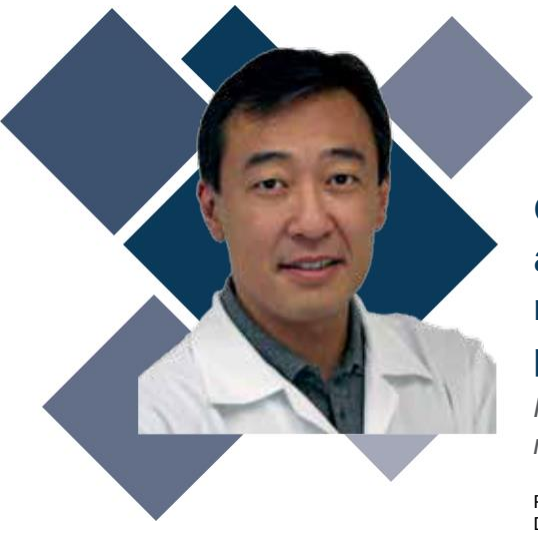

Como selecionar e como combinar corretamente as membranas e enxertos para as cirurgias de regeneração óssea em Implantodontia: um guia para a tomada de decisões

How to select and properly match membranes and grafts for bone regeneration in implant surgery: a guide to decision making.

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Many bone graft techniques have been developed with the purpose of recovering and maintaining bone tissue, so that the implant occupies a good spatial position, in order to produce an esthetic and functionally adequate prosthetic restoration.

For any graft to be successful, 4 conditions must exist: 1) Bone-forming cells (osteoblasts) must be present at the site; 2) the blood supply of the bed must be sufficient for graft nutrition; 3) the graft must be well stabilized during healing; and 4) the periosteal mucus flap must be sutured without tension in the incision.

THE BIOMATERIALS

The bone augmentation and regeneration procedures use bone substitutes that serve as air-shells for osteoblastic cell differentiation, and membranes, which are interposed between the periosteum and the graft, in order to avoid the competition of soft tissues with the space formed by biomaterial. Used and combined correctly, both grafts and membranes will create an appropriate environment for cell growth, promoting the opportunity for the formation of new bone.

Biomaterials are classified in 4 ways. As for the origin, as for the presentation, as for the time of resorption and as for the osteogenic potential. Considered the *gold standard*, autogenous grafts have all the ideal characteristics for the promotion of new tissue, differing from all bone substitutes in that they take viable osteoblastic cells to the surgical bed. The other materials will necessarily depend on cell differentiation resulting from the support

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nutritional blood, in addition to the cellular sources of the surrounding tissues. In this way, it is easy to understand that the healing and bone formation time is longer in relation to the autogenous ones.

Membranes or barriers can also receive classifications according to their nature, permeability and absorptive potential. Historically, the first membranes used for ROGs were polytetrafluoroethylene, considered as the *gold standard* for membranes. Even with extremely rewarding results in the aid of bone formation, early exposure with consequent contamination, cost and technical difficulties, led researchers to look for a membrane that had characteristics similar to bone formation, bio-compatibility, not being hostile with the soft tissues and do not need a second surgery for its removal. Then the absorbable collagen membranes appeared. Gentle with the gingival tissues, permeable, easy to handle and more favorable cost, the collagen membranes have gained an advanced space in the preference of the membranes. However, the control of the absorption time is still in doubt, as it depends on degradation mechanisms, which can vary from individual to individual. And, exactly because of the lack of resorption pattern, its efficiency in techniques that requires the presence of a barrier with a longer period is doubtful. We can add the fact that its physical structure does not support grafts in more critical areas, such as those where vertical increase is needed. Thus, collagen membranes are indicated for smaller, self-limiting regenerative procedures, which do not involve the need for a long period of stay.

To address these deficiencies, titanium meshes, which have structural properties suitable for greater bone increases required, have emerged to assist professionals in containing biomaterials in position, immobilizing the particles and tissue tissues, in addition to allowing additional vascularization of the periosteum, because they are being manufactured with controlled holes of variable diameters, thus ensuring an environment for the growth of new bone on and between the graft granules and pores.

DECISION PROCESS

The success of bone grafts requires the correct selection, or the most consistent, of the materials used in bone augmentation surgery. To assist in choosing and combining grafts and membranes, filling in key questions related to three topics can help. These questions refer to the recipient site, graft selection and membrane selection, and form an iron triangle of evaluation and planning (Figure 1).

