GUIDED BONE REGENERATION ASSOCIATED WITH L-PRF VERTICAL BONE GAIN: A CASE REPORT

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ABSTRACT

Every day have been increased the number of patients in the dental office looking for oral reabilitações, many of them being a challenge to the dentist surgeon. Currently, implants are installed on guided bone regeneration, the use of membranes, titanium threads and bone substitutes are key parts for correcting bone defects and to support the implant. Thereunto, the aim of this study was the description of a case addressing the methods and materials used for guided bone regeneration with the use of L-PRF for vertical bone gain. The patient showed the absence of the elements 22, 23 and 24, and a bony defect arc in this region. The installation of the implants, followed by guided bone regeneration support with a titanium mesh was indicated. The use of guided bone regeneration technique involving the mesh titanium implants, bone and lyophilized bovine L-PRF membrane showed a viable technique, the succeeding vertical bone gain until the implant platform.

KEYWORDS: bone regeneration, fibrin, oral rehabilitation, dental implants
http://dx.doi.org/10.19177/jrd.v4e62017162-166

INTRODUCTION

Bone grafts have been used frequently in Dentistry for horizontal bone gain in patients with bone deficiencies which make impossible the appropriate installation of implants. However, the first choice for graft has been the autogenous, which mostly cases has been used in block, due to be considered the Golden standard for grafts. Meanwhile, vertical bone gain is still a challenge[1,2].

Despite the results, techniques which use autogenous bone graft need confection of two surgical beds. Oftentimes, the access to extraoral donor areas brings greater post-operative morbidity and consequently uncomforting to the patient. Then, several biomaterials have been studied in order to replace techniques which use autogenous bone graft[2-4]. However, bone substitutes have only the osteoconfuction property, what shows inferior results, when compared to autogenous grafts. Meanwhile, techniques for bone grafts, even with autogenous bone or bone substitute biomaterials have limitation in vertical bone gain[5].

Guided bone regeneration techniques using mechanical barriers, like titanium meshes or non-absorbable

membrane shave demonstrated good results in vertical bone tissue gain[6-10]. Some techniques have associated mechanical barriers and simultaneous implant installation to create a more stable framework to stimulate the bone formation[11].Some studies have used mechanical barriers with combined use of morphogenetic protein, but the high cost and few prospective studies decrease this technique indication[12,13]. Platelet-rich fibrin has demonstrated good results as support on bone grafting techniques for bone remodeling and soft tissue healing[14-20].

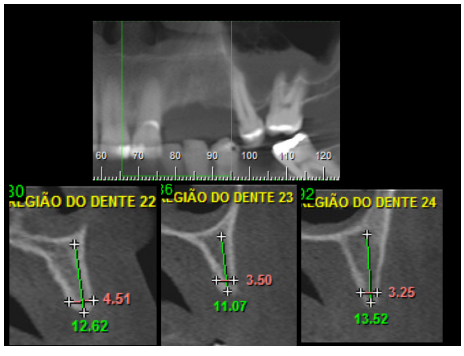
Therefore, this work has as aim describing, through a case report, the usage of guided bone regenerationusing titanium mesh associated to implants installation, and using particulate biomaterial with L-PRF technique.

CASE REPORT

Female patient, 47 years old with favorable systemic health has searched implant specialization of Superior School of Amazônia (ESAMAZ) in Belém, Para state, in order to install implants in the region between lateral incisor and first premolar. However, after clinical examination and computed tomography we find that the patient had vertical bone loss characterized by a bone defect in the arch, making impossible anesthetic rehabilitation in the region through implants (Figures 1 and 2). Before the challenge to obtain vertical bone tissue, the guided bone regeneration technique using titanium mesh was proposed. By bone tomography, we observed that the patient had height and thickness bone tissue, what enables the implants installation (Figure 1).

Previously to the surgery, four tubes of blood were collected from the patient and started the centrifugation for L-PRF technique. Then, the surgical technique was initiated with bone crest linear incision, slightly palatinate to preserve greater mucosal volume (Figure 3), following to the total displacement surgical flap (Figure 4) and milling frequency to install the implants by surgical guide (Figure 5). Three External Hexagon Implants were installed (SIN implants) and a turn in supra bone in 3 to 4 mm were left exposed in order to the implants platform would achieve the same height than the cementitious junction of 11 element (Figures 6 and 7). With implants inserted, a titanium mesh was installed and stabilized at vestibular with two graft screws. For turn filling, inorganic bone graft (Gen Mix, Genius, Baumer, Brazil), mixed to L-PRF membrane perforated pieces (Figure 8). Over the particulate material, a L-PRF membrane was inserted (Figure 9). Next, the mesh modelling was confectioned to cover the biomaterial (Figure 10). Another L-PRF membrane was accommodated on the titanium mesh (Figure 11), finishing with horizontal mattress sutures on wound's surgical lips and stabilized by simple surgery points (Figure 12).

