Regenerative approach of the alveolar bone after extraction with the use of anodized titanium foil - Titanium Seal®

Bone regenerative post extraction approach using anodized titanium foil - Titanium Seal®

Fábio Shiniti Mizutani[1]
Danilo Lazari Ciotii[2]
Danilo Maeda Reino[3]
Marcelo Faveri[4]

SUMMARY

The objective of this study was to report the use of titanium foil, Titanium Seal®, in post-extraction sites without primary closure of the ridge, discussing the effects of anodizing on the regenerative process of the alveolar bone. After verification of the root fracture, a transalveolar instruction was performed in order to reduce the interference of the anatomy of the ridge of the ridge on the stability of the drill during milling for the implant. Following the minimally traumatic extraction, the implant, the bovine mineralized matrix and the anodized titanium foil were installed. Anodizing is a surface treatment done through the electrochemical discharge process that converts amorphous titanium oxide into anatase, a layer that increases the adhesion of osteoblasts and fibroblasts and decreases the growth of specific oral bacteria. The monitoring showed an efficient sealing of the edge, with advantageous tissue formation.

Descriptors: Dental implants, titanium, anodizing, surface, alveolar preservation.

ABSTRACT

The aim of this article was to report the use of titanium foil, Titanium Seal®, at post extraction sites without primary closure of the ridge, discussing the effects of anodizing on the regenerative process of alveolar bone. After verifying the root fracture, a transalveolar instrumentation was performed in order to reduce the interference of the ridge crest anatomy in the drill stability during the preparation for the implant. Following the minimally traumatic extraction, the implant, the bovine mineralized matrix, and the anodized titanium foil were installed. Anodizing is a surface treatment made through the electrochemical discharge process that converts the amorphous titanium oxide into anatase, a layer that increases the adhesion of osteoblasts and fibroblasts and decreases the growth of specific buccal bacteria. The accompaniments demonstrated an efficient sealing of the ridge, with an advantageous tissue formation.

Descriptors: Dental implants, titanium, anodization, surface, socket preservation.

[1] Master and Dr. in Implantology - SLMandic. Professor of the Master's Degree in Periodontics - SLMandic.
[2] Master in Periodontics and PhD in Prosthodontics - UNICAMP. Coord. of the Master's Degree in Periodontics - SLMandic.
[3] Master and Dr. in Periodontics - USP/Ribeirão Preto.
[4] Master and Dr. in Periodontics - UNG. Prof. of Periodontics and Implantology - UNG and ABO/São Paulo.

E-author's email: fsmizutani@hotmail.com
Received for publication: 10/22/2018 Approved for publication: 11/01/2018

How to cite this article:
Mizutani FS, Ciotii DL, Reino DM, Faveri M. Regenerative approach to alveolar bone after extraction using anodized titanium foil - Titanium Seal®. Full Dent. Sci. 2018; 10(37):21-34.
DOI: 10.24077/2018;1037-2134

INTRODUCTION

The resorption of the alveolar ridge resulting from dental extraction is a frequent phenomenon observed that reduces the possibility of positioning the dental implant within a good aesthetic and functional prosthetic positioning[8,14]. Thus, procedures aimed at preserving the bone and soft tissue contour arouse great clinical interest [3,17]. Many surgical techniques and a variety of materials have been introduced over the years in an effort to prevent or reduce post-extraction bone loss[17]. The advent of membranes for guided bone regeneration helped clinicians with a new method to enhance changes in alveolar healing[9].

The post-extraction alveolar preservation method involves placing the membrane directly on a bone defect and under the soft tissue before the primary closure[7] . Because of the logical sequence of the lack of tissue for edge-to-edge closure of the alveolus, the membrane is exposed, but protecting the content of the alveolus, which can be a blood clot, bone graft and simultaneous implant[1,7].

These membranes should have important characteristics due to the difficulty of primary closure after extraction. In other words, they should be technologically elaborated in such a way that they are intentionally exposed to the oral environment, protecting the surgical wound, without causing an infectious inflammatory process in the alveolar contents[6].

The objective of this study is to report a clinical case of alveolar preservation in a situation of immediate implantation in the posterior region of the mandible, performing occlusive sealing with the use of anodized titanium foil - Titanium Seal® (Bionnovation Biomedical, Bauru/SP).

CASE REPORT

The 40-year-old Caucasian female patient, CP, attended the dental office with a fracture of the lingual mesial cusp of element 36, with hyperemic and swollen gum tissue and causing painful symptoms during chewing. The fragment was removed and the dental element was protected with glass ionomer (GC Gold Label 2 CSF-VOCO, Germany) (Figure 1). Computed tomography of the region was requested to evaluate the extent of the fracture and its involvement with noble dental areas.

The evaluation of the examination revealed the presence of a fracture area in proximity to the furcation, which is already considered bone resorption, a fact that condemned the dental element to extraction (Figure 2A-B). Continuing the analysis, the quantification of bone below the dental root and above the inferior alveolar nerve allowed the planning of the installation of an immediate implant, filling the intra-alveolar spaces with bovine mineralized matrix and occlusive sealing of the alveolus with a titanium foil.

