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Case Series

Use of Resorbable Membrane in Combination with Bone Grafts

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Abstract

The aim of this study is to report our experience with the collagen membrane through its use in 25 cases in recent years and also to present our series of articles published in recent years using this product.

Alveolar bone resorption is a constant post-extraction alteration. This is because the alveolar process has the function of supporting the teeth and, once this function is lost, it tends to be gradually resorbed [1-4]. This process of resorption constantly culminates in bone defects regarding height, thickness, or associated aspects, and they often preclude installation of dental implants, making it necessary to perform a bone graft first.

The sample included 25 patients, 14 female and 11 male, with an average age of 48 years (range 25-65 years), who sought treatment with a view to installing dental implants and after clinical and tomographic assessment were found to require bone augmentation.

The phenomenon of soft-tissue invagination into the reconstruction site occurs because this tissue has a healing process piloted by fibroblasts, which are cells that have rapid and considerable proliferation capacity, whereas bone tissue incorporation is dependent on osteoblasts, whose proliferation process occurs more slowly. When the grafts in which the Lumina Coat membrane was used were reopened, they were found to be in an advanced state of incorporation, ensuring secure implant insertion.

The use of the Lumina Coat membrane proved to be viable and predictable in optimizing surgical outcomes, with low rates of complications and excellent clinical safety, and its use by clinical professionals is highly recommended.

Keywords: Collagen Membrane; Celullar Exclusion; Bone Grafts

Introduction

Alveolar bone resorption is a constant post-extraction alteration. This is because the alveolar process has the function of supporting the teeth and, once this function is lost, it tends to be gradually resorbed [1-4]. This process of resorption constantly culminates in bone defects regarding height, thickness, or associated aspects, and they often preclude installation of dental implants, making it necessary to perform a bone graft first [4-8].

It is known that the treatment of bone defects remains a major challenge to the surgeons even today [9-12]. The exposure rate, as well as the difficulty delivering nutrients to block or particulate bone grafts, when performed on the alveolar ridge in areas with bone defects, are the main factors reported in the literature to directly and negatively influence reconstruction outcomes [12-16].

In order to optimize these outcomes, the use of resorbable membranes has been reported in the literature as an option with this capacity. Studies indicate that their use reduces graft resorption due to their ability to protect the operated area, but that their main ability is to prevent soft-tissue invagination into the reconstruction site [15-20].

According to these studies, the phenomenon of soft-tissue invagination into the reconstruction site occurs because this tissue has a healing process piloted by fibroblasts, which are cells that have rapid and considerable proliferation capacity, whereas bone tissue incorporation is dependent on osteoblasts, whose proliferation process occurs more slowly [15-25].

Therefore, in order to inhibit this competition between soft and hard tissues, the use of a resorbable membrane acts as a selective barrier capable of preventing the migration of fibroblasts into the graft, while at the same time allowing graft revascularization, angiogenesis and nutrient delivery [15-31].

In view of the above, the aim of this study is to report our experience with the collagen membrane through its use in 25 cases in recent years and also to present our series of articles published in recent years using this product.

Series of clinical cases using collagen membrane

The sample included 25 patients, 14 female and 11 male, with an average age of 48 years (range 25-65 years), who sought treatment with a view to installing dental implants and after clinical and tomographic assessment were found to require bone augmentation (Figure 1 and 2).

Figure 1: Bone depression on the vestibular surface, highlighting the need for bone grafting.

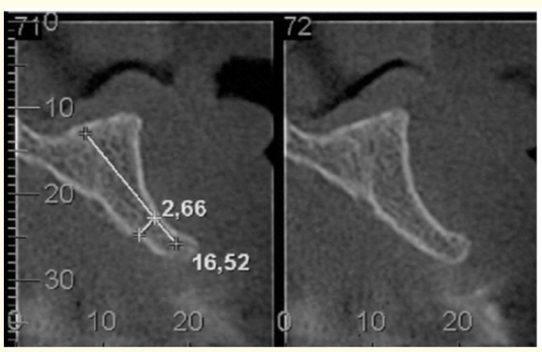

Figure 2: CT scan confirming the need for bone grafting.

