



Use of Polypropylene Membrane to Accelerate Bone Maturation after Cystic Exeresis

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Received: October 19, 2020; **Published:** November 21, 2020

Abstract

Bone cysts are lesions frequently seen in the stomatological and dental clinics. The main technique used in their treatment is surgical excision, with enucleation of the lesion. Generally, the bone defect generated can become large, depending on the size of the cystic lesion. Bone repair, in these cases, is slow, and may offer post-surgical risks and complications, such as pathological fractures, risk of recurrence and loss of function due to difficulty in rehabilitation. Regenerative techniques can favor bone repair and accelerate the healing process. The purpose of this article is to present the case of cystic exeresis in a patient by the technique of enucleation of the lesion, followed by the use of polypropylene membrane. The membrane was adapted and maintained on the bone defect, remaining for 10 days. The permanence of the membrane for this period was sufficient to maintain the blood clot, considered a biological basis for bone formation and maturation, repairing in a short period of time. The use of polypropylene membrane is a simple, efficient and affordable technique, that can be used in cases of surgical excision of cystic lesions, presenting satisfactory results and accelerated bone repair.

Keywords: Radicular Cyst; Wound Healing; Bone Regeneration; Oral Surgery

Introduction

Cystic lesions are pathologies frequently seen in the stomatological and dental clinic. Approximately 86% are odontogenic lesions of periapical origin and do not require complex treatment, even if they can reach larger dimensions. Larger sized cystic lesions are rarer and are usually diagnosed as follicular cysts or keratocysts. Radicular cysts can also reach larger dimensions causing considerable defects [1-3].

Residual radicular cysts develop from epithelial remnants that have been stimulated and proliferate from the inflammatory process in response to pulp necrosis of non-vital teeth, even those already extracted. The dimensional development occurs autonomously. Over time, the cysts may undergo regression, remain static (in size) or grow [1].

The diagnosis of cystic lesions, except for painful symptoms related to endodontic conditions, are mostly inadvertently established by routine radiological examinations [1].

Among the therapeutic modalities, endodontic treatment - when necessary and indicated, particularly in teeth with negative pulp vitality - and surgical treatment [1-3] stand out. Endodontic overinstrumentation, traversing the apical foramen, can sometimes produce an acute transient inflammatory response, destroying the epithelial lining of radicular cysts, converting them into granulomas, which regress spontaneously [2]. Several techniques can be employed, such as enucleation of the cystic lesion (gold standard), marsupialization and decompression. These last two techniques are indicated in large cases, because they reduce the internal pressure of the lesion and favor bone formation and reduction of the cystic cavity, allowing subsequent enucleation. However, these techniques require the strict cooperation and assiduity of patients, as well as frequent visits and maintenance of the cystic cavity hygiene, which can be considered as limitations or disadvantages of these techniques. On the other hand, the exeresis of the cystic lesion requires the maintenance of the clot inside the bone cavity after the enucleation of the lesion to the bone neoformation. This technique is well indicated for lesions of small dimensions, which usually regress by physiological apposition, while in lesions of larger dimensions usually generate large bone defects [1-3].

The use of regenerative techniques, with the use of biomaterials becomes a viable option for the acceleration of the bone repair process after the enucleation of cystic lesions. However, advantages and disadvantages of each material and techniques employed should be considered [1]. The purpose of this article is to present the case of cystic exeresis in a patient by the enucleation technique of the lesion, followed by the use of polypropylene membrane.

Case Report

African-descendent female patient, 18 years-old, came to the clinic complaining of gingival pain.

Clinically, bone bulging at the palatal cortical was observed in the region of teeth 11 and 12 (Figure 1).

Radiographically, a radiolucent image suggestive of a cystic lesion was observed in the periapical region of teeth 11 and 12 (Figure 2). Teeth 12 presented endodontic treatment performed and tooth 11 showed pulp vitality. The endodontic retreatment was proposed and performed, with calcium hydroxide extravasation during root canal plugging (Figure 3).



Figure 1: Intraoral initial aspects (palatal view): bone bulging at the palatal cortical in the region of teeth 11 and 12.



Figure 2: Radiolucent image suggestive of a cystic lesion observed in the periapical region of teeth 11 and 12.



Figure 3: Endodontic retreatment of the teeth 12.

Cystic exeresis through the enucleation technique of the lesion was recommended and the use of polypropylene membrane to accelerate the bone regeneration process in the region was suggested. The patient agreed and signed the consent form to the treatment plan.