Figure 1 - Dental dressing performed with glass ionomer.

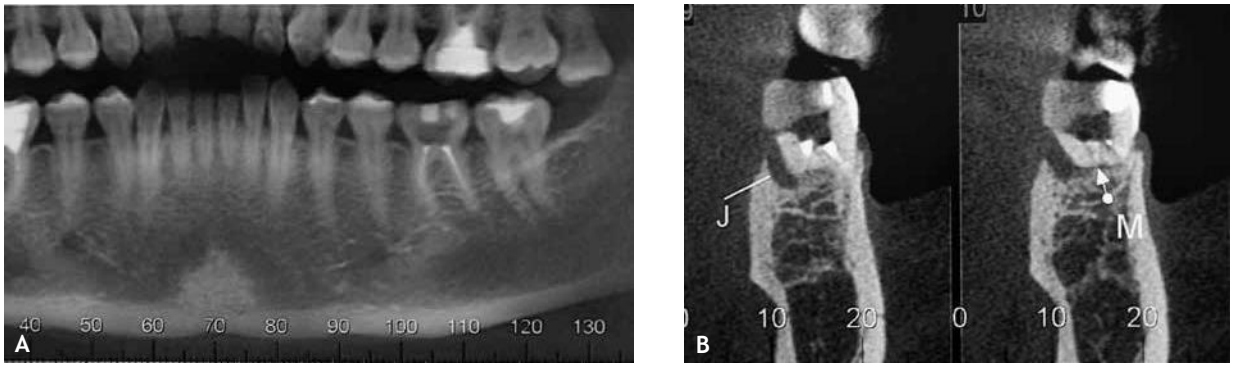


Figure 2 (AB) - A) Panoramic image. **B)** Tomographic section showing root fracture and bone resorption.

The glass ionomer restoration was removed and transalveolar instrumentation was performed in order to reduce the interference of the ridge anatomy of the ridge on the stability of the drill bit during milling for the implant. In other words, the entire implant preparation was performed in the presence of the tooth. Another advantage of this technique is that it achieves perforation in the most median and centralized region of the tooth in the alveolus (Figure 3A-G).

