Dentistry

# Clinical Sheet

## ALVEOLAR RIDGE THREE-DIMENSIONAL RECONSTRUCTION IN THE AESTHETIC ZONE USING THE *SAUSAGE TECHNIQUE*

Use of preserved collagen granules and equine pericardial membrane for volume restoration.



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Implant rehabilitation is a predictable solution for replacing missing teeth. However, bone defects resulting from edentulism or the removal of compromised implants may require regenerative procedures aimed at restoring adequate bone volume, which is essential for implant placement and to promote osseointegration. Guided Bone Regeneration (GBR), which relies on the use of barrier membranes to prevent soft tissue colonization of the regenerative site, is a well-documented approach for treating horizontal bone defects. A variant of GBR, the "Sausage Technique" proposed by Urban et al., involves a resorbable membrane securing under tension by pins[1]. This configuration allows for the creation of a three-dimensional regenerative chamber capable of containing large volumes of biomaterial, promoting a more predictable increase in the volume of regenerated bone.
In this context, maintaining tension in the membrane plays a fundamental role in ensuring the stability of the regenerative chamber and the graft during the initial stages of healing. Membranes derived from equine pericardium, thanks to the preservation of the native collagen matrix, exhibit good tensile strength, which allows them to be fixed under tension without compromising their integrity. This characteristic, combined with prolonged resorption times, helps maintain barrier function and the stability of the blood clot and biomaterial, creating conditions conducive to regenerative processes.

1. Urban, I.A. et al., *Int J Oral Maxillofac Implants*, 26(2), 404-414 (2011).

## Materials

In the clinical case under consideration, the *Sausage Technique* was used employing collagen-preserved cortical-cancellous bone granules measuring 0.25–1 mm (Osteoxenon Cancellous Cortical Granules, Bioteck SpA) and a resorbable equine pericardial membrane (Heart Pericardium Membrane, Bioteck SpA).
Both materials are equine-derived tissue substitutes treated with the low-temperature deantigenation process, Zymo-Teck (Bioteck SpA), which selectively removes immunogenic components while preserving the collagen and the native mineral component of the bone tissue. Heart is an equine pericardial membrane with its native collagen architecture preserved, ensuring excellent tensile strength—a useful characteristic in procedures requiring tension fixation. Its dry application facilitates handling and positioning, while the rapid absorption of blood promotes hydration, adaptation and adhesion to tissues.
Heart ensures effective protection of the bone graft for 3–4 months.



***Fig. 1*** *– Initial clinical status 20 days after removal of the implant in position 1.3.*

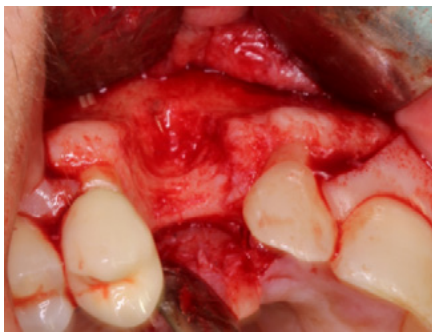


***Fig. 2*** *– View of the bone defect following removal of fibrous tissue.*

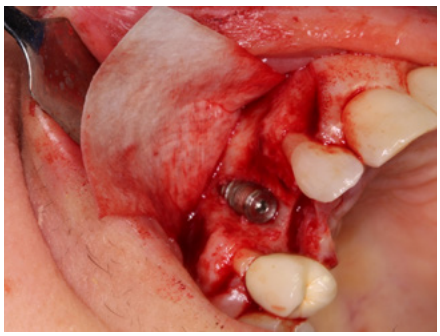


***Fig. 3*** *– Implant placement and fixation of the Heart membrane in the apical region of the site.*



***Fig. 4*** *– A 1:1 mixture of preserved collagen granules and autologous tissue.*



***Fig. 5*** *– Placement of the Heart membrane to cover the bone graft using the Sausage Technique.*

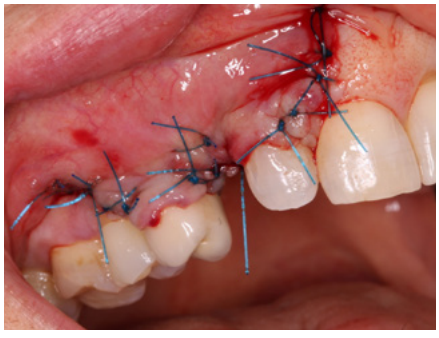


***Fig. 6*** *– Closure of the flap using horizontal mattress sutures and single-stitch sutures to promote primary healing.*

