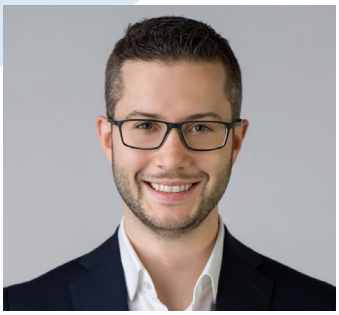
Dentistry

Clinical Sheet

ALVEOLAR PRESERVATION BY MODIFIED PERIOSTEAL INHIBITION

Volumetric restoration using an equine-derived Flex Cortical Sheet.



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Immediate implant rehabilitation has recently become widespread, mainly because of its ability to limit the post-extraction resorption process and the possibility of reducing time and costs. However, the scientific literature has shown that immediate placement of a dental implant in the alveolus does not necessarily prevent bone resorption[1].
In 2019, Nguyen and colleagues developed a new alveolar preservation technique based on the use of a PTFE membrane placed between the periosteum and the buccal cortical of the alveolus[2]. This membrane prevents the migration of pre-osteoclasts from the periosteum towards the cortical bone by arresting their differentiation into mature osteoclasts and thus inhibiting their bone resorption activity[2]. One of the limitations of this technique is the need to perform double surgery to remove the PTFE membrane, in addition to the possible complications associated with the use of non-resorbable membranes. To overcome these limitations, the technique has evolved with Modified Periosteal Inhibition (MPI), which involves replacing the PTFE membrane with a resorbable cortical bone sheet of equine origin[3]. MPI makes it possible to avoid a second surgery to remove the membrane and at the same time to benefit from the complete remodelling of the bone plate with the patient's own bone.

1. Menchini-Fabris et al., 2023, DOI: https://doi.org/10.3390/jcm12082783
2. Nguyen et al., 2019, DOI: https://doi.org/10.11607/prd.4178
3. Grassi et al., 2023, DOI:https://doi.org/10.3390/app13159034

Materials

The procedure was performed using a 0.5 mm thick flexible cortical bone sheet (Osteoxenon, Flex Cortical Sheet, OSP-0X09, Bioteck S.p.A., Italy).
The flexible cortical bone sheet is obtained by the exclusive enzymatic deantigenation process (Zymo-Teck, Bioteck S.p.A., Italy) able to preserve the mineral phase and collagen of the bone extracellular matrix in their native conformation.
This process allows natural and physiological recognition by bone cells and ensures complete bone remodelling.
The cortical bone lamina also undergoes a process of partial demineralisation that gives it flexibility once hydrated for a few seconds in sterile saline. This makes it easily adaptable to the geometry of the bone defect.
The cortical bone composition makes Flex Cortical Sheet perfectly occlusive, which allows it to be used as a protective membrane.
On one side, it has an indentation indicating the direction of the bone fibres.
The sheet must be folded perpendicular to the axis indicated by the indentation. It can be fixed with fibrin glue or with osteosynthesis media (preferably pins).

Fig. 1 *– Carious and non-recoverable element 46.*

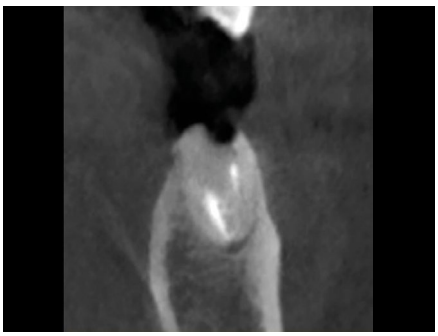

Fig. 2 *– Cross-section from pre-operative CBCT. The thin vestibular cortical bone thickness is highlighted.*

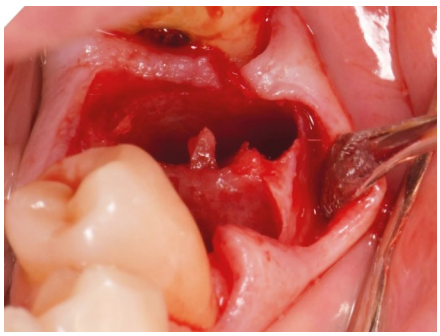

Fig. 3 *– Intraoperative image visually showing the thin vestibular cortical bone.*

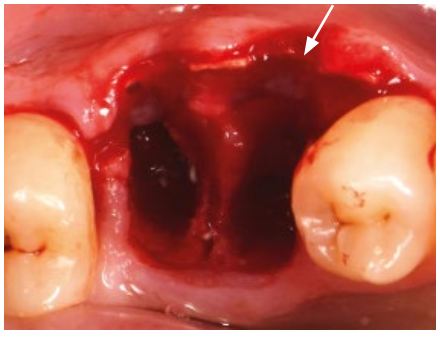

Fig. 4 *– Intraoperative image showing the Flex Cortical Sheet positioned in the vestibular space between bone and periosteum (white arrow).*