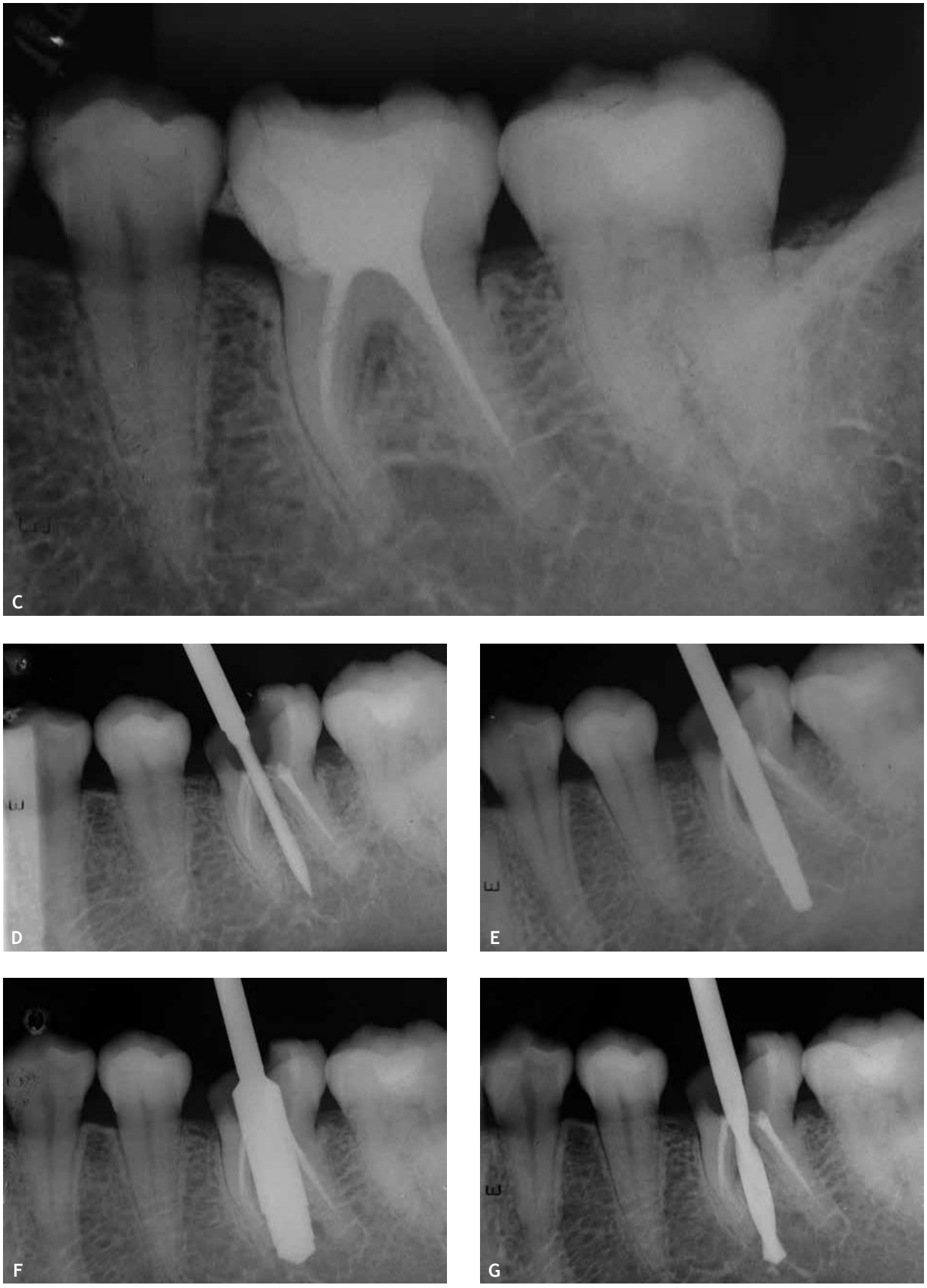


Figure 3 (A-G) - A) Occlusal clinical view. **B)** Alveolus prepared in the presence of the dental element. **C-G)** Radiographs showing the drill sequence.

After instrumentation, an odontosection was performed in order to perform a minimally traumatic extraction, without destruction or impairment of the alveolar bone (Figure 4A-C).