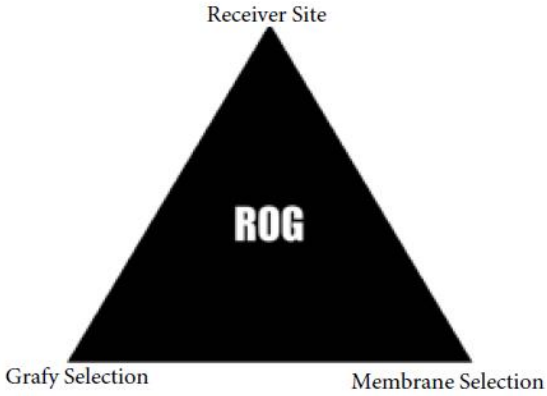


Figure 1 - Evaluation and planning topics.

Receiving Site:

Does the recipient site have the potential for revascularization and cell supply?

What is the shape of the graft receptor site?

How many millimeters do you need to increase?

Graft selection:

Which graft best stabilizes at the surgical site ?

What kind of material should be used as a graft ?

Is there a need for mixing with autogenous bone?

Selection of membranes:

Is there a need for the membrane to stabilize the graft?

What is the desired length of stay of the membrane?

How are the soft tissues of the operated area?

(Figure 2)

The capacity for revascularization and the supply of osteoblastic cells that can populate the grafted area decides the graft filling material. If the bed is disadvantaged with this quality, the decision to use autogenous grafts totally or partially must be chosen. To assess this ability, the presence of bone marrow must be observed by tomography. The greater the amount of bone marrow, the greater the nutritive power of the recipient bed, the more predictable is the tissue formation.

The shape of the recipient site can influence the surgical technique and the selection of the presentation of the filling materials. Block grafts are easily adapted and stabilized on the flat edges. A single screw is capable of securing the graft properly and does not require barriers with a strong physical structure, nor an amount of artifacts for its stabilization. On the other hand, bone blocks are difficult to model and adapt to concave edges, which more easily accept particles that adapt

immediately upon its introduction into the defect. In these situations where the particles easily stabilize, any barrier, absorbable or not, can be used, always observing immobilization of membranes and grafts (Figure 2).

The residual dimensions of the edges determine the need for bone augmentation and, consequently, the amount of material to be introduced (Figure 3). This relationship is crucial in choosing the quality of the filling material. This means that the more absorbed the edge is, the less regenerative capacity it has, and it needs osteoblastic cells provided with an autogenous graft, totally or partially. To facilitate decision-making, averages provided in the literature can assist in determining the origin of the graft. For gains up to 3 millimeters, the use of bone substitutes is quite predictable. For gains greater than 3 millimeters, the use of autogenous graft, mixed with biomaterial, is the most appropriate.

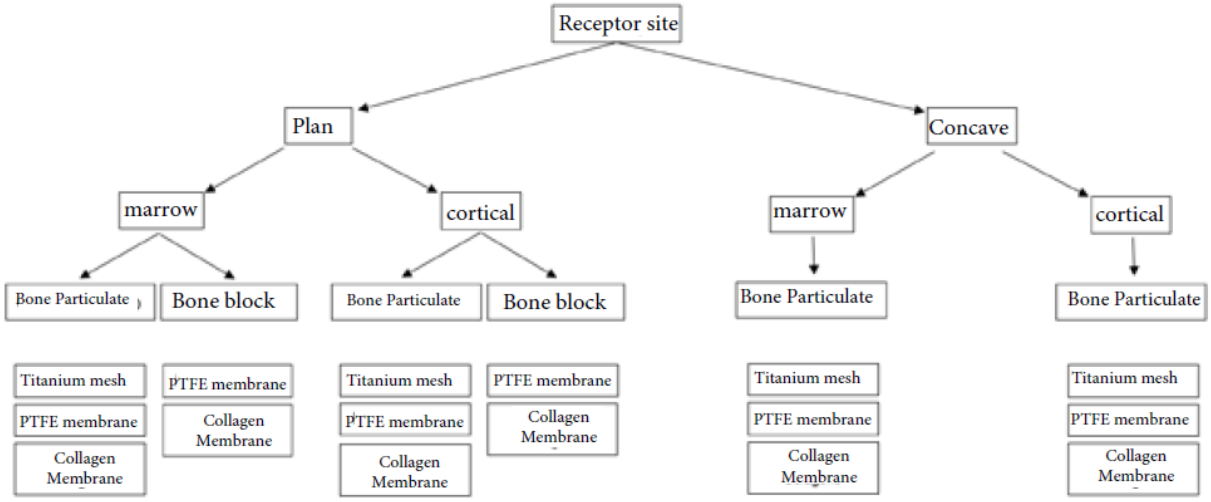


Figure 2 - Material selection diagram according to form, nutrition and type of graft used.