The patients enrolled into the study were assessed using cone beam computed tomography and had a bone defect that required reconstruction using different techniques (block grafting, particulate grafting, maxillary sinus lift, height augmentation grafting, thickness augmentation grafting, etc.). No patient reported any relevant medical data that could have interfered with the outcomes.

The bone graft surgeries were started with a nerve block using 4% articaine solution with vasoconstrictor 1:100,000 (Dfl, Rio de Janeiro-Brazil), followed by a full-thickness mucoperiosteal incision. The next step was mucoperiosteal detachment (Figure 3) and removal of all periosteal remnants by means of vigorous curettage.

Figure 3: Bone bed after mucoperiosteal detachment showing the size of the bone defect.

The next step was to drill multiple holes in the implant bed in order to facilitate the delivery of nutrients to the graft. The grafting material (particulate or block graft, fixed with screws, mesh or miniplates, or even a combination of these) was added in the region (Figure 4).

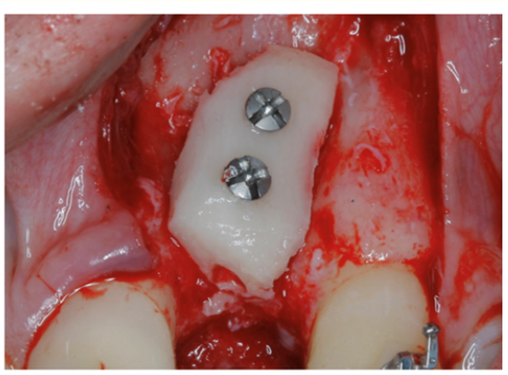

Figure 4: Bone block fixed with screws in order to incorporate it.

A resorbable collagen membrane (Lumina-Coat, Critéria, São Carlos-Brazil) was placed on the grafted region of all cases (Figure 5). The procedure was completed by suturing to secure the edges of the surgical wound.

After the six-month period, all patients were submitted to a new computed tomography (Figure 6), and planning for implant installation. After careful mucoperiosteal detachment, the fixation system was removed and the dental implants were installed according to the surgical guide and reverse planning performed (Figure 7 and 8). The table below summarizes the outcomes of the 25 cases studied (Table 1).

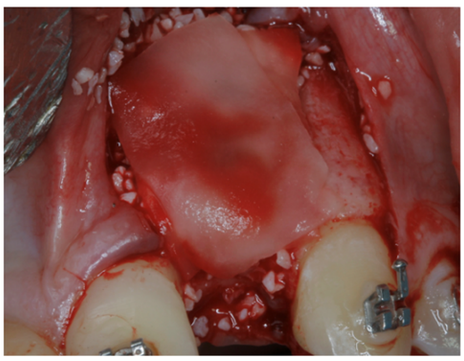

Figure 5: Placement of the collagen membrane (Lumina Coat) for the purpose of optimizing the reconstruction outcome.

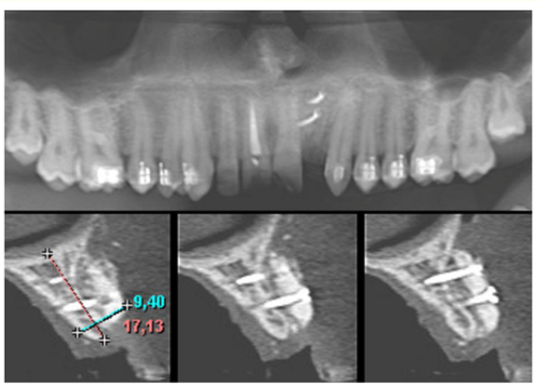

Figure 6: CT scan six months after reconstruction.