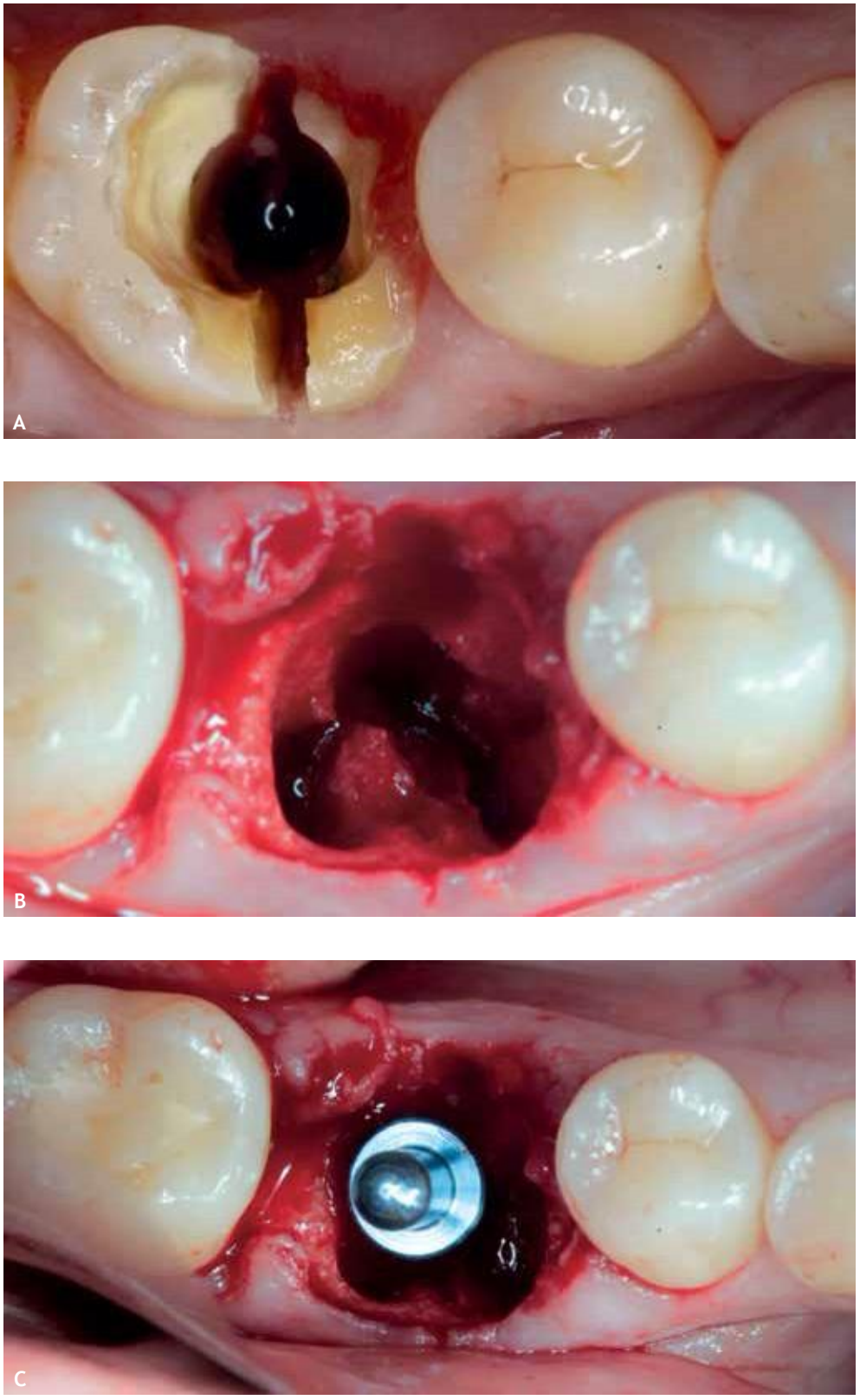
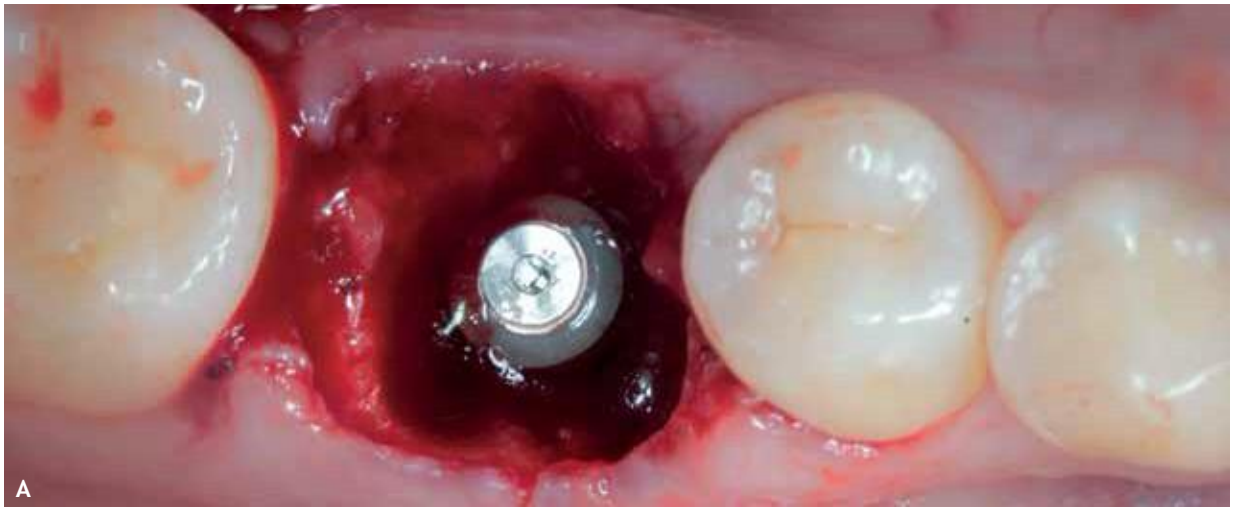
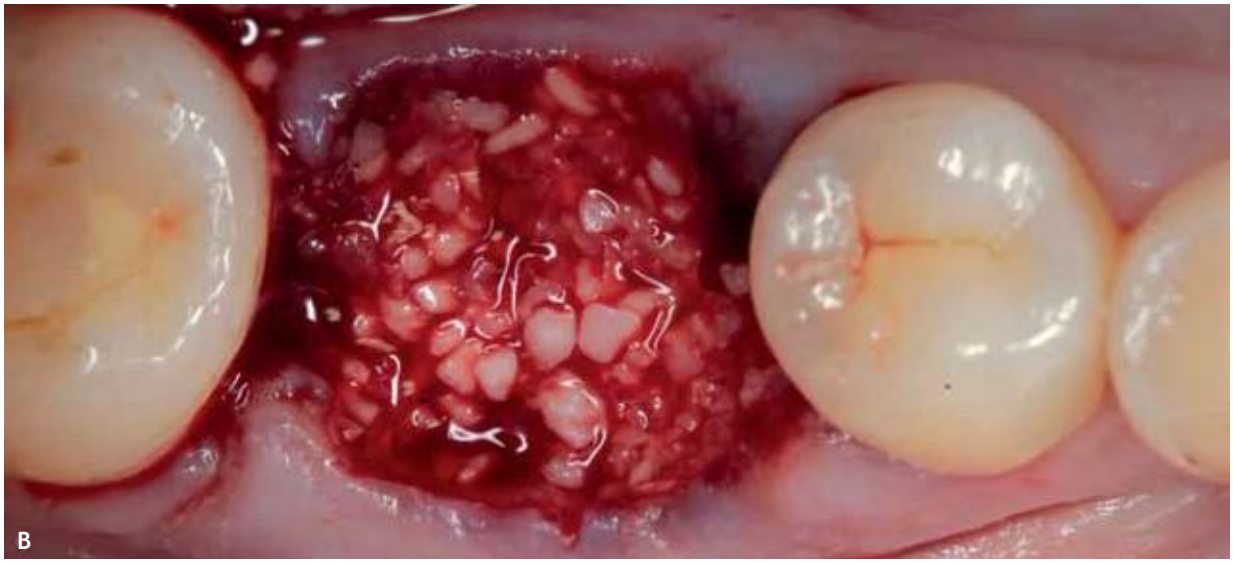
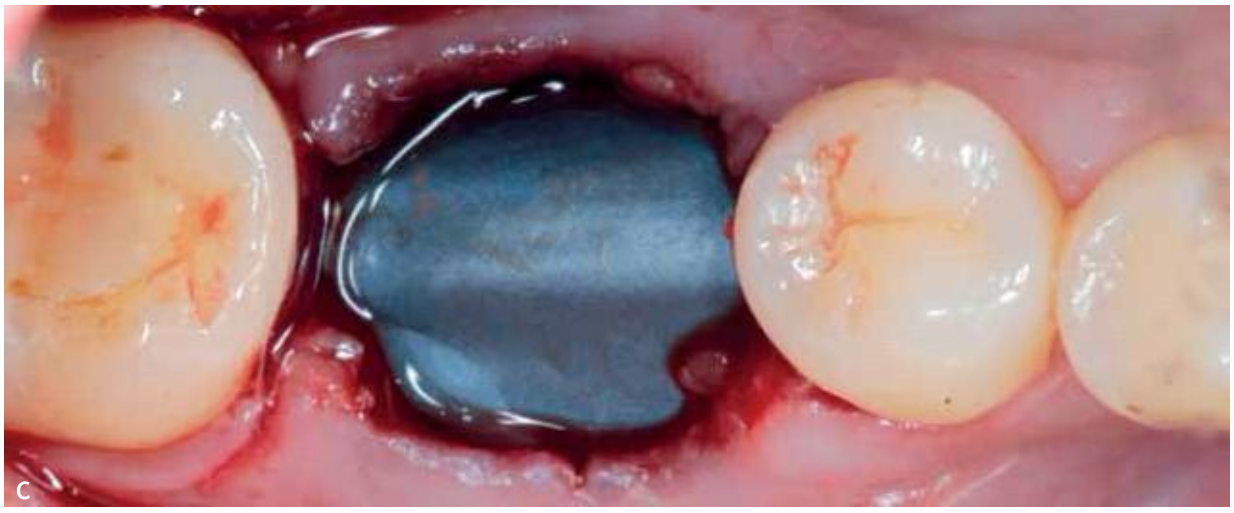


