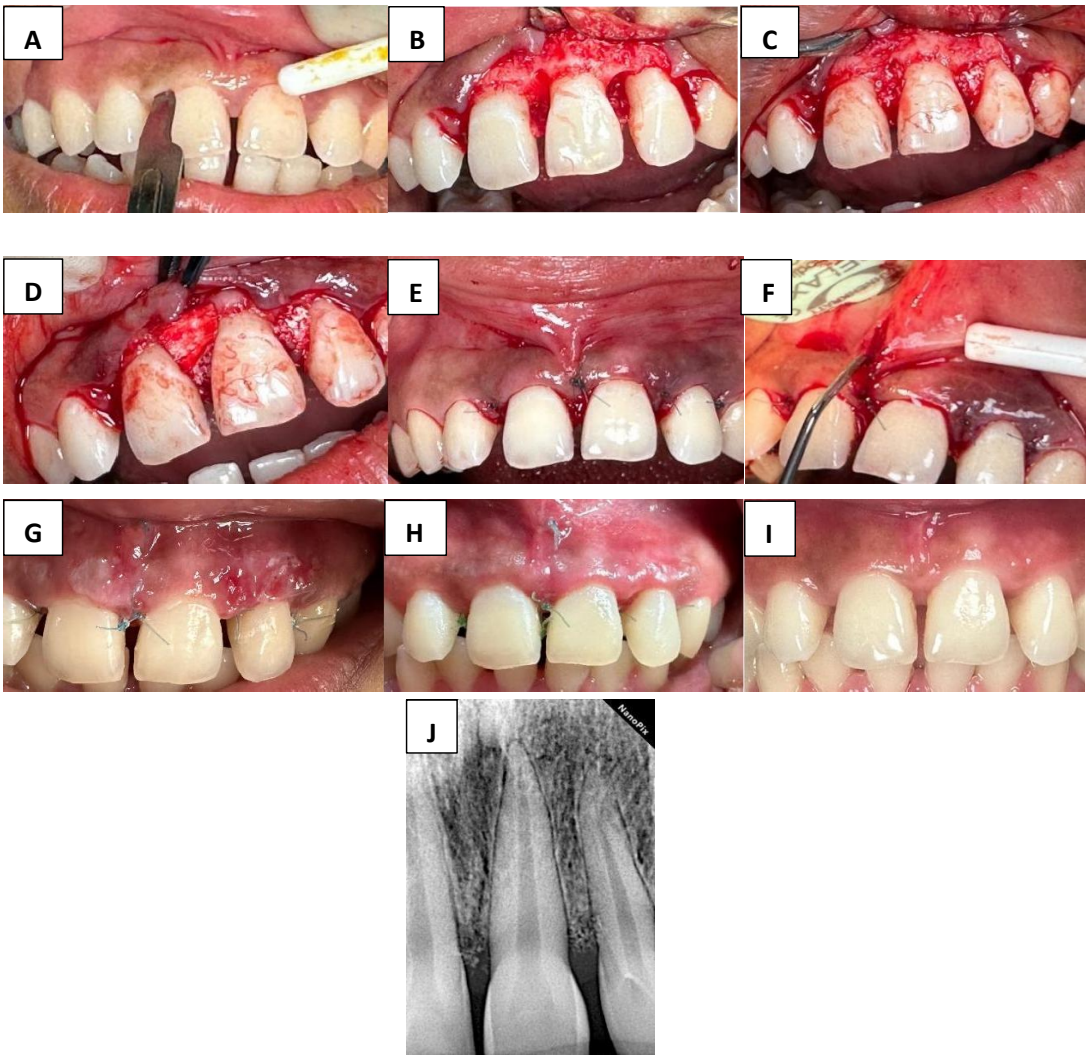

Figure 2. Open flap debridement to gain access. (A) sulcular incision, (B) removal granulation tissue with curettage, then scaling, and root planing, (C&D) GTR was performed using bone graft from alenograft and resorbable collagen membrane to correct the infrabony defect area, (E)Flap fixed with simple interupted mattress sutures, (F) a frenectomy is also performed to remove tension at the flap closure, (G) Opening of the periodontal pack were removed at seven days post-surgery, (H) Opening of sutures was removed at 14 days post-surgery, (I&J) Control was performed three months post-surgery and periapical radiographs were taken.