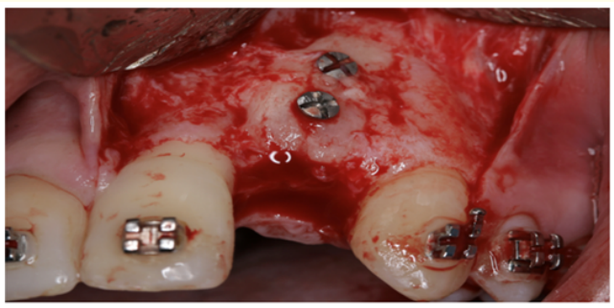

Figure 7: Excellent bone graft incorporation.

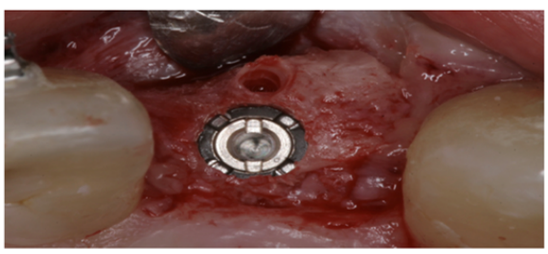

Figure 8: Insertion of the implant in the grafted area.

Published articles on the use of collagen membrane

In recent years, several papers/studies/research projects have been published in which collagen membrane was used as part of the clinical protocol to optimize bone grafting outcomes (Table 2).

Patient	Sex	Type of defect	Defect area	Treatment conducted	Was resorbable membrane used?	Number of implants inserted	Complications
1	F	Absence of thickness	Premaxilla	Block graft	Yes	1	No
2	M	Absence of thickness	Premaxilla	Block graft	Yes	1	No
3	M	Absence of thickness	Premaxilla	Block graft	Yes	2	No
4	F	Absence of height	Posterior view of mandible	Sandwich graft	Yes	2	No
5	M	Absence of height	Posterior view of maxilla	Sandwich graft	Yes	3	Small fracture of the bone block
6	M	Lack of height and thickness	Complete view of maxilla	rhBMP-2 + biomaterial	Yes	7	Loss of 1 implant
7	F	Absence of height	Posterior view of mandible	rhBMP-2 + biomaterial	Yes	3	Screen display
8	F	Absence of height	Posterior view of mandible	Sandwich graft	Yes	3	No
9	F	Absence of height	Posterior view of mandible	Sandwich graft	Yes	3	No
10	F	Absence of height	Posterior view of mandible	Sandwich graft	Yes	2	No
11	F	Absence of height	Posterior view of mandible	Sandwich graft	Yes	2	No
12	F	Poorly positioned implant	Premaxilla	Implant repositioning	Yes	1	No
13	F	Poorly positioned implant	Premaxilla	Implant repositioning	Yes	1	No

14	F	Absence of height	Posterior view of mandible	IAN lateralization	Yes	2	No
15	F	Absence of height	Posterior view of mandible	IAN lateralization	Yes	2	No
16	F	Absence of height	Posterior view of mandible	IAN lateralization	Yes	3	No
17	F	Absence of height	Posterior view of mandible	IAN lateralization	Yes	3	IAN laceration
18	F	Absence of thickness	Premaxilla	Screw tent pole	Yes	2	No
19	F	Absence of thickness	Premaxilla	Screw tent pole	Yes	2	No
20	F	Absence of thickness	Premaxilla	Screw tent pole	Yes	2	No
21	F	Lack of thickness and height	Complete view of maxilla	Screw tent pole	Yes	6	No
22	F	Absence of height	Posterior view of maxilla	Maxillary sinus lift	Yes	3	No
23	F	Absence of height	Posterior view of maxilla	Maxillary sinus lift	Yes	1	No
24	F	Absence of thickness	Premaxilla	Split Crest	Yes	2	Ridge fenestration
25	F	Absence of thickness	Premaxilla	Split Crest	Yes	2	No

Table 1: Outcomes of cases where resorbable membrane was used.