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## Results

The following case report describes a 59-year-old patient in good general health who presented with mobility of an implant in site 1.3.
The CBCT scan revealed peri-implant bone resorption consistent with advanced peri-implantitis, confirming the indication for implant removal.
Twenty days after removal, surgery was performed by elevating and detaching a full-thickness vestibular flap, extended beyond the margins of the defect area.
After removing the fibrous tissue, autologous bone was harvested using a scarper and subsequently mixed in a 1:1 ratio with the collagen-preserved cortical-cancellous granules.
A 3.8 × 12 mm implant was then placed in a prosthetically guided position.
Subsequently, the pericardial membrane was secured with osteosynthesis small nails at the apical portion.
The bone defect was filled with a generous amount of the mixture of autologous bone and cortical-cancellous granules in order to create a volumetric excess designed to compensate for physiological volumetric contractions during the healing phase; the membrane was then folded back and tensioned over the graft to stabilize it.
The membrane was finally secured with small nails in the palatal position.
Once a stable regenerative chamber was achieved, a periosteal incision was made to allow for passive closure of the flap. The flap was sutured with horizontal mattress sutures and single stitches, achieving primary closure, which is essential for the success of the procedure.
Five months later, the site was reopened, and a connective tissue graft was performed at the same time as the abutment was placed, in order to ensure an adequate amount of gingival tissue and an appropriate canine arch.
After six months, the final prosthesis was delivered.



***Fig. 7*** *– Clinical status 5 months after surgery, showing that the soft tissues are in good condition.*

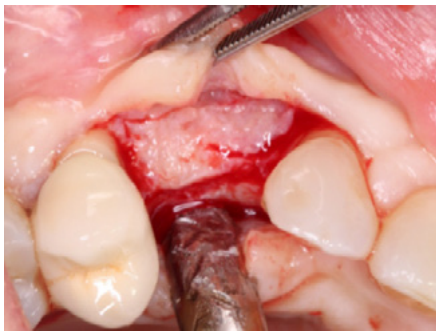


***Fig. 8*** *– Clinical status upon reopening the site and subsequent application of a connective tissue graft to restore gingival volume.*

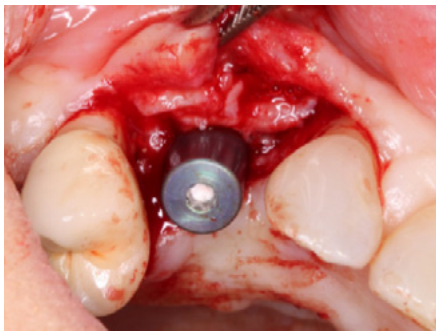


***Fig. 9*** *– Placement of the abutment concurrently with the connective tissue graft to promote the formation of the gingival contour and preserve tissue volume.*



***Fig. 10*** *– Clinical view of the final prosthesis 16 months after surgery: note the excellent soft-tissue contour.*



***Fig. 11*** *– Clinical occlusal assessment of the final prosthesis 16 months after surgery.*

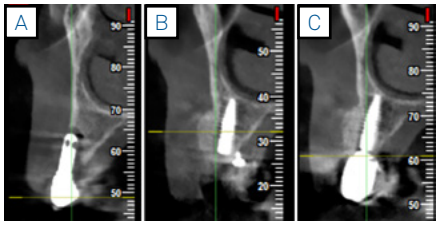



***Fig. 12*** *– CBCT cross-sections showing:*
- *A) the initial condition with a loose implant and peri-implant bone resorption*
- *B) 2-month follow-up. The bone graft and the newly placed implant are visible.*
- *C) 16-month follow-up. Note the excellent volume retention at the graft site.*

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