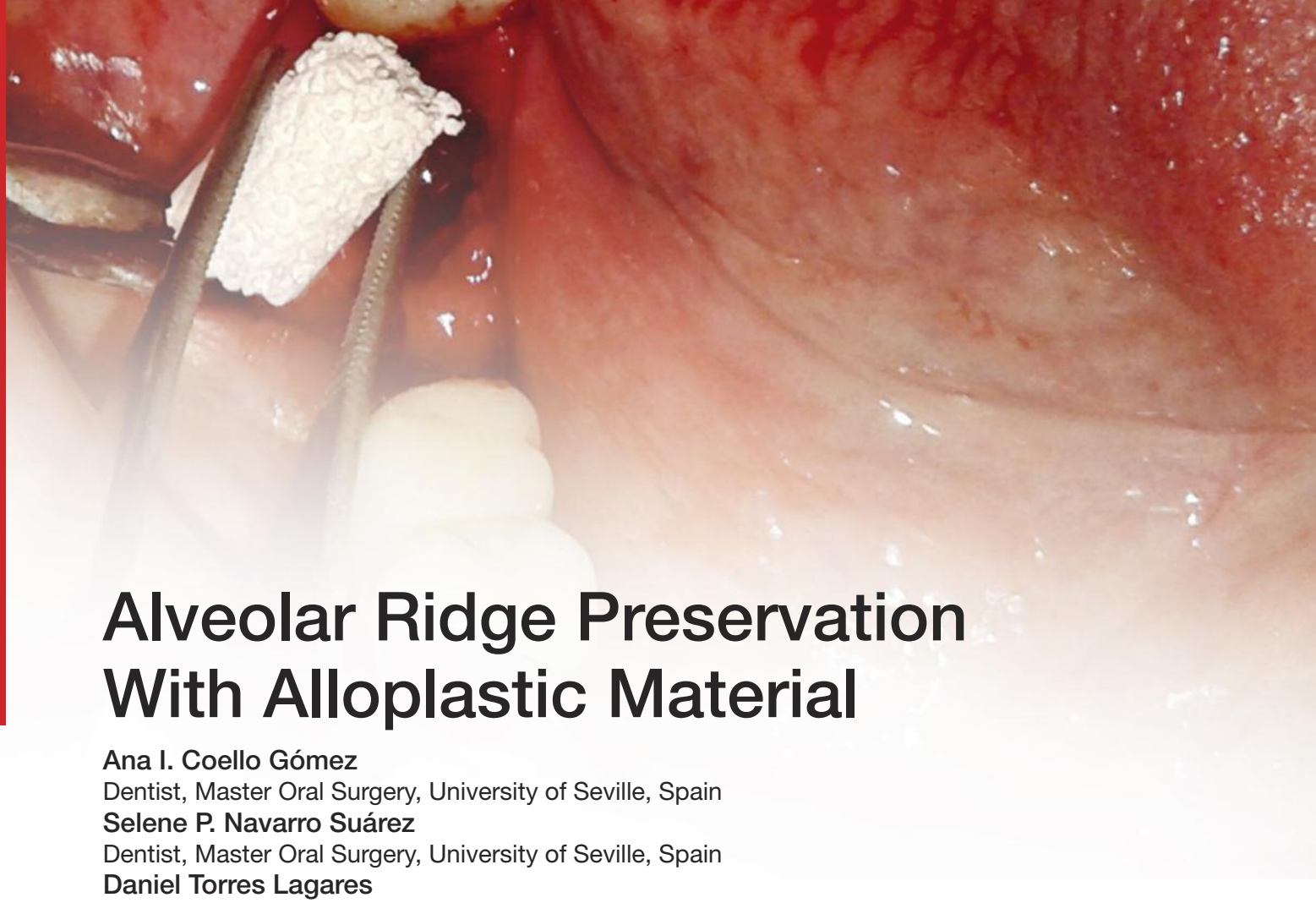

Alveolar Ridge Preservation With Alloplastic Material

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Introduction and objective

Alveolar ridge preservation is done when it is expected that following a tooth extraction this part will be rehabilitated by an implant to minimize the bone resorption that occurs during the biological healing of the socket. Current studies allow us to expect that, with the alveolar ridge preservation technique, we will decrease the volume loss by around 1 mm in height and 3 mm in width.1

Different techniques and materials have been used in recent years, all based on three biological mechanisms that promote alveolar healing: 2-4

- Osteogenesis: formation of new bone from viable and precursor osteoblasts, transplanted with graft material.
- Osteoinduction: formation of new bone by differentiation of local connective tissue cells in bone-forming cells, under the influence of one or more inductors.
- Osteoconduction: formation of new bone by the network generated by a non-vital graft material, which allows the penetration of precursor osteoblasts present in the defect.