Figure 4 (A-C) -
A) Dental element sectioned.
B) Occlusal view of the prepared ridge.
C) View of the parallelism pin showing positioning of the preparation.

After dislocation movements, the sectioned roots were extracted and the implant placement (Biomorse - Bionnovation Biomedical, Bauru/SP) was initiated. Subsequently, the filling of the intra-alveolar spaces was performed with the placement of bovine porous mineralized matrix Bonefill *Mix* (Bionnovation Biomedical, Bauru/SP) and the alveolus was sealed with titanium foil - Titanium Seal® (Bionnovation Biomedical, Bauru/SP). The sutures were followed by *nylon* sutures and the patient was medicated with antibiotics, anti-inflammatory, analgesic and mouthwash (Figure 5A-F).







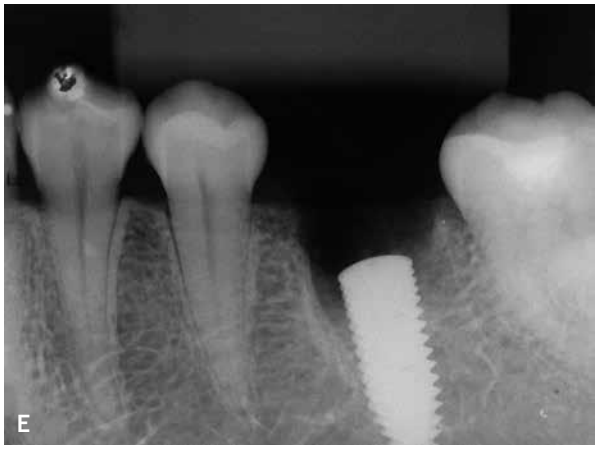


Figure 5 (A-D) - A) Implant installed. **B)** Ridge filled with *Bonefill Mix*. **C)** Ridge sealed with Titanium Seal. **D)** Suture of the ridge. **E)** Periapical X-ray demonstrating the positioned implant. **F)** Periapical RX demonstrating the implant, graft and foil.

At 14 days, the patient returned for suture removal and removal of the Titanium Seal® (Figure 6-C), and new follow-ups were performed on days 21, 30, 60 and 90 (Figure 7A-D).