2.2. Case 2

A 28-year-old woman came in with complaints of bleeding gums when brushing her teeth four years ago. Patients also complain that the molars and anterior teeth of the upper and lower jaws are mobility. Clinical examination: 6 mm periodontal pocket and infrabony defects in teeth 13 and 14 (Figure 3). Therapeutic scaling and root planning (SRP) and curettage are performed. Further treatments for dental teeth number 13 and 14 include conventional flap surgery with bone grafts (xenograft), using platelet-rich fibrin, and collagen membrane placement for bone regeneration.

After the intrasulcular incision, open flap debridement is performed to gain access to the root perforation area and remove the granulated tissue with curettage, then scaling and root planning are performed over the entire tooth surface until it is completely clean when irrigated with a saline solution.

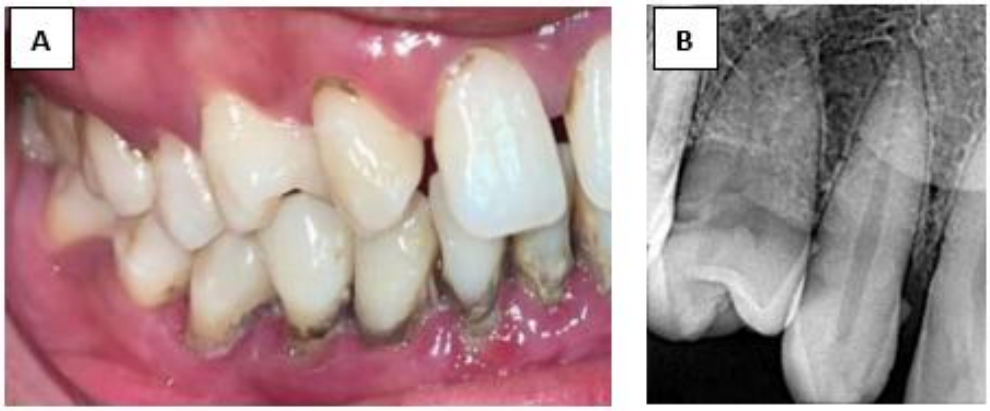

Figure 3. (A) Clinical presentasion, (B) periapical radiographic

Immediately before the surgical procedure, 10 mL of blood is drawn from the patient's antecubital vein. Blood samples were collected in glass-coated plastic tubes that did not contain antifreeze. The blood tubes are centrifuged at 1300 rpm for 10 minutes. The centrifugated blood mass is seen with a clot of fibrin structured in the center of the tube, between the red blood cell layer at the bottom and the acellular plasma at the top. Fibrin clumps can be easily removed from the tube, formed freely, and used immediately after collection. In this case, PRF is compressed between the two tongue blades to take on a consistent membrane shape, which is applied to the defect in its entirety or chopped, as described in the text below.

The surgical procedure is performed with local infiltration of 2% lidocaine containing epinephrine at a concentration of 1:100,000. Buccal and lingual sulcular incisions are made, and the mucoperiosteal flap is elevated. Then, debridement, scaling, and planning of the roots to ensure the smoothness of the roots are carried out using ultrasonic devices and hand curettage. Canselous xenograft granules with a particle size of 0.25 mm were mixed with PRF chopped into pieces of about 0.5 mm at a ratio of 1:1 (v/v). The PRF xenograft mixture is applied to the defect with an amalgam condenser to the surrounding bone wall section. The application should not overfill the defects. The compressed PRF membrane is cut and adjusted on the grafted defect. The membrane is extended at the edges of the defect in the buccal and lingual directions and secured using a 5-0 intestinal suture linked to adjacent teeth.

Finally, the mucoperiosteal flap is coronally repositioned and fixed with a simple disconnected mattress seam. Hyaluronic acid gel is applied into the surgical area and then covered with a periodontal pack. Patients are given post-operative instructions, chlorhexidine mouthwash, and medication prescription.

