Peri-implant bone augmentation using the subperiosteal peri-implant augmented layer technique and a bovine-derived bone block

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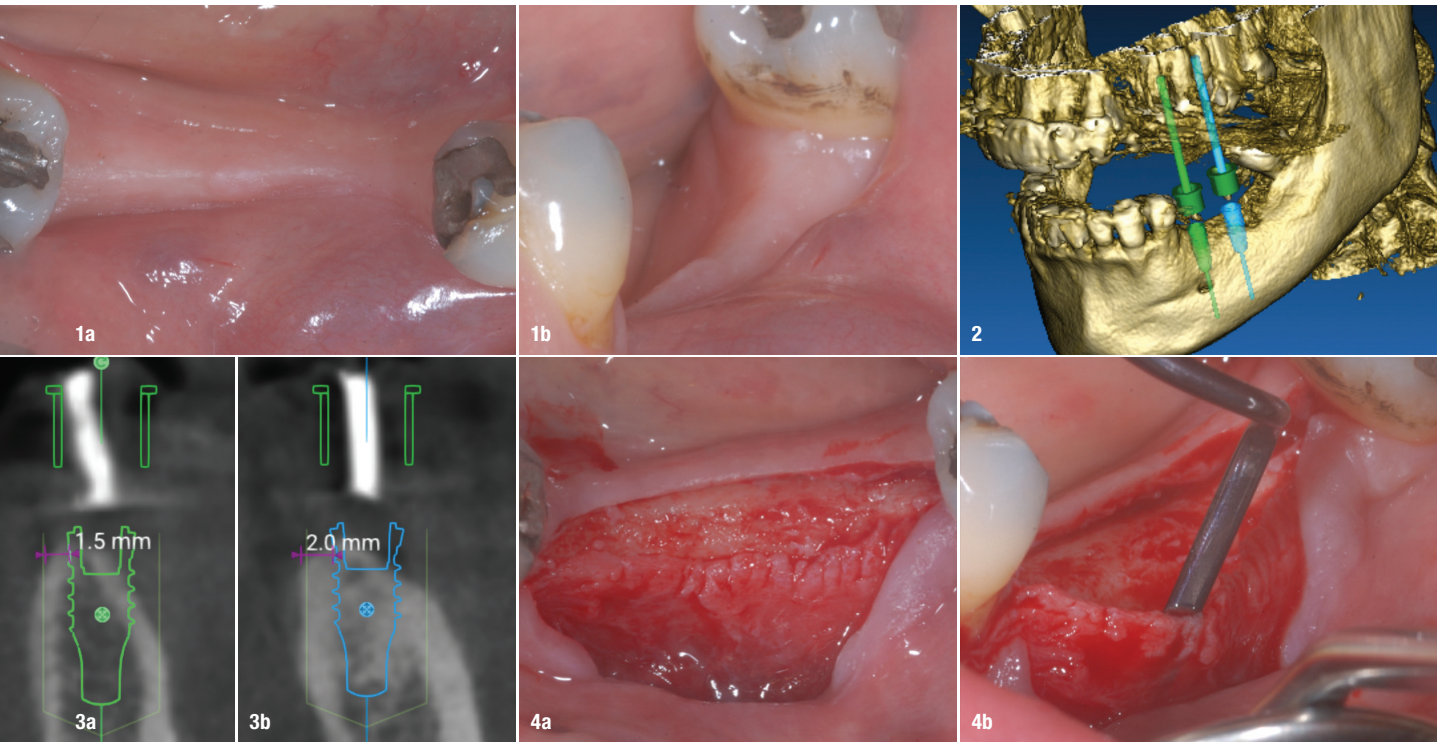
A 50-year-old, non-smoking, systemically healthy female patient presented for implant-supported rehabilitation of an edentulous area in the left posterior mandible (Fig. 1). After treatment for Stage II periodontitis, the patient had a bleeding on probing score of < 10% and no sites with a probing depth of ≥ 5 mm and was enrolled in a supportive periodontal care programme.