Figure 1. Computed tomography.



After 6 from the surgery, a new tomography was solicited to follow the osseointegration and verify the vertical bone tissue gain by vestibular. Meanwhile, the same gain was not observed by palatine (Figures 13 and 14). Nevertheless, result found did not harm the implants stability. On the other hand, another surgical opening was planned to remove the titanium mesh and install healers. Then, gingival healing was followed to observe whether the peri-implant tissue keep itself stable or absorbing, exposing the implants (Figure 15). Due to the ongoing orthodontic treatment after only seven months from the surgical opening, mucosal tissue stability was verified in order to try a gingival conditioning. After 3 months from the conditioning, definitive metal ceramics crowns were installed through the provisional ones over the implants (Figures 16 and 17).

Figure 2. Clinical examination.

Figure 3. Bone crest linear incision.

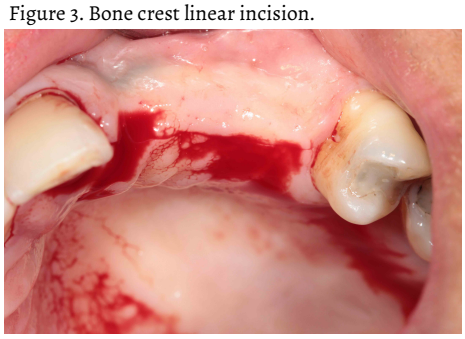


Figure 4. Total displacement surgical flap.

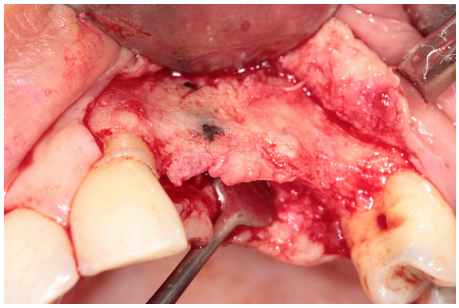


Figure 5. Install the implants by surgical guide.

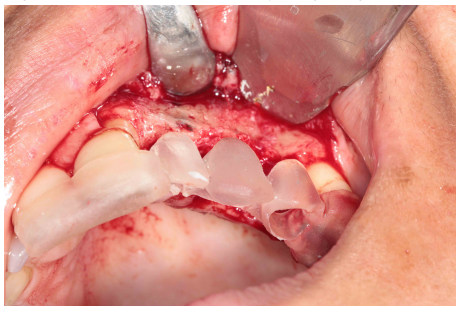


Figure 6. Installed implants im supra bone.

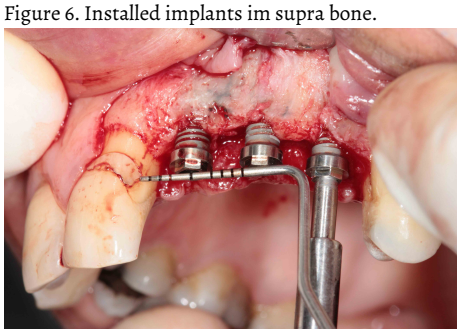


Figure 7. Installed implants.

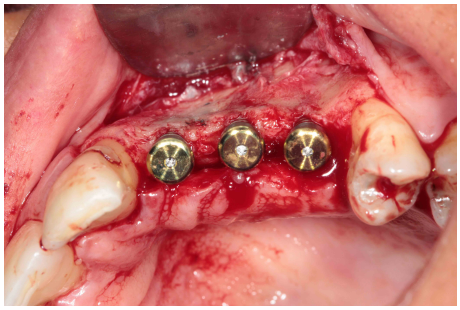


Figure 8. Inorganic bone graft mixed to L-PRF membrane perforated pieces.

Figure 9. L-PRF membrane.

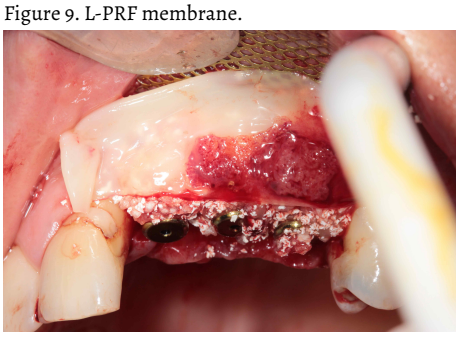


Figure 10. Mesh modelling confectioned to cover the biomaterial.