3. Discussion

AA clinical sign that indicates a case of advanced periodontal disease is an infrabony defect. Various regenerative techniques have been developed to treat infrabony defects with varying clinical outcomes. GTR combined with bone grafting is a successful treatment modality in periodontal regenerative surgery. GTR is more effective than conventional surgery in obtaining clinical attachments, reducing pocket in-depth, and treating intrabody and bifurcation defects.[1,6,7]

Periodontal therapy has come a long way since Prichard in i1957 first focused on morphology and treating infrabony pockets, but periodontal regeneration remains an elusive goal. Periodontal regeneration indicates that the 3-wall bone defect responds to regenerative therapy. PRF, combined with other bone substitutes such as bovine porous bone minerals and hydroxyapatite, may improve the clinical parameters and regenerative effects observed with PRF in treating human three-walled intrabody defects.[2,8,9]

Several studies support using bone graft materials and collagen membranes in these cases. The bone graft fills in the infrabony defect that helps support the GTR membrane to prevent flap collapse. Bone grafts can help to locate

missing bone and facilitate information about the original bone. The process of informing the original bone is carried out with osteoconductive/osteoinductive activity so that it can improve the healing process after surgery. It serves as a framework for bone-forming cells and blood vessels, thus promoting information about new, healthy bones and aiding in the repair of bone defects.[1,9,10]

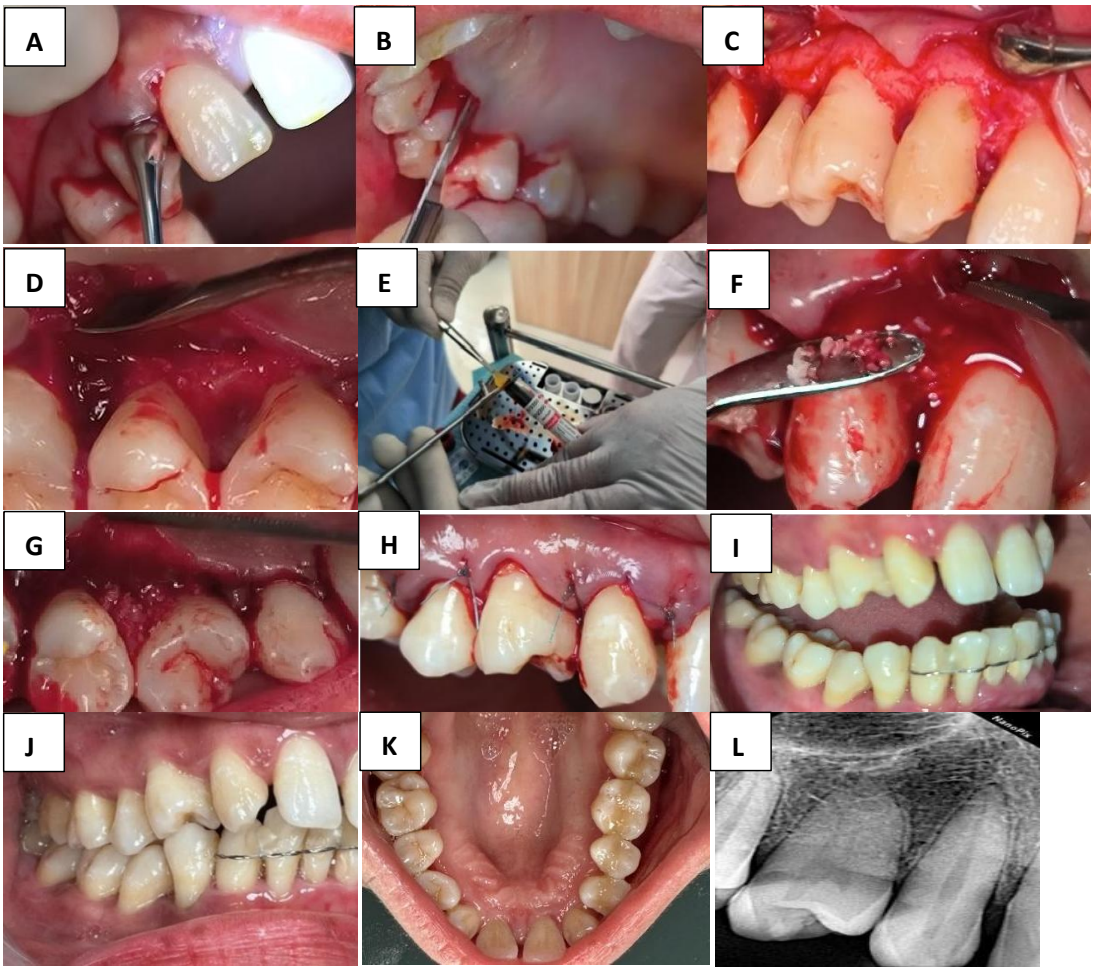

Figure 4. (A-D) Open flap debridement to gain access in buccal and palatal side. Remove granulation tissue with curettage, then scaling, and root planing, (E-G) GTR was performed using bone graft from xenograft with PRF and resorbable collagen membrane to correct the infrabony defect area, (H) Flap fixed with simple interuppted mattress sutures (I) Opening of sutures were removed at 14 days post-surgery (J-K) Control was perfomed three months post-surgery and periapical radiographs was taken.