Under local infiltrative anesthesia at a distance at the vestibular and palatal, an intrasulcular incision was made in the palatal mucosa between the mesial of tooth 23 and the distal of tooth 15. After removal of the mucoperiosteal flap (Figure 4), external cortical resorption was observed. The lesion was enucleated (Figure 5) and the bone cavity was properly washed with 0.9% saline solution (Figure 6). Blood clot filling of the bone cavity was stimulated. The polypropylene membrane (BoneHeal®, São Paulo, Brazil) was cut, adapted and inserted over the bone defect (Figure 7) and subsequently the sutured flap (Figure 8). Analgesic drugs (dipyron

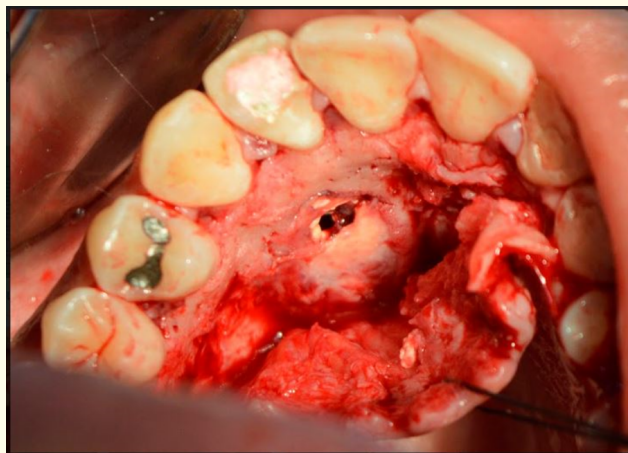


Figure 4: Removal of the mucoperiosteal flap, after intrasulcular incision in the palatal mucosa between the mesial of tooth 23 and the distal of tooth 17.

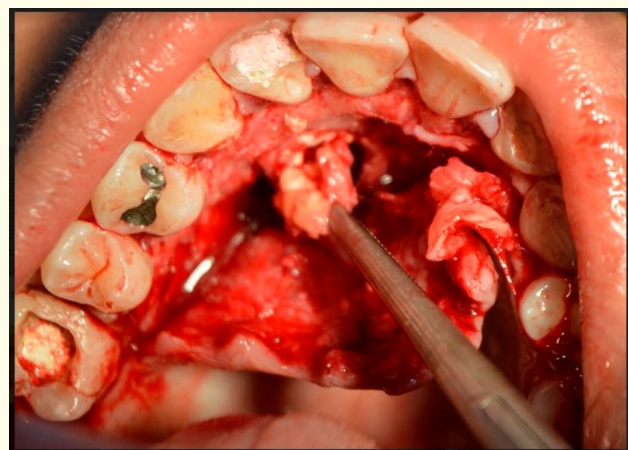


Figure 5: Enucleation of the lesion.

sodium 500 mg of 8/8 hours for 3 days), anti-inflammatory drugs (nimesulide 100mg of 12/12 hours for 5 days) and antibiotics (amoxicillin 500 mg of 8/8 hours for 7 days) were administered to the patient in the post-surgical period.

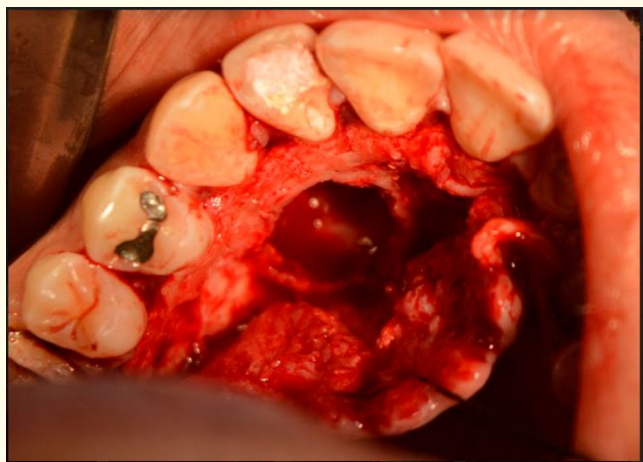


Figure 6: The bone cavity was properly cleaned and its filling was stimulated by the blood clot.



Figure 8: Sutured flap.

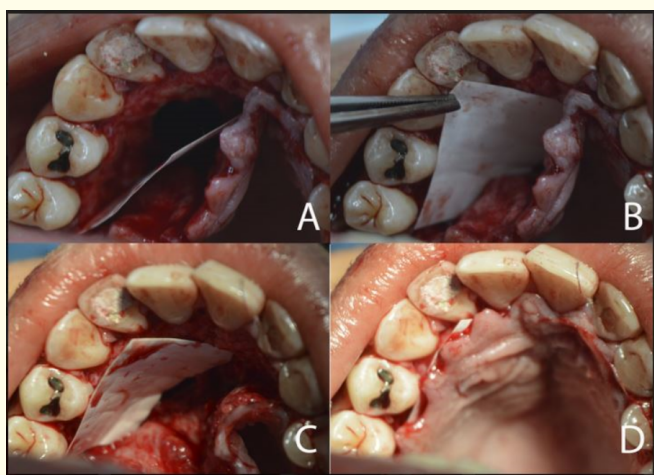


Figure 7: Adaptation and insertion of the polypropylene membrane on the bone defect (A, B, C and D).