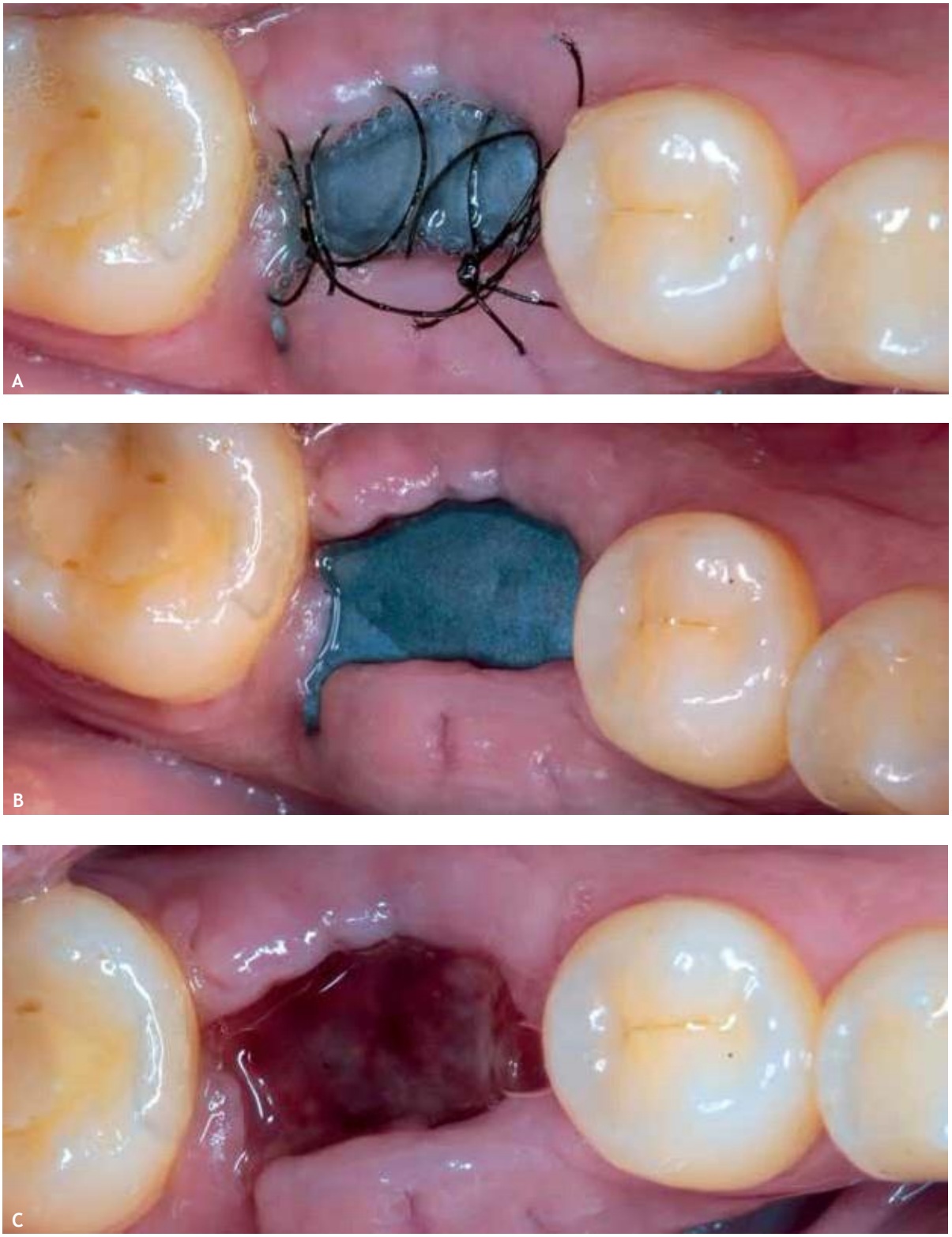


Figure 6 (A-C) - A) 14-day postoperative period - occlusal view. **B)** Removal of the suture. **C)** Removal of the Titanium Seal. Note the quantity and quality of reactive granulation tissue.