The first case report found that treatment with GTR (xenograft and collagen membrane) at clinical evaluation 7 and 14 days after surgery showed gingival edema, erythema, pus, patient discomfort, or gingiva recession. It can be categorized as an excellent healing. The wound healing index (WHI) is subjective in examining the periodontal status of the selected teeth 7 and 14 days after surgery. Score 1–3, where 1 is associated with excellent healing (no gingiva edema, erythema, pus, patient discomfort, or flap dehiscence), 2 is associated with smooth healing with mild gingival edema, erythema, patient discomfort, or flap dehiscence but no pus, and 3 is considered the worst cure (poor wound healing with significant gingival edema, erythema, patient discomfort, dehiscence flap or pus).[11] iOur results suggest that GTR using xenografts and collagen membranes is more effective, especially in significantly reducing pocket depth and increasing the amount of bone regeneration. Subsequently, intraoral periapical digital

radiography showed significant bone filling in the intrabody defect compared to the initial measurement. The radiographs showed significant increase in bone identity.

In the second case report, the decision to use chopped PRF as a defect filler in combination with a xenograft was made due to the lease of manipulation and its placement into the defect area. The role of chopped PRF in intrabody defects is to improve growth factors in the early healing phase. In another study, if combined with bone minerals, it had the ability to enhance regenerative effects in intrabody defects. For that reason, we choose xenografts, where xenografts can enhance the effects of PRF by preserving space for periodontal tissue regeneration to occur. Fibrin is rich in amorphous platelets and, when used in conjunction with bio-oss for augmentation in cases of maxillary atrophy, will show excellent reduction in healing time and bone tissue regeneration.[12,13,14]

In this second case report, where clinical evaluation shown into gingival edema, erythema, pus, or patient discomfort, and xenograft-treated sites with PRF and collagen membranes showed less GR, GR observed at 3 months was maintained at PRF-treated sites. The additional biological properties of PRF may explain these findings. The 3D fibrin matrix in PRF has mechanical adhesive properties and acts like fibrin glue, which holds and maintains the cover in a stable position.[15] Platelet-rich fibrin may promote the healing of periodontal bone defects, as PRF can regulate the expression of phosphorylated extracellular signal-regulated protein kinase and suppress osteoclastogenesis by promoting osteoprotegerin (OPG) secretion in osteoblast cultures, as well as stimulating cell osterogenic differentiation human dental pulp by regulating the expression of OPG and alkaline phosphatase (ALP) and PRF increases the expression of endoplasmic reticulum kinases such as protein kinase, OPG, and ALP, which are beneficial for periodontal regeneration by affecting human PDL fibroblasts.[12,16] Treatment of intrabony defects with GTR using PRF with xenograft and collagen membrane results in significant pouch repair and bone regeneration. Intraoral periapical digital radiography is taken. Radiographs show significant bone filling in intrabody defects compared to the beginning of the measurement. Radiographs show a significant increase in bone identity. None of the cases presented in this report show how the rupture of the mucoperiosteal flap was observed during the entire healing phase. This factor may significantly affect the amount of issues generated. Since all treated defects are highly advanced intrabony defects, it can be assumed that the prevention of flap collapse is primarily due to the graft immaterial, which may be irresponsible if ensuring the provision of space and wound instability.[17]

Several factors related to the patient and the surgical site must be appropriately evaluated before the implementation of the regenerative procedure and strictly controlled during the postoperative healing period. Therefore, periodontists must have a better understanding of the materials and techniques available to apply the growing knowledge in clinical management with successful outcomes.[18]

4. Conclusion

The additional application of iPRF with xenograft and collagen membranes in treating periodontal infrabony defects has a better clinical impact than using only xenograft and membranes.

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