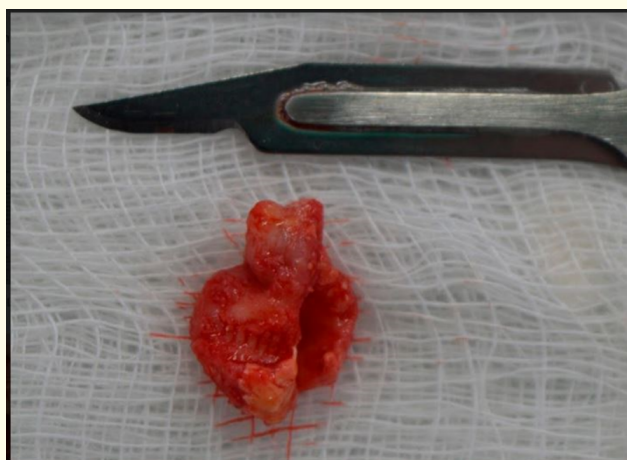


Figure 9: Fragment of the lesion removed.

The fragments of the lesion (Figure 9) were fixed in 10% formaldehyde and referred to the Pathological Anatomy Service of the School of Dentistry, University of São Paulo. The histopathological examination revealed a cystic capsule fragment consisting of dense connective tissue showing granulation tissue with numerous neofomed vessels and predominance of lymphoplasmocytic

inflammatory infiltrate in its periphery. Blood vessels of different diameters and congestions were also observed. The final diagnosis was a cystic capsule.

After 7 days of surgical procedure, under local anesthesia, the remaining sutures and membrane were removed (Figure 10 and 11) and the surgical site was sutured again (Figure 12). After 7 days the remaining sutures were removed. No post-surgical alterations or complications were reported.



Figure 10: Post-operative (7 days) evaluation



Figure 11: Removal of the remaining sutures and membrane.



Figure 12: Site sutured again.

The patient was evaluated after 12 months of the surgical procedure, with satisfactory repair of the surgical site (Figure 13). In the imaginological examination (periapical radiograph), advanced surgical repair was observed in the region of the bone cavity (Figure 14).



Figure 13: Clinical aspects of the post-operative evaluation (12 months).



Figure 14: Radiographic aspects of the post-operative evaluation (12 months): acceleration of the bone maturation.

Discussion

The hypothesis of using or not using the materials refers to post-surgical complications, such as risks of pathological fractures, recurrence of lesions and loss of function due to the difficulty of rehabilitation. The recurrence rate of cystic lesions after enucleation was estimated between 11 and 18% [3]. However, the use of bone grafts reduces the risk of spontaneous fractures after enucleation of large cystic lesions [1].

After enucleation, bone defects caused by small cystic lesions (20 to 30 mm) present a density compatible with spontaneous bone regeneration after 12 months, while in large lesions (larger than 30 mm), they usually present their repair after 24 months [1,2]. The increase in bone density was significantly greater in the first six months compared to subsequent months [1]. Chacko., *et al.* [3] demonstrated that, through digital analysis of post-surgical radiographs, there was a reduction in residual cavity size of 25.85% after 6 months, 57.13% after 9 months, 81.03% after 1 year and 100% after 2 years. The authors suggested that bone repair after enucleation of cystic lesions does not depend on the use of autogenous grafts or bone substitutes. They also recommended that there is no need to strengthen the bone with replacement materials to avoid pathological fractures of the mandible. However, the acceleration of the repair process of large bone defects, using bone replacements or not, becomes a dilemma [1,3]. Faced with several advantages and disadvantages, the best technique and material should be evaluated.

Although autogenous bone grafting is determined as the gold standard, some disadvantages are considered such as prolonged time of the surgery (graft collection time, time of donor and recipient bed preparation), donor site morbidity, limited availability of bone when large defects need to be replenished, as well as its resorption. Consequently, alloplastic and xenogenic materials can assist in filling bone defects after enucleation of the cystic lesions as an alternative to autogenous grafts. Despite reducing morbidity and risks to complications, alloplastic materials present the limitations of their use as a disadvantage, since they show reduced osteogenic activity, since they need to be initially resorbed and subsequently replaced by new osteogenic tissue, eventually delaying the bone repair process. It was found that approximately 20% of cases with large defects treated by xenogeneous grafts presented failures [1].

