Dentistry

Clinical Sheet

MODIFIED PERIOSTEAL INHIBITION WITH LAMINA IN FLEXIBLE CORTICAL BONE

Inhibition of osteoclastic remodelling using an equine-derived Flex Cortical Sheet.

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Among the most recent techniques developed to counteract the inevitable phenomenon of bone and soft tissue resorption resulting from dental extraction, a place of considerable interest is occupied by the periosteal *inhibition* technique[1]: in contrast to the classic ARP (bone ridge preservation) method, which involves the use of membranes and filling materials to regenerate the missing tissue and then be able to place *endosseous* implants, the purpose of periosteal inhibition is to act upstream, preventing the grafting of the resorption process. It is known from the literature that, following dental extraction, the deep periosteum is the zone of passage of preosteoclasts to the outer bone surface, where they fuse into osteoclasts, initiating bone resorption: if, however, the contact between periosteum and bone is obstructed with a barrier, this phenomenon can be effectively counteracted. The periosteal inhibition technique, which involves the placement of a d-PTFE membrane between the periosteum and buccal bone, is based on this assumption. The membrane mechanically prevents the passage of preosteoclasts from the periosteum to the buccal bone, inhibiting osteoclast formation and consequently bone resorption. Subsequently, the membrane is removed by a second surgery at the same time as implant placement.

A recent evolution of this technique is the *modified periosteal inhibition*[2], which involves, in place of the PTFE membrane, the use of a flexible cortical bone lamina of equine origin that, being completely replaced by the patient's own bone in physiological time, determines the undoubted advantage of being able to avoid the second surgical procedure of its removal. The lamina also provides support for soft tissue regeneration and, by integrating with the bone, increases its thickness.

1. Nguyen, V. et al., 2019, DOI: https://doi.org/10.11607/prd.4178
2. Grassi, A.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-OX09, Bioteck S.p.A., Italy). The equine-derived Flex Cortical Sheet was obtained by the Zymo-Teck enzymatic deantigenation process (Bioteck S.p.A., Italy), an innovative and patented system that allows antigens to be selectively eliminated without the need for high temperatures or the use of organic solvents, preserving the collagen in its native conformation and keeping the mineral component of the bone unaltered. The Flex Cortical Sheet then undergoes partial demineralization to expose the native collagen and become flexible once hydrated. The cortical bone composition makes Flex Cortical Sheet entirely occlusive; this allows it to be used as a protective membrane.

Due to its flexibility, the Flex Cortical Sheet, adapts perfectly to the curvilinear surfaces of the alveolar cavity, providing a twofold advantage: on the one hand, it serves as a support for the adhesion of cells involved in tissue regeneration, and on the other hand, it allows complete remodelling with the patient's bone, integrating without the need to be subsequently removed.

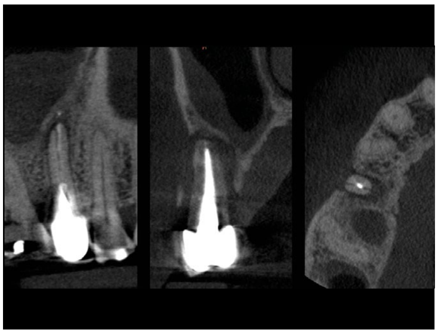

Fig. 1 *– CBCT pre-extraction of the tooth element 14.*

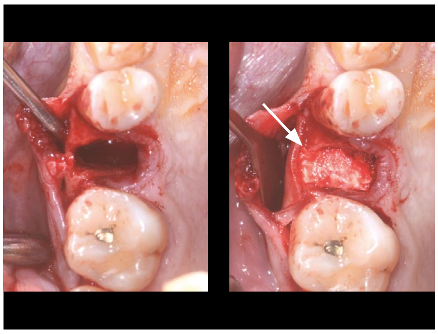

Fig. 2 *– Right, post-extraction alveolus and flap disconnection. Left, flexible cortical lamina placed above the bone wall (white arrow) and collagen sponge placement within the socket.*

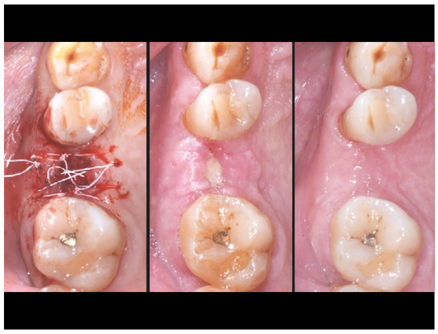

Fig. 3 *– Left, suturing of the papillae and crossing to hold the collagen sponge in place. Middle and right, the healing process at 15 and 30 days, respectively.*