The implant position was planned digitally on a CBCT scan, and a surgical guide was fabricated. Digital planning previewed the formation of a buccal dehiscence at placement of both implants, suggesting the need for a horizontal bone augmentation procedure (Figs. 2 & 3). At the buccal aspect, a split-thickness flap (creating the mucosal layer) was raised, leaving the periosteal layer on the edentulous ridge intact. The periosteal layer was then elevated from the bone crest by means of a microsurgical periosteal elevator (PTROM, Hu-Friedy) and tunnelling knives (KPAX, TKN1X and TKN2X, Hu-Friedy) with varying angulated sharp edges (Fig. 4). At the lingual aspect, a full-thickness flap was elevated. The elevation was extended in an apical direction to detach the superficial fi-



Figs. 1a & b: Clinical view of the initial situation. **Fig. 2:** Digital planning of the implant positions. **Figs. 3a & b:** Digital planning of the individual implant positions, previewing the formation of a buccal dehiscence at placement of both implants. **Figs. 4a & b:** Split-thickness flap at the buccal aspect **(a)**. Elevation of the periosteal layer from the bone crest **(b)**.

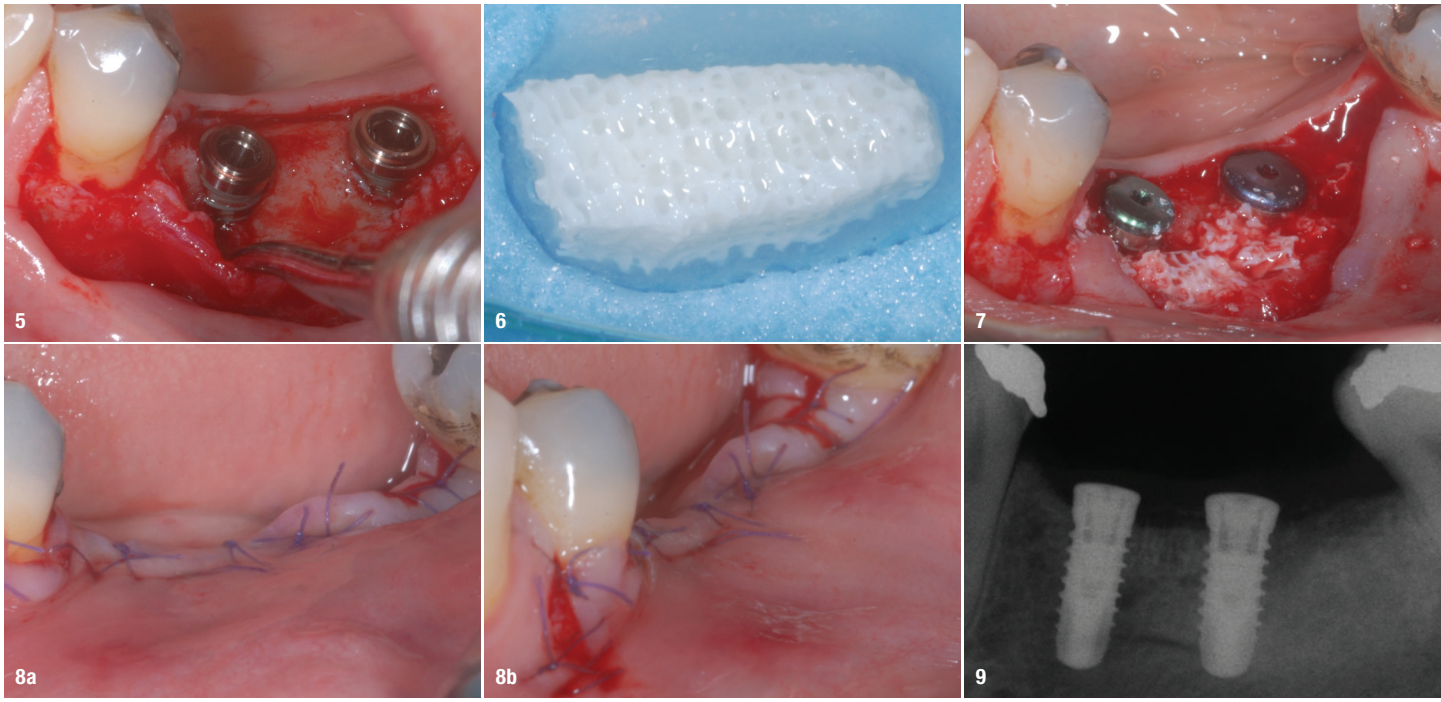
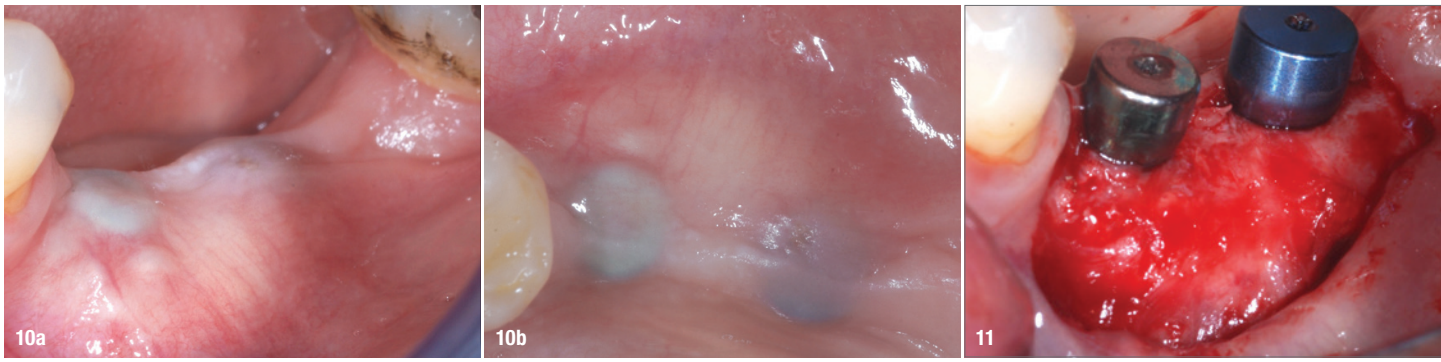