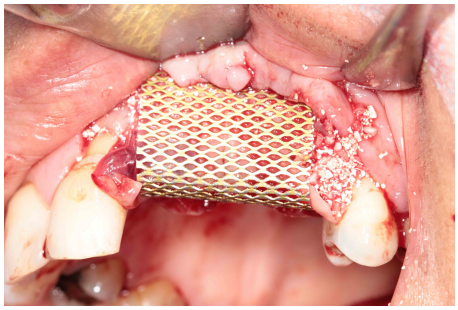


Figure 11. Another L-PRF membrane was accommodated on the titanium mesh.

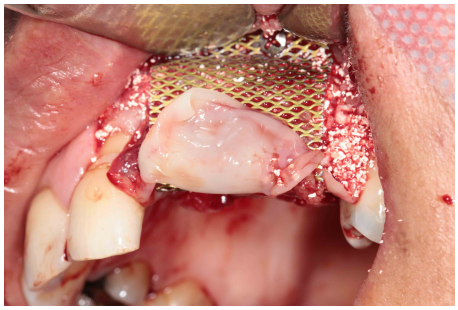


Figure 12. Finishing with horizontal mattress sutures.

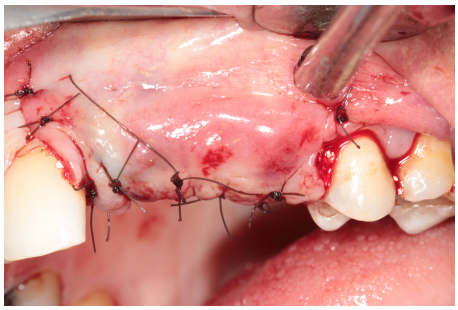
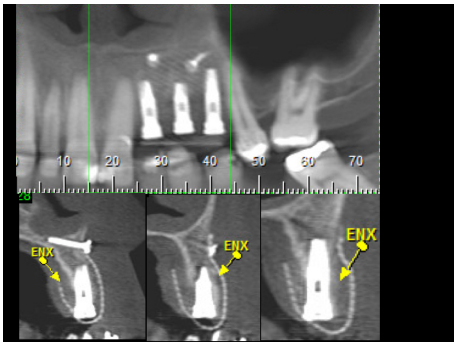


Figure 13. A new tomography after 6 months.



DISCUSSION

Guided bone regeneration techniques using mechanical barriers have been described in the literature to gain vertical bone volume. However, the technique showed itself sensitive to the operator ability, bringing certain difficulties[6].

This case report allows observing the titanium mesh usage as mechanical barrier for bone formation is effective. On the other hand, the lack of soft tissue for total recovering of mesh and soft tissue tensioning through sutures promote post-surgical exposition of this mesh. This exposition may result in contamination of bone graft material.

Figure 14. Bone gain was not observed by palatine.

Figure 15. Healing abutment.

Figure 16. Provisional crowns.

L-PRF membranes usage shows potential to fight infection by leukocyte releasing and facilitates the titanium mesh covering, decreasing the soft tissues tensioning. This study allows observe an improvement on soft tissue

healing in 7 days, suggesting a faster healing by this material usage[16].

L-PRF also has potential to stimulate new blood vessels (angiogenesis), then stimulating new vascularization on the surgical area, facilitating the cellular renovation and of any biomaterial for bone substitution, even a slow absorption[17].

Figure 17. Anterior view of final case.

This study presents a limitation due to the use of an external hexagon implant.Whether the use of cone morse implants probably the results could be better.

CONCLUSIONS

The use of bone guided regeneration technique associated to titanium mesh as mechanical barrier, implants and lyophilized bovine bone as osseoconductors and L-PRF membrane as stimulator of bone tissue cells and soft tissue on healing showed a viable technique obtaining success in vertical bone tissue gain until the implant platform.

Implant spires exposition for healing as bone biomaterial, despite being audacious, it is effective for bone formation on vertical defects. L-PRF membranes usage demonstrated possible fight over infection, even with post-surgical exposition of titanium mesh and provided a more favorable soft tissue healing in 7 days.

REFERENCES

1. MARTUSCELLI R, TOTI P, SBORDONE L, ET AL. Five-year outcome of bone remodelling around implants in the maxillary sinus: assessment of differences between implants placed in autogenous inlay bone blocks and in ungrafted maxilla. Int J Oral Maxillofac Surg. 2014;43(9):1117-26.

2. ONIȘOR-GLIGOR F, JUNCAR M, BĂCIUȚ G, et al. Subantral Augmentation with a 1/1 Alloplastic and Autologous Material Mixture. Histological Characteristics and Dimensional Stability of the Newly Formed Bone. Clujul Med. 2015;88(1):69-72.