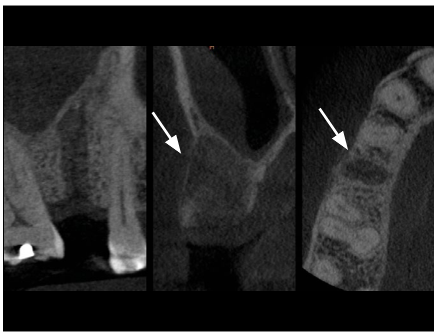

Fig. 4 *– CBCT at 3.5 months after the Modified Periosteal Inhibition procedure. The alveolus appears intact (note the presence of the cortical layer at the vestibular level (white arrow).*

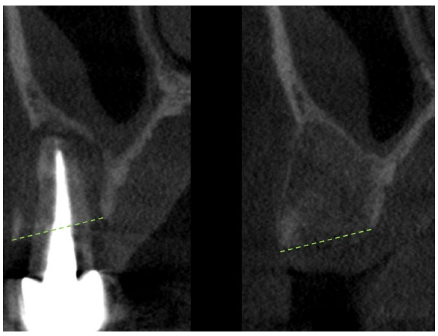

Fig. 5 *– Comparison of the situation pre-extraction and at 3.5 months after extraction by CBCT: the profile is preserved after Modified Periosteal Inhibition (dashed green line).*

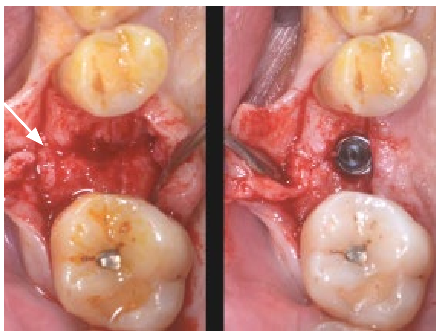

Fig. 6 *– Left, reopening of the site for implant placement. Note the good filling of the socket and integration of the lamina (white arrow). Right, dental implant placement.*

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Results

The clinical case involves a patient with fractured tooth element 14, together with vestibular fenestration, extended to the apex of the tooth element, and palatal resorption of 2 mm. Analysis of the patient's initial *status* was performed by CBCT.

After appropriate medical and dental history evaluation, the decision was made to remove the compromised tooth element, to be performed under plexic anesthesia. The procedure involved incision of the *papillae* and full-thickness debridement of the buccal tissues extending beyond the fenestration, with elevation of the periosteum, so as to create a space for the cortical lamina to be placed. Prior to placement, the lamina was properly cut so that it would fit into the housing.

The cortical lamina is not hydrated but in the trial phase it is wetted with the patient's blood; this allows for sufficient rigidity to be bagged.

The lamina was then glued to the vestibular side, using drops of fibrin glue, ensuring coverage of the entire fenestration. A collagen sponge was placed inside the cavity, subsequently secured by suturing the papillae, without completely sealing the flap to promote healing by second intention. At 4 months after surgery, CBCT examination was performed, from which excellent remineralization of the socket was shown, with complete preservation of the cortical profile, complete fenestration closure and absence of bone resorption.

The positive result was achieved by a dual mechanism: on the one hand, the lamina acts as a mechanical barrier between *periosteum* and native bone, preventing the recall of osteoclast precursors, which are responsible for bone resorption; on the other hand, the lamina itself generates an increase in vestibular bone thickness, providing soft tissue support during the healing process.

Therefore, a 4 x 10 mm implant was placed in the regenerated site. After an additional 3 months, the implant was prosthesized with a curvomax abutment and a cemented metal-ceramic crown.

Subsequent inspection showed a perfect integration of the prosthesis and an optimal aesthetic result, with restoration of physiological vestibular convexity.

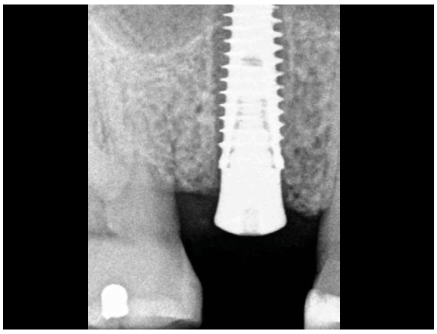

Fig. 7 *– Endoral X-ray of the newly placed implant in d3 bone quality..*

Fig. 8 *– Left, placement of the healing screw. On the right, placement of the prosthesis.*

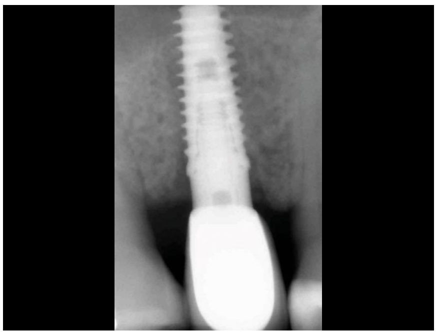

Fig. 9 *– Endoral X-ray of the implant with prosthesis at 11 months after extraction.*

Fig. 10 *– Healing after 11 months after surgery: note the optimal integration of the prosthesis and perfect soft tissue regeneration.*