Author	Year	Title	Number of patients	Was resorbable membrane used?
Bergamaschi., *et al*. [17]	2020	Alternatives for rehabilitation with dental implants in atrophic posterior mandible	3	Yes
Ventura de Souza., *et al*. [18]	2020	Split Crest Technique with Immediate Implant to Treat Horizontal Defects of the Alveolar Ridge: Analysis of Increased Thickness and Implant Survival	13	Yes
Petean., *et al*. [19]	2019	Mandibular ridge expansion and simultaneous insertion of dental implants	1	Yes
Noia [20]	2019	Tentpole technique for treating vertical ridge defect	1	Yes
Guillen., *et al*. [21]	2018	Alveolar Ridge Expansion with Simultaneous Insertion of Dental Implants	1	Yes
Jara Ferreira., *et al*. [22]	2018	Surgical approach for lifting the maxillary sinus floor in cases of sinus septa	1	Yes
Noia., *et al*. [23]	2017	Sandwich Osteotomies to Treat Vertical Defects of the Alveolar Ridge	14 patients (14 surgeries)	Yes
Noia., *et al*. [24]	2016	Treatment of Posterior Vertical Atrophy of the Mandible Through Sandwich Osteotomy: Case Series	8	Yes
Noia., *et al*. [25]	2015	Clinical considerations for optimizing results in bone grafting: part II	Descriptive study aimed at demonstrating the treatment protocol	Yes
Noia., *et al*. [26]	2015	Repositioning Implants Through Sandwich Osteotomy with the Interposition of Lyophilized Bovine Bone	1	Yes
Rocha., *et al*. [27]	2015	Considerations On The Use Of Xenogenous Bone Blocks In Implantology: A Case Report	1	Yes
Noia., *et al*. [28]	2014	Association between autogenous bone and heterogen graft to optimize outcomes of bone grafting: a case report	1	Yes
Noia., *et al*. [29]	2014	Clinical considerations for optimizing results in bone grafting: Part I	Descriptive study aimed at demonstrating the treatment protocol	Yes

Noia., *et al*. [30]	2012	Segmental osteotomy with interpositional bone grafting in the posterior maxillary region	1	Yes
Andrade., *et al*. [31]	2011	Segmental osteotomy with interpositional bone graft in implant dentistry	1	

Table 2: Main information from published studies using resorbable membrane.

Discussion

Modern implant dentistry aims to restore proper masticatory function, comfort, aesthetics and phonetics to the patient; regardless of the existence of atrophy, disease or injury to the stomatognathic system [10,12,15,16].

The use of resorbable membranes has been reported in the literature as an option with this capacity. Studies indicate that their use reduces graft resorption due to their ability to protect the operated area, but that their main ability is to prevent soft-tissue invagination into the reconstruction site [15-20]. In this particular study, it can be concluded that this objective was achieved through the use of the Lumina Coat membrane, since there was no exaggerated resorption of the grafts or invasion of the soft tissues at the time of reopening.

The phenomenon of soft-tissue invagination into the reconstruction site occurs because this tissue has a healing process piloted by fibroblasts, which are cells that have rapid and considerable proliferation capacity, whereas bone tissue incorporation is dependent on osteoblasts, whose proliferation process occurs more slowly [15-25]. When the grafts in which the Lumina Coat membrane was used were reopened, they were found to be in an advanced state of incorporation, ensuring secure implant insertion. The use of the membrane undoubtedly contributed to this.

Therefore, in order to inhibit this competition between soft and hard tissues, the use of a resorbable membrane acts as a selective barrier capable of preventing the migration of fibroblasts into the graft, while at the same time allowing graft revascularization, angiogenesis and nutrient delivery [15-31]. The Lumina Coat membrane proved adequate in this respect, protecting the grafts and allowing them to be incorporated effectively.

Another advantage of using membranes is the low rate of complications and infections [25,29], which was also observed in this particular study. The 25 clinical cases along with the 15 published articles demonstrate the safety and efficacy of using such a membrane.

Conclusion

The use of the Lumina Coat membrane proved to be viable and predictable in optimizing surgical outcomes, with low rates of complications and excellent clinical safety, and its use by clinical professionals is highly recommended.

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