The various types of grafts can be classified according to their origin in: autografts, allografts, xenografts, and alloplastic materials.

- Autografts: bone grafts that come from a donor area of the same individual. They are osteogenic, but have high resorption.
- Allografts: bone grafts from a member of the same species. They can be mineralized. In principle, they are associated with osteoinductive and osteoconductive properties.

Fig. 1: Preoperative intraoral view of the 1st and 4th quadrants.

Fig. 2: Preoperative occlusal view of the lower arch.

Fig. 3: Panoramic X-ray showing tooth 47, posterior three-unit porcelain-metal dental bridge, fractured, endodontically treated tooth, and apical radiolucent image.

Fig. 4: Preoperative periapical X-ray.

Fig. 5: Image of the socket after extraction, where we observe the integrity of its walls.

Fig. 6: Image of the placement of the selected biomaterial, easy handling using clamps.

Fig. 7: Image that shows the filling of the socket with the biomaterial.

Fig. 8: Image where it is seen how the cone is impregnated with the blood from the socket.

- Xenografts: bone grafts from other species with osteoconductive properties.
- Alloplastic materials: bone grafts of synthetic origin (hydroxyapatite, bioactive glass, tricalcium phosphate, etc). They have osteoconductive properties.

Among the various available techniques described, the objective of this article is to present a case report of preservation with an alloplastic material without the need for membrane.

Case Report

A female patient, 53 years of age, with no special medical history, presented for alveolar ridge preservation of tooth 47 for subsequent rehabilitation with implant. The patient had an endodontically-treated, infected and fractured tooth ***(Fig. 1-3)***. The chosen treatment was its extraction and, given the risk of placing an implant in such conditions, we decided to postpone it, preserving the alveolar ridge.

After the careful extraction of the tooth and without raising a flap ***(Fig. 4)***, we proceeded to a thorough curettage, irrigating the socket using 0.2% chlorhexidine. Once the socket was disinfected, we checked that the walls were intact and proceeded to fill it with the selected biomaterial.

In this case, we used a sterile resorbable beta-tricalcium phosphate material from Septodont (R.T.R.), presented in the form of 0.3 cm^3 cones, made of beta tricalcium phosphate granules coated with a matrix of highly purified collagen fibers of bovine origin which, in the case of cavities that cannot be closed, prevents the granules from leaking out.

The cone was placed in the socket using clamps ***(Fig. 5, 6)***, waiting for it to be carefully impregnated with the patient's own blood and compacting it ***(Fig. 7, 8)***. Finally, three crossed sutures were done on top, leaving the material slightly exposed

and checking the final status by X-ray ***(Fig. 9, 10)***. As post-op instructions, the patient was instructed to rinse with 0.2% chlorhexidine mouthwash, three times a day, from the second day, and as medical treatment, amoxicillin 1 g 1 tab/8hr/7days and ibuprofen 600 mg 1 tab/8 hr/7 days were prescribed.

After one week ***(Fig. 11)***, we removed the sutures and observed the start of healing of the soft tissues, also anticipating some maintenance of the alveolar ridge architecture, with less resorption than would occur spontaneously after simple removal of the molar.

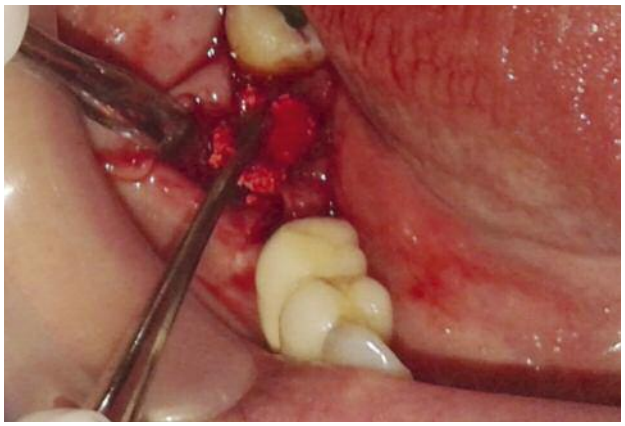

Fig. 9: Image finishing compacting the biomaterial.