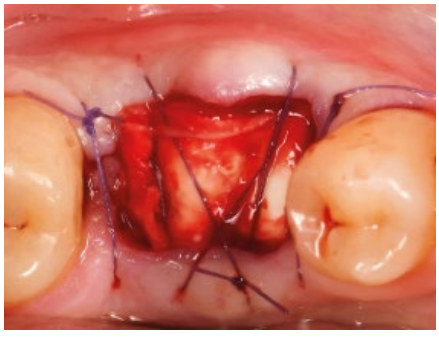

Fig. 5 *– The alveolus is filled with a collagen matrix and sutured with two simple stitches and an X-stitch using PGA 5/0 thread.*

Fig. 6 *– On removal of the stitches 10 days after surgery, the soft tissues are healing.*

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Results

The clinical case concerns a 44-year-old patient who had a root remnant of element 46, which was not salvageable. Preoperative CBCT showed sufficient bone in the vertical direction but with a very thin vestibular cortical and a high risk of resorption.

Maintaining an adequate horizontal vestibular cortical thickness is crucial in order to achieve an adequate emergence profile of the prosthesis.

These conditions represented the correct clinical indication for the use of the Modified Periosteal Inhibition technique. Having obtained the patient's consent, the operation involved atraumatic root extraction.

To protect the vestibular cortical, a 0.5mm Flex Cortical Sheet was inserted buccally between the alveolar bone and periosteum, after hydration for 5-6 seconds with sterile saline solution.

The presence of the lamina in flexible cortical bone prevents the passage of pre-osteoclasts from the periosteum to the vestibular cortical, thus preventing their differentiation into mature osteoclasts.

The operation was completed by filling the socket with a collagen matrix, immobilised with two simple stitches and an X-stitch using 5/0 PGA thread and letting it heal by second intention. At 10 days after surgery, the sutures were removed.

At this time, the socket was already completely closed with good soft tissue trophism.

The subsequent evaluation with CBCT performed 4 months after surgery showed a perfect maintenance of the original bone volumes with no relevant phenomena of bone resorption and a good mineralisation of the alveolus. In addition, the gingival volumes were also preserved thanks to the support provided by the cortical bone lamina.

The optimal bone quality allowed the placement of a standard implant (diameter 3.75 length 11.5 mm) at 4 months, confirming the good outcome of the alveolar preservation therapy.

At 3 months the final prosthesis was delivered to the patient's satisfaction with the excellent aesthetic result achieved.

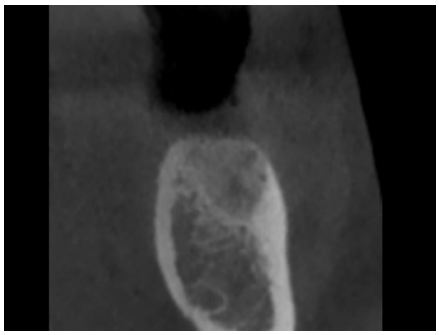

Fig. 7 *– Cross-section of the CBCT performed 4 months after surgery. The preservation of the vestibular cortical and good mineralisation within the alveolus is shown.*

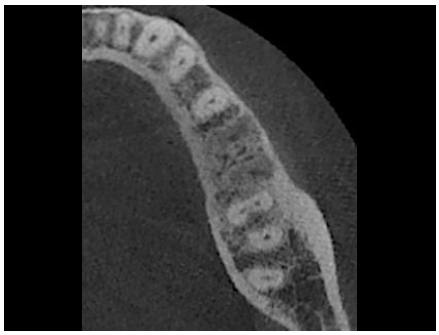

Fig. 8 *– Axial view of the CBCT 4 months after surgery: note the preservation of the vestibular cortical and the good mineralisation of the alveolus.*

Fig. 9 *– At 4 months, one can see the excellent appearance of the soft tissue, whose stability was supported by the Flex Cortical Sheet.*

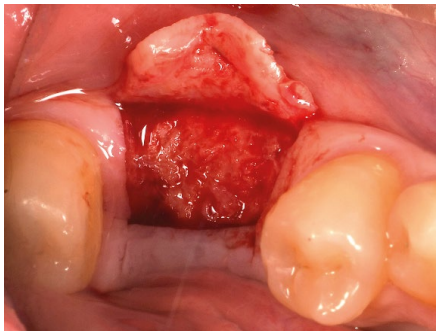

Fig. 10 *– Flap removal for implant placement at 4 months. You can appreciate the excellent maintenance of bone volumes.*

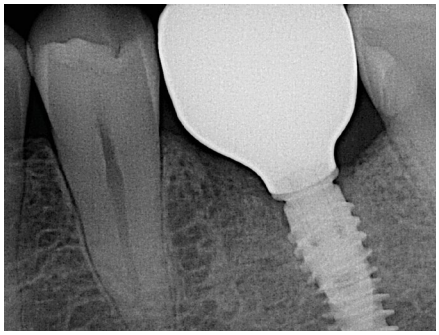

Fig. 11 *– Intraoral radiograph one year after periosteal inhibition surgery showing maintenance of bone levels.*

Fig. 12 *– Final prosthesis at 7 months after alveolar preservation surgery. Note the excellent aesthetic result obtained.*

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