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CASE REPORT

Alveolar biomodification as an indispensable procedure before guided bone regeneration

Biomodificación alveolar como un procedimiento indispensable previo a regeneración ósea guiada

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ABSTRACT

Introduction: The placement of dental implants is based on the creation of optimal conditions in the remnant bone. In some cases, it is indispensable to perform bone regeneration procedures and use barrier membranes to create such optimal conditions capable of favorably supporting the dental implant. **Objective**: Describe alternatives of barrier membranes in cases of guided bone regeneration. **Case report**: A female 53-year-old patient presents with a gingival fistula attached to tooth 14. Root fracture is diagnosed and extraction is conducted. Next, alveolar biomodification is performed to carry out guided bone regeneration and placement of a fibrin-rich plasma membrane. When healing is complete dental implants will be placed. **Conclusions**: The use of barrier membrane alternatives has shown to be effective in cases of guided bone regeneration.

Keywords: platelet-rich fibrin; alveolar biomodification; bone regeneration; membranes; artificial; dental implant; osseointegration.

RESUMEN

Introducción: Para la colocación de implantes dentales se deben establecer condiciones óptimas de hueso remanente, por lo cual existen casos en los que se hace indispensable realizar procesos de regeneración ósea y la utilización de membranas de barrera para generar esas condiciones óptimas que puedan soportar favorablemente el implante dental. **Objetivo**: Describir alternativas de membranas de barrera en casos de regeneración ósea guiada. **Reporte de caso**: Paciente femenino de 53 años de edad que acude a consulta por presentar fístula en encía adherida de órgano dentario 14, se diagnostica como fractura radicular y se procede a la extracción, posteriormente se realiza una biomodificación del alveolo para realizar regeneración ósea guiada y colocación de membrana de plasma rica en fibrina, se espera cicatrización para la

colocación de implantes dentales. **Conclusiones**: El uso de alternativas de membranas de barrera muestra resultados efectivos en casos de regeneración ósea guiada.

Palabras clave: fibrina rica en plaquetas, biomodificación alveolar, regeneración ósea, membranas, artificial, implante dentario, oseointegración.

INTRODUCTION

The stomatognathic system is one of the most complex systems of the human body, in which all the structures that integrate it act in a synchronized and harmonic way, and when one of the structures fails, automatically all the adjacent structures modify themselves looking for stability, which may not be the best, generating mild, moderate or severe consequences, which is why when a dental organ is extracted in the oral cavity, it is essential to rehabilitate the edentulous area to return the occlusal harmony and not generate consequences in other structures.[1]

Currently there are different options for the rehabilitation of edentulous areas, which aim to return the patient an optimal masticatory function, which allows an occlusal and aesthetic stability, since the lack of dental organs will generate resorption of alveolar ridges, occlusal imbalance and poor dental position, mandibular problems and even postural problems in the patient.[2] Among the most common options are removable partial dentures, fixed partial dentures and dental implants, which consist of the placement of a metallic device inside the bone that will simulate the dental root and provide support to the prosthetic attachment that will be placed on top of it.[3]

For the placement of dental implants optimal conditions of remaining bone and periodontal health of the patient should be established, so that for this procedure a thorough clinical and radiological assessment is indispensable. In cases where the amount of bone is not enough, it is necessary to implement bone regeneration, in order to achieve optimal osseointegration of the implant and therefore a lasting rehabilitation.[4]

Among the techniques of bone regeneration, the most widely used is guided bone regeneration (GBR), it is considered a stimulation technique for the formation of new bone where the membranes favor the formation and preservation of the clot to avoid infiltration of cellular components (epithelial and conjunctive cells) different from osteo-promoter cells in the area of repair, which allows the differentiation of the clot into bone tissue and, in this way, count on an adequate quantity and quality of bone, with sufficient stability for rehabilitation conventional prosthesis or with osseointegrated dental implants. The materials used for the GBR include autologous bone grafts, which are

considered the gold standard due to their osteoconductive and osteoinductive properties, the presence of osteogenic cells and the non-generation of immunological rejections, but it is a material that is difficult to collect, which encourages the search for other alternatives such as isografts, xenografts or heterografts, allografts or homografts and, finally, alloplastic grafts; these are synthetic substances used as bone substitutes, among which are quoted: β-tricalcium phosphate (β-TCP), calcium sulfate, bioactive vitreous ceramics and polymers.[5,6] The present article describes a dental extraction, in which alveolar bio modification and bone grafting with fibrin-rich plasma (FRP) was performed for rehabilitation purposes with dental implants in order to show alternatives of barrier membranes in cases of guided bone regeneration, for this reason, its objective is to describe alternatives of barrier membranes in cases of guided bone regeneration.
In order to carry out all the treatment, the Declaration of Helsinki was respected, informing the patient of the objectives and the particularities of the treatment, and requesting in writing their consent to participate.