Guided Bone Regeneration intends to select specialized cells, compatible with the formation of the new bone tissue, by means of osteoblasts, in the bone cavity after cystic enucleation, preventing the movement of the clot necessary for angiogenesis, chemotaxis and neoformation of granulation tissue, which will culminate in local bone repair and filling the region with matured bone tissue [4-9]. Additionally, procedures using regenerative techniques may favor the maintenance of pulp vitality in teeth adjacent to the cystic lesions [2].

After the enucleation of the cystic lesion, the bone cavity is filled with blood from the ruptured periodontal vessels and apical vascular bundle. Due to hemostasis and discrete participation of oral microbiota and salivary enzymes, superficial clot depression is evidenced. These conditions, as well as physical trans-surgical hemostatic maneuvers (physical compression), may favor bone remodeling and increase post-enucleation bone resorption of the cystic lesion [4-9].

As in other surgical procedures (exodontia and implant installation), several materials were researched with the intention of helping in clot immobilization, selecting viable cells, preventing bacterial penetration and maintaining the proper environment, without sudden changes in temperature. The physiological formation of the fibrin network is sought, with chemotaxis of cells responsible for angiogenesis, migration of undifferentiated cells that will compete to occupy their proliferative site, promoting secretory changes originating the granulation tissues, whose differentiation and synthesis of extracellular matrix, susceptible to mineralization and maturation, will develop to mature bone tissues [4-9]. In this perspective, gold, castor bean and polytetrafluoroethylene fabrics were used, not fully reaching the characteristics considered ideal for the promising and safe use of a membrane. Among the expected characteristics of this material are impermeability; resistance; possibility of being cut with scissors; low cost; no need for screws, compressive screens or tacks for fixation; it can be exposed to the oral environment; favor passive contact of the edges of the flap; be conservative because it does not require the use of relaxing incisions; sit passively; it can be easily removed, if necessary; and, meet the needs of the guided bone regeneration technique for preservation and functionality of the maxillary bones [4-9].

Additionally, the polypropylene membrane offers other advantages, such as the indication of intentional exposure of the membrane to the oral environment; the flaps should be kept away from each other; there is no need to use other biomaterials inside the bone cavity, only the blood clot; no greater investment in instruments; no need to be previously hydrated; it does not undergo dimensional changes during the period of stay in the surgical bed; any type of suture can be used; it is totally impermeable; it can be removed between 7 and 10 days; it does not adhere to the tissues; the internal surface promotes blood adsorption; it can be used in cases of immediate implants; it allows the simultaneous regeneration of bone tissue and keratinized tissue; it hinders the accumulation of dental biofilm and food debris [4-9]. All these characteristics were observed in the present case. The only disadvantage observed refers to the need of its removal after 7 to 10 days post-surgical, with the need to anesthetize the region and new suture.

The polypropylene membrane presented in the clinical case has all the intrinsic characteristics of a material with reparative and regenerative competence, providing a suitable alternative in current clinical practice. The polypropylene membrane was originally indicated after exodontia with a view to the future installation of osseointegrated implants [4-9]. It is still being used as a totally occlusive membrane after maxillary sinus grafting technique, avoiding tissue invagination [10,11]; Guided Bone Regeneration in defects of a bone wall [12-19]. Recently, the polypropylene membrane was used associated with xenogenous and connective tissue grafts prior to rehabilitation with osseointegrated implantation [20]. From this report, as well as others of our series, we present the first case of the use of polypropylene membrane favoring the acceleration of bone repair after cystic exeresis.

Conclusion

This case illustrates another promising new indication of polypropylene membrane after enucleation of cystic lesions to accelerate bone repair. The process of bone repair is simple in essence and has a huge percentage of success. However, the study of tissue regeneration has created new possibilities regarding the control of osteopromotion through the use of polypropylene membranes. The low cost, easy access and manipulation and the participatory control in tissue physiology make the technique a

potential alternative in minimizing bone resorption or even immobilization of the clot, favoring the acceleration of bone repair and composing the therapeutic arsenal of the dental surgeon.