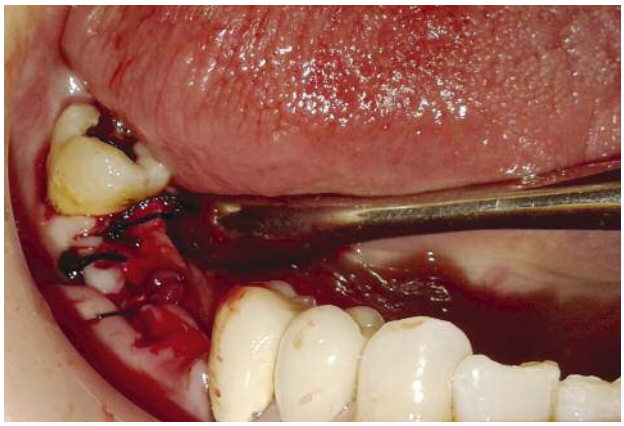

Fig. 10: Immediate postoperative image where the socket suturing is visible.

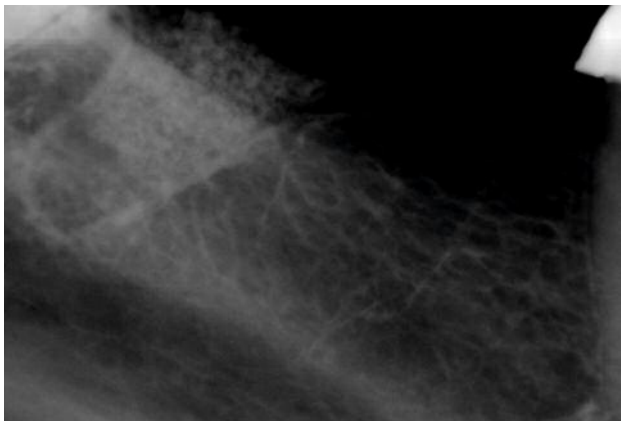

Fig. 11: Immediate postoperative periapical X-ray.

Fig. 12: One-week periapical X-ray.

Discussion

The case presented in this article correlates with previous studies in which, by using ß-tricalcium phosphate and collagen bone grafts, it was possible to largely maintain the dimensions of the alveolar ridge.

In oral implantology, the goal of bone regeneration techniques is to increase or maintain bone volume for implant placement. Bone regeneration can be modified, by systemic factors, and also by using biomaterials or bone substitutes. Traditionally, the ideal material, considered as "gold standard" for bone regeneration has been the autologous bone, taken from the patient. However, in recent decades, new human, animal or synthetic materials have been introduced, such as beta-tricalcium phosphate (R.T.R.), which has been very successful in implantological surgical techniques in experimental studies. 5-14
Cardaropoli et al.15 and other studies16-18

showed that sites where preservation had previously been done presented less resorption at six months compared with areas without preservation. However, even having performed an alveolar ridge preservation, the crestal resorption in width was 17% to 25%.

On the other hand, it has also been studied that there is a little loss of crest height and width after preservation19, but even so, Lasella et al.20 concluded that the dimensions were improved, achieving conditions favorable for subsequent implant placement.

The alloplastic material used in this case is presented in the form of granules of beta tricalcium phosphate forming an osteoconductive micro- and macro-porous structure that encourages a dense growth of new bone.

The degree of bone regeneration from tricalcium phosphate varies depending on its formulation, porosity, and the size of the particles. The beta phase is more recommended because it is less soluble than the alpha phase.
The dissolution rate of the material is related to its porosity, meaning that a greater porosity favors its resorption. In addition, the porosity is essential for perfusion, since the blood vessels and neoformed bone tissue need pores of at least 60 microns to grow. The size of the particles is also important since it has been shown that a smaller size causes less inflammatory reaction to a foreign body, which allows a stable mechanical interconnection and prevents phagocytic disintegration 21.

From a clinical viewpoint, the various studies that use ß-tricalcium phosphate in oral implantology show that about six months can be considered as a bone healing period. 22-31 The case reports in the literature show some successful results and provide clinical evidence to consider for future randomized and controlled clinical trials that more broadly study the benefits of this technique.

Conclusion

Alveolar ridge preservation is a technique that has shown to significantly reduce the bone resorption observed in the alveolar crest after tooth extraction, helping in the formation of hard tissue that is necessary for correct subsequent implant placement.

ß-tricalcium phosphate (R.T.R.) has shown to be a good osteoconductive material for bone regeneration after filling a post-extraction socket, maintaining an adequate alveolar ridge for subsequent placement of a dental implant.

When ß-tricalcium phosphate is gradually resorbed, it is replaced by bone similar to the original bone, obtaining a regenerated vital bone tissue. The cone presentation, in addition to adapting to the shape of the socket, does not need to be covered with a membrane, thus facilitating its placement and handling.

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