CLINICAL CASE

A 55-year-old female patient who came to the clinic due to a fistula in the upper right posterior area of approximately 45 days of evolution, with painful symptomatology during mastication, also reported that she had not received any treatment for this condition. Clinical examination reveals definitive individual restoration, metal-free crown, in dental organs 15, 14, 13; slightly reddening gingiva is seen at the marginal level of dental organ 15 and 14, and fistula with erythematous edges is observed in the adhered gingiva of dental organ 14, there is mobility of the clinical crown and probing depth 6 mm (Fig. 1).

Fig. 1 - A fistula in the attached gingiva of dental organ 14 and reddened gum is observed in the right image. In the left image, a 6mm probing depth is observed.

Computerized axial tomography images showing root fracture in the middle-apical third and radiolucent area in dental organ 14.

According to the clinical and radiological findings, it is diagnosed as a root fracture in the dental organ 14 and chronic apical abscess. The tooth extraction was then performed. The procedure begins with the application of local anesthesia with lidocaine 2 % epinephrine 1:80 000, an intrasulcular incision is made with a Bard Parker # 3 scalpel handle and # 15 scalpel blade to make a complete Neumann flap, then a lifting of the mucoperiosteal flap was performed, where a large part of the root can be appreciated. The extraction of the dental organ was performed, followed by the extraction of the remaining root in the alveolus (Fig. 2).

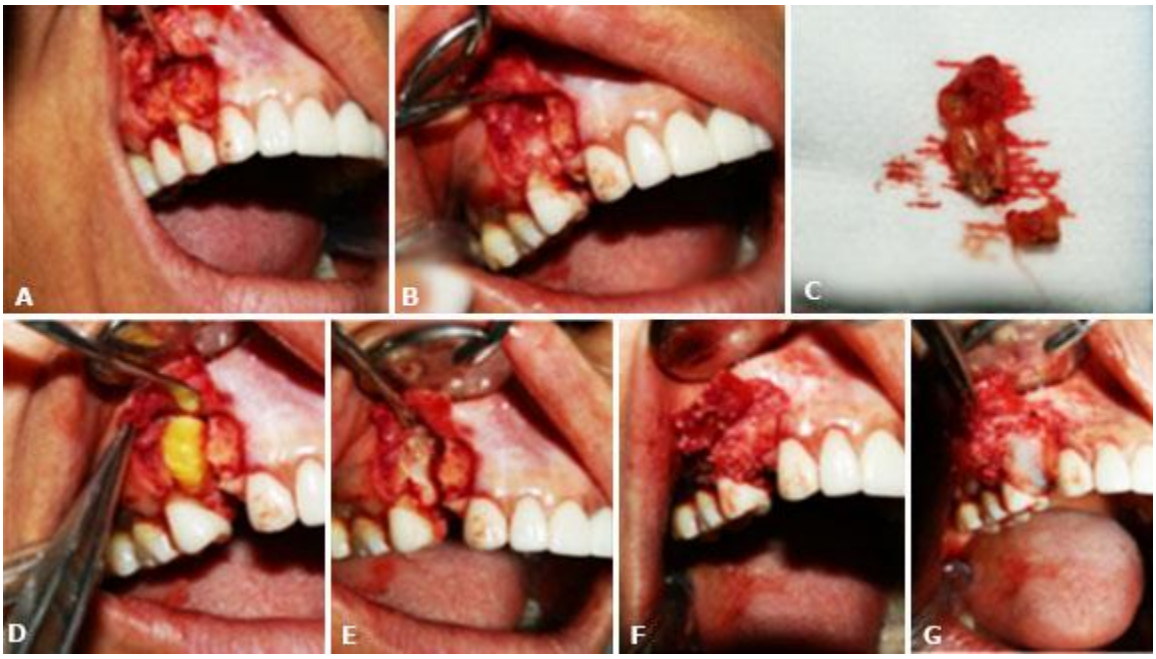

Fig. 2 - In the left image, the vestibular root of dental organ 14 can be clearly observed after performing the mucoperiosteal flap. In the central image the post-extraction alveolus is observed and in the image on the right, the extracted premolar is observed. In the image on the left, a cotton wool embedded in diluted tetracycline is used to perform the bio modification of the alveolus. In the following image the clean alveolus is observed after the bio modification. In the following image the bovine bone graft is observed and in the image on the right, the placement of the FRP membrane on the bone graft is observed.

It was then proceeded to perform alveolar bio modification with tetracycline, to then perform the placement of bovine bone, covered with a membrane of FRP, previously extracted and prepared from the patient's blood.