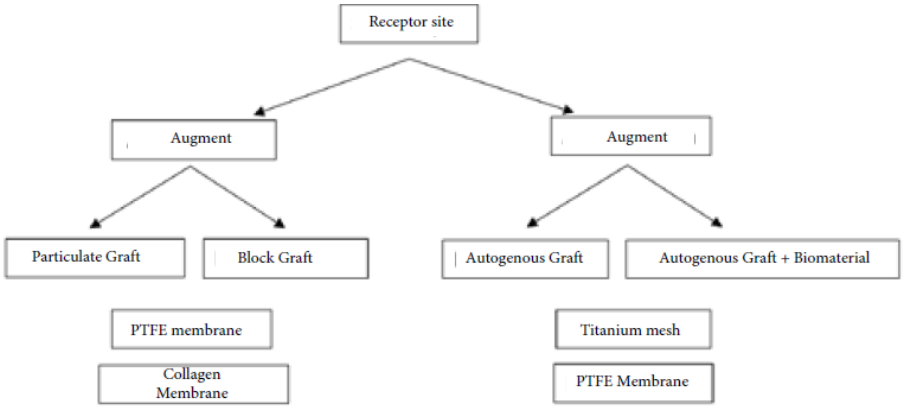
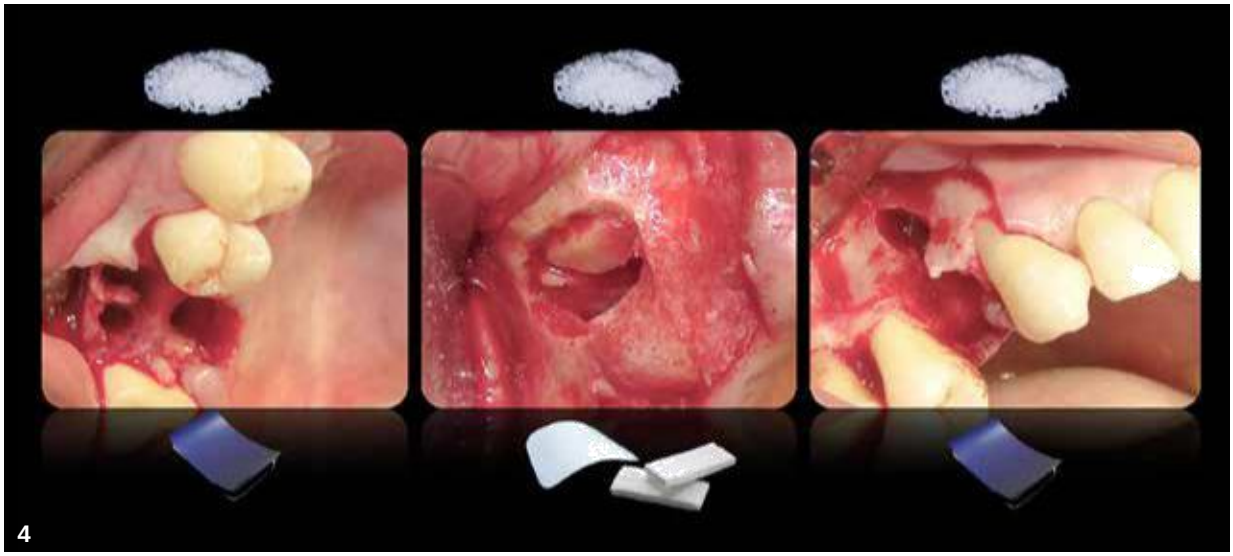


Figure 3 - Material selection diagram according to the desired amount of fabric.

The decision to use absorbable or non-absorbable membranes is based on the size and location of the defect, how long the membrane needs to work as a barrier and how much bone regeneration
é required. The general rule of thumb is 1 mm of bone regenerated per month for the duration of the barrier function. For example, a barrier of 2-3 months of function is required for small defects of 2 to 3 mm, and larger defects should require 6 to 9 months.

Thus, the coherent combination of assessment of the receiving bed, the choice of graft and membrane, make bone regenerations more predictable (Figures 4 and 5). When a surgical technique and the selection of materials for a bone defect are appropriate, the original morphology of the site can be recovered or even increased. However, if the selection of a surgical technique or materials is inappropriate, graft resorption or failure to integrate with the surrounding tissues may occur. Consequently, it will be replaced by fibrous tissue instead of functional bone.



Figures 4 and 5 - Visualization of material combination for ROG.

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