A
B
C

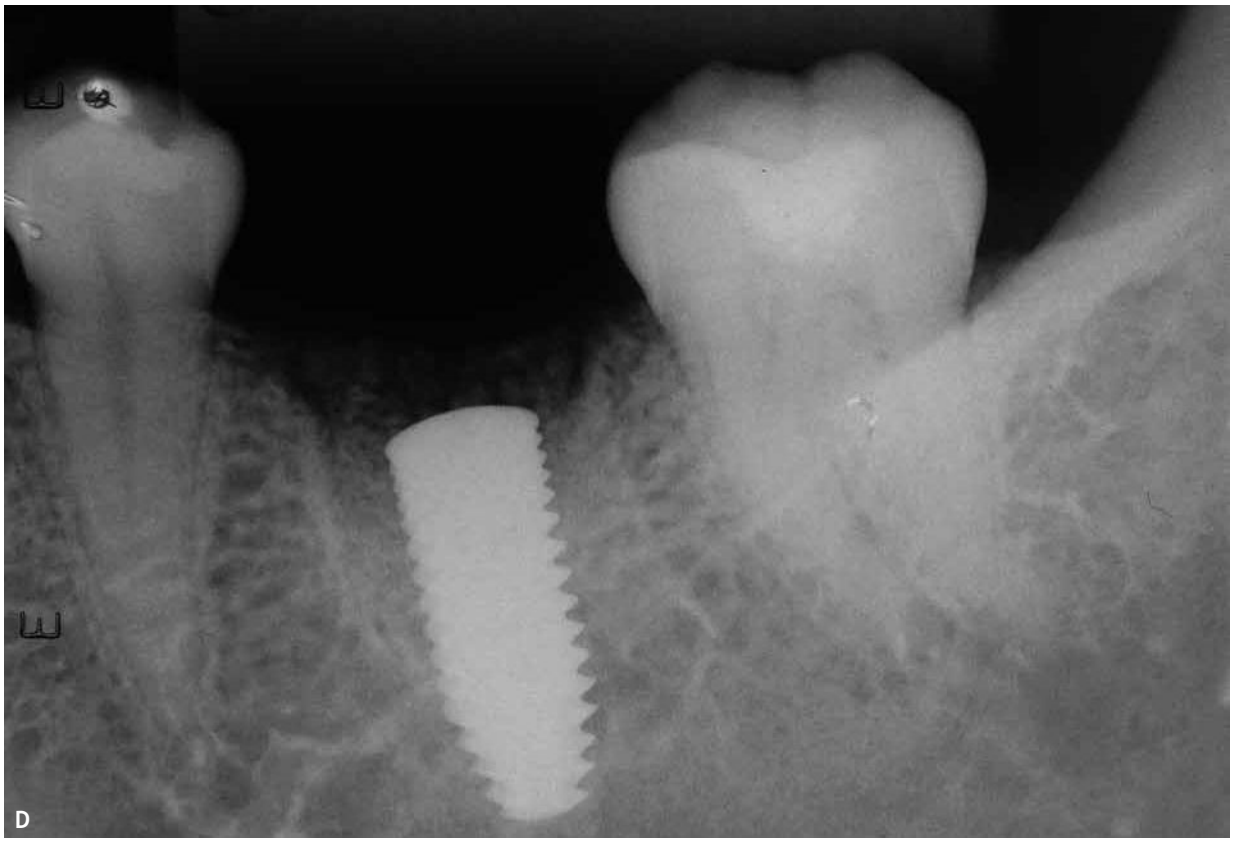


Figure 7 (AD) - A) 21-day postoperative period. **B)** 30-day postoperative period. **C)** 60-day postoperative period. **D)** 90-day postoperative X-ray.

After the period of 120 days, the patient underwent surgery to reopen the implant, performed with a more lingualized U-shaped incision in order to rotate the tissue to increase the vestibular thickness, followed by placement of the implant healer (Figure 8A-E).