Control was performed at 15 days, in which there was a marked improvement of the area, the fistula disappeared and the suture was removed. Control was scheduled 4 months later, where the complete healing of the area was observed, a normal colored gingiva was observed, without swelling or signs of inflammation, for this reason it was proceeded to place a fixed partial denture type cantilever to mesial with the pillar in dental organ 15 as a provisional while the dental implant is placed in the area of dental organ 14 with the purpose of not losing space for its subsequent final rehabilitation (Fig. 3). Computed axial tomography in the sagittal, coronal and horizontal direction, where there is an absence of radiolucent zones, and good regeneration of the bone tissue is also observed.

Fig. 3 - The gingiva is observed without signs of inflammation 4 months after the procedure and the placement of a fixed partial denture type cantilever in the zone of dental organs 14-15.

DISCUSSION

The use of barrier membranes for GBR processes have the function of acting as a physical barrier to prevent rapidly growing tissues, such as fibrous or epithelial, to invade the space of the defect, maintaining said space and allowing the cells of the parent tissue, which has the ability to regenerate lost tissues, (cells of the periodontal ligament or bone cells) to fill the defect during healing,[7] necessary to perform restorative processes in the future, in the case mentioned above you can see an excellent state of the Periodontal tissues necessary for implantological processes.

Currently there is a wide variety of options with regarding barrier membranes that can be classified as resorbable or not, and their use will depend on the particular case of the patient, among the most used in GBR processes are the resorbable since they avoid additional surgical procedures for removal of the barrier membrane, most resorbable membranes are polyester-based, such as, for example, polyglycolic acid (PGA),

polylactic acid (PLA), poly ε-caprolactone (PCL), and its copolymers or collagen tissue derivatives. Currently, the use of fibrin-rich plasma (FRP) has been used with great success in periodontal surgeries due to its easy handling and cost, as well as being biocompatible, generating a higher success rate in surgical procedures, in addition due to the high content of growth factors it helps the rapid healing of periodontal and bone tissues, compared to other types of materials such as chitosan membranes or other resorbable materials, as stated by Paredes *et al* in 2014 in their study, *Comparative analysis of the obtained bone regeneration with chitosan and plasma rich in fibrin*, Solórzano *et al.* in 2017 in their study *Periradicular tissues regeneration by endodontic treatment and paraendodontic surgery, guided bone regeneration (fibrin-rich plasma)*, and Nikoladikis *et al.* in 2008 in their study *Effect of platelet-rich plasma on the early bone formation around Ca-P-coated and non-coated oral implants in cortical bone. Clinical oral implants research.*[8,9,10] In accordance with the results obtained in the case sample described above, where the use of fibrine-rich plasma membranes can serve as an aid in the regeneration of periodontal and bone tissues, generating optimal support tissues for implant placement and regeneration of bone defects in the patient, in addition to the ease and economy that this type of membranes provide and comfort as for other non-absorbable membranes, since it is not necessary to perform post-surgery to perform the procedure to remove membranes.

These membranes in turn have disadvantages in cases in which previous infectious processes occurred, because these membranes tend to reabsorb faster in the presence of bacterial infiltrate, decreasing their barrier function and therefore the failure of GBR since it does not form sufficient bone tissue.[11] That is why before performing a GBR process it is necessary to perform a detoxification and conditioning of the bone that will be regenerated with materials that have functions over a large bacterial spectrum and have favorable functions on the affected surface. Chakraborti *et al.* in 2011, in their study *Drug intercalation in layered double hydroxide clay: Application in the development of a nanocomposite film for guided tissue regeneration*, used a combination of controlled release of tetracycline to the periodontal pocket fluids combined with a membrane, and observed after 5 weeks, the significant increase in the activity of alkaline phosphatase and formation of bone nodules.[12]

Tetracycline is a bacteriostatic antibiotic that provides a broad spectrum of activity against Gram positive and Gram negative bacteria, it also has the property of demineralization that allows to create a conditioning of the root or alveolar surface, inhibition of collagenase and bone resorption, as well as it has great therapeutic potential

due to its ability to inhibit matrix metalloproteinase activity and osteoclast function, preventing the degradation of bone connective tissue generated by bacterial pathologies.[13,14,15] Due to the great antibacterial properties of tetracycline, it is a medicine indicated to perform detoxification processes prior to GBR procedures and thus avoiding failure. That is why in the case described previously it was necessary to use tetracycline as a medicine for detoxification of the bone prior to GBR and avoid failures, since it has properties that allow the connective tissue necessary for formation to be destroyed bone again.

CONCLUSION

In processes of guided bone regeneration in which there are previous infections in the area, most of the bacterial infiltrate present in the area should be eliminated, to avoid the failure of regeneration. On the other hand, one of the options in terms of barrier membranes, may be FRP membranes, since they are economical, with large regenerative properties and quite biocompatible.

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Conflict of interest

There are no conflicts of interest to declare among the authors of this publication, the institutions and/or products mentioned in the manuscript.

Author's contributions

Daniel Gustavo Del Rio Rocha: Surgical procedure participation, literature review and writing of the manuscript.

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