Bibliography

1. Perjuci F, Ademi-Abdyli R, Abdyli Y, Morina E, Gashi A, Agani Z, Ahmedi J. Evaluation of spontaneous bone healing after enucleation of large residual cyst in maxila without graft material utilization: case report. *Acta Stomatol Croat.* 2018;52(1):53-60.
2. Tian FC, Bergeron BE, Kalathingal S, Morris M, Wang XY, Niu LN, Tay FR. Management of large radicular lesions using decompression: A case series and review of the literature. *J Endod.* 2019;S0099-2399(18)30874-4.
3. Chacko R, Kumar S, Paul A, Arvind. Spontaneous bone regeneration after enucleation of large jaw cysts: A digital radiographic analysis of 44 consecutive cases. *J Clin Diagn Res.* 2015;9(9):ZC84-ZC89.
4. Pedron IG, Salomão M, Bispo LB. Regeneração óssea guiada com membrana de polipropileno na preservação alveolar pós-exodontia prévia a futura instalação de implante osteointegrado. *Rev Maxillaris Portugal.* 2017;83(10):36-45.
5. Pedron IG, Bispo LB, Salomão M. Selective polypropylene membrane: alveolar behavior in post-extraction repair with a view to the future installation of osseointegrated implants. *Italian Journal of Dental Medicine.* 2018;3(2):33-38.
6. Pedron IG, Magno Filho LC, Salomão M, Varoli FP, Al-Juboori MJ. Guided bone regeneration with polypropylene membrane associated with dental implant placement. *J Health Sci Inst.* 2018;36(4):275-280.
7. Pedron IG, Salomão M. Polypropylene membrane in post-extraction alveolar repair with a future perspective on osseointegrated implants. *Implants - International Magazine of Oral Implantology* 2019;20(1):10-15.

8. Pedron IG, Salomão M. Application of polypropylene membrane in the restoration of alveolar bone after tooth extraction - Prospects for the development of intraosseous implant restoration. *Cosmetic and Implants China*. 2019;(1):17-20.
9. Pedron IG, Salomão M, Medeiros JMF, Shitsuka C, Magno Filho LC. Placement of dental implant after use of guided bone regeneration with polypropylene membrane. *Scientific Archives of Dental Sciences*. 2019;2(8):25-30.
10. Lacerda EJR, Lacerda HM, Salomão M. Invaginação de tecido conjuntivo após levantamento do seio maxilar; uso de biomateriais e implante tardio: resolução cirúrgica em um caso clínico. *Implant News*. 2012;9(6):843-850.
11. Borges FL, Dias RO, Piattelli A, Onuma T, Cardoso LAG, Salomão M, Scarano A, Ayub E, Shibli JA. Simultaneous sinus membrane elevation and dental implant placement without bone graft: A 6-month follow-up study. *J Periodontol*. 2011;82(3):403-412.
12. Salomão M, Cunha J, Morales RJ, Siqueira JTT. Regeneração óssea guiada com barreira de polipropileno intencionalmente exposta ao meio bucal. *Rev Catarinense Impl*. 2012;12(14):65-68.
13. Zeppini LAS. Barreira de polipropileno - Uma nova abordagem para regeneração óssea guiada (ROG). *Rev Odontol (ATO)*. 2014;14(5):301-307.
14. Salomão M, Alvarez FK, Siqueira JTT. Regeneração óssea guiada em defeitos extensos pós-exodontias utilizando membrana exposta ao meio bucal. *Implant News*. 2010;7(6):753-759.
15. Salomão M, Siqueira JTT. Uso de barreira de polipropileno pós exodontia. Relato de três casos clínicos. *Rev Bras Impl*. 2009;15(2):12-15.
16. Salomão M, Siqueira JTT. Regeneração óssea guiada através de barreira exposta ao meio bucal após exodontias. *Rev Bras Impl*. 2010;16(3):5-7.
17. Salomão M, Siqueira JTT. Recuperação do rebordo alveolar através de barreira exposta ao meio bucal. Novo paradigma? *Rev Catarinense Impl*. 2010;10(12):26-28.
18. Salomão M, Siqueira JTT. Uso de barreira exposta ao meio bucal para regeneração óssea guiada após exodontia. *Rev Assoc Paul Cir Dent*. 2010;64(3):184-188.
19. Silva BCR, Salomão M, Siqueira JTT. Regeneração de defeito ósseo extenso pós-exodontia para instalação de implante osteointegrável com uso de barreira intencionalmente exposta ao meio bucal. Relato de caso. *Rev Catarinense Impl*. 2013;13(15):54-57.
20. Salomão M, Junior POT, Fonseca MB. Caso clínico - Regeneração óssea guiada utilizando barreira de polipropileno (Bone Heal®), associado a enxerto xenógeno (BIO-OSS®) e enxerto de tecido conjuntivo, otimizando a reabilitação com implante dental. *Rev Catarinense Impl*. 2016;18(17):42-44.

Volume 3 Issue 12 December 2020

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