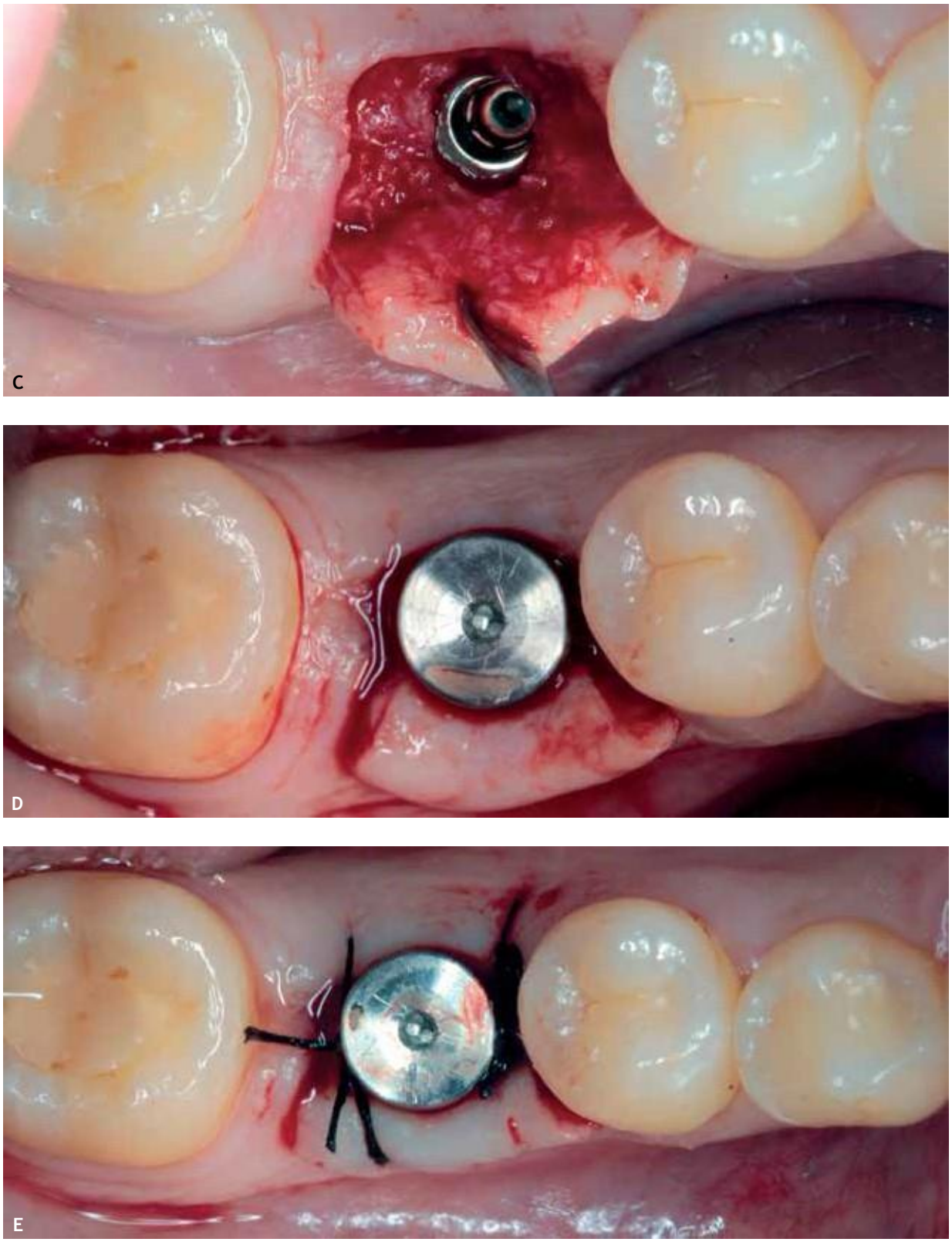
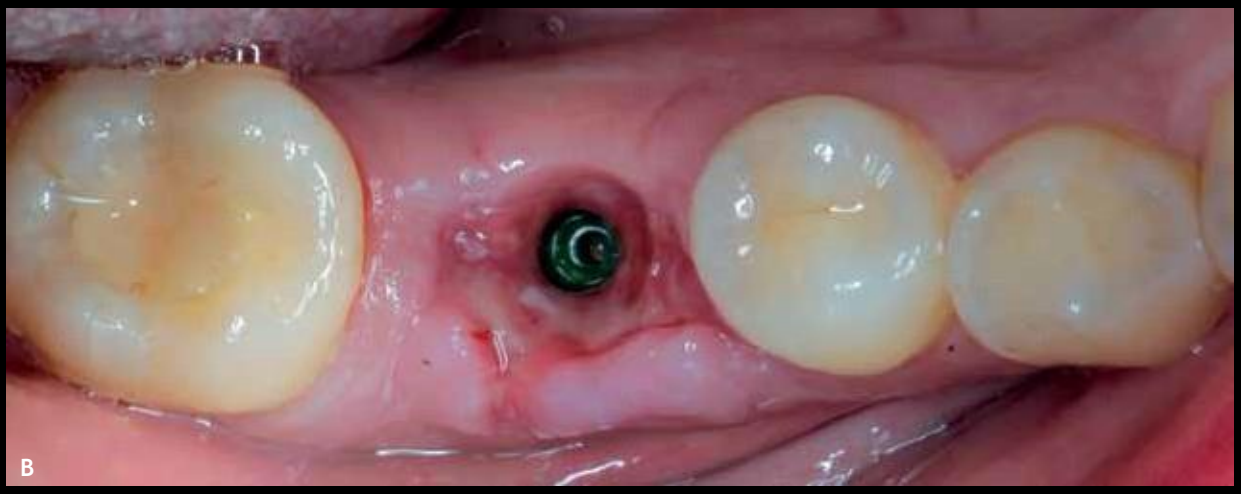


Figure 8 (AE) - A) 120-day occlusal view. Note the thickness of the ridge. **B)** Incision plus U. **C)** Detachment of the flap. **D)** Installation of the healer. **E)** Suture.

After 10 days, the suture was removed and the implant transfer molding could be performed and sent to the prosthetic laboratory to create the prosthesis (Figure 9A-D).

After returning from the laboratory, the dental element was installed with crown torque of up to 20 Newtons, occlusal verification and closure of the screw tunnel with resin (Figure 10A-B).



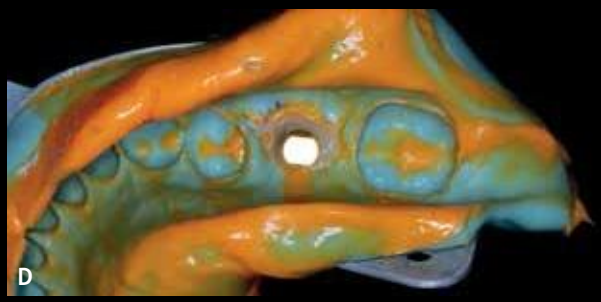


Figure 9 (A-D) - A) Healed reopened ridge. **B)** Removal of the healer. **C)** Installation of the molding transfer. **D)** Obtainment of the molding.

Figure 10 (A-B) - A) View of the dental element in the model. **B)** View of the dental element in the mouth.

DISCUSSION

The procedures aimed at preserving the bone and soft tissue contour after extraction rouse great clinical interest [3,17]. As a consequence of the lack of tissue for edge-to-edge closure of the alveolus [1,7], membranes were created that can remain intentionally exposed [6], sealing and protecting the content of the alveolus so that it can regenerate while maintaining its volume [2,12].

The fundamental characteristics of membranes for regeneration and preservation of alveoli are biocompatibility, mechanical resistance for formation of framework and biological corrosion

CONCLUSION

REFERENCES