3. ZHOU X, ZHANG Z, LI S, et al. Osteoconduction of different sizes of anorganic bone particles in a model of guided bone regeneration. Br J Oral Maxillofac Surg. 2011;49(1):37-41.

4. ARTZI Z, DAYAN D, ALPERN Y, et al. Vertical ridge augmentation using xenogenic material supported by a configured titanium mesh: clinicohistopathologic and histochemical study. Int J Oral Maxillofac Implants. 2003;18(3):440-6.

5. PIERI F, CORINALDESI G, FINI M, et al. Alveolar ridge augmentation with titanium mesh and a combination of autogenous bone and anorganic bovine bone: a 2-year prospective study. J Periodontol. 200;79(11): 2093-103.

6. CORINALDESI G, PIERI F, MARCHETTI C, et al. Histologic and histomorphometric evaluation of alveolar ridge augmentation using bone grafts and titanium micromesh in humans. J Periodontol. 2007;78(8):1477-84.

7. PIERI F, CORINALDESI G, FINI M, et al. Alveolar ridge augmentation with titanium mesh and a combination of autogenous bone and anorganic bovine bone: a 2-year prospective study. J Periodontol. 2008;79(11): 2093-103.

8. HER S, KANG T, FIEN MJ. Titanium mesh as an alternative to a membrane for ridge augmentation. J Oral Maxillofac Surg. 2012;70(4):803-10.

9. MIYAMOTO I, FUNAKI K, YAMAUCHI K, et al. Alveolar ridge reconstruction with titanium mesh and autogenous particulate bone graft: computed tomography-based evaluations of augmented bone quality and quantity. Clin Implant Dent Relat Res. 2012;14(2):304-11.

10. RAKHMATIA Y, AYUKAWA Y, FURUHASHI A, et al. Current barrier membranes: titanium mesh and other membranes for guided bone regeneration in dental applications. J Prosthodont Res. 2013;57(1):3-14.

11. CAPLANIS N, SIGURDSSON TJ, ROHRER MD, et al. Effect of allogeneic, freeze-dried, demineralized bone matrix on guided bone regeneration in supra-alveolar peri-implant defects in dogs. Int J Oral Maxillofac Implants. 1997;12(5):634-42.

12. DE ANGELIS N, DE LORENZI M, BENEDICENTI S. Surgical combined approach for alveolar ridge augmentation with titanium mesh and rhPDGF-BB: a 3-year clinical case series. Int J Periodontics Restorative Dent. 2015 Mar-;35(2):231-7.

13. KATANEC D, GRANIĆ M, MAJSTOROVIĆ M, et al. Use of recombinant human bone morphogenetic protein (rhBMP2) in bilateral alveolar ridge augmentation: case report. CollAntropol. 2014;38(1):325-30.

14. OZDEMIR H1, EZIRGANLI S, ISA KARA M, et al. Effects of platelet rich fibrin alone used with rigid titanium barrier. Arch Oral Biol. 2013;58(5):537-44.

15. JEONG SM, LEE CU, SON JS, et al. Simultaneous sinus lift and implantation using platelet-rich fibrin as sole grafting material. J Craniomaxillofac Surg. 2014;42(6): 990-4.

16. CHOUKROUN J, DISS A, SIMONPIERI A, et al. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part IV: clinical effects on tissue healing. Oral Surg

Oral Med Oral Pathol Oral RadiolEndod. 2006;101(3):e56-60.

17. CHOUKROUN J, DISS A, SIMONPIERI A, et al. Platelet-rich fibrin (PRF): a second-generation platelet concentrate. Part V: histologic evaluations of PRF effects on bone allograft maturation in sinus lift. Oral Surg Oral Med Oral Pathol Oral RadiolEndod. 2006;101(3):299-303.

18. TAJIMA N, OHBA S, SAWASE T, et al. Evaluation of sinus floor augmentation with simultaneous implant placement using platelet-rich fibrin as sole grafting material. Int J Oral Maxillofac Implants. 2013;28(1): 77-83.

19. SIMONPIERI A, DEL CORSO M, VERVELLE A, et al. Current knowledge and perspectives for the use of platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) in oral and maxillofacial surgery part 2: Bone graft, implant and reconstructive surgery. Curr Pharm Biotechnol. 2012;13(7):1231-56.

20. SIMONPIERI A, CHOUKROUN J, DEL CORSO M, et al. Simultaneous sinus-lift and implantation using microthreaded implants and leukocyte- and platelet-rich fibrin as sole grafting material: a six-year experience. Implant Dent. 2011;20(1):2-12.