Fig. 5: Positioning of the two tissue-level implants. **Fig. 6:** Graft composed of deproteinised bovine bone mineral. **Fig. 7:** Adaptation of trimmed deproteinised bovine bone mineral beneath the periosteal layer to cover the exposed implant surface. **Figs. 8a & b:** Stabilisation of the periosteal layer to the lingual flap by internal mattress sutures. **Fig. 9:** Radiographic image immediately after implant placement and bone augmentation.



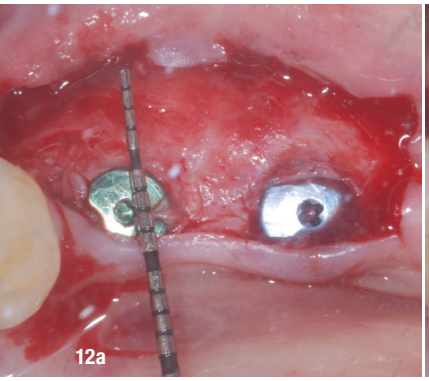
Figs. 10a & b: Before the re-entry procedure. **Fig. 11:** Previously exposed implant surfaces covered by new hard tissue.

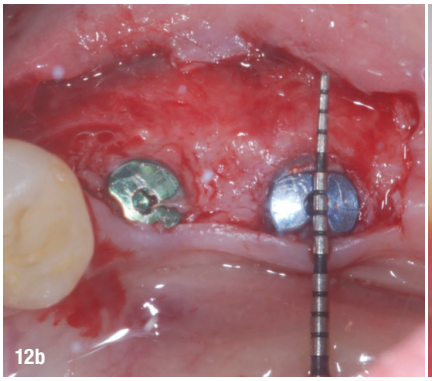
bres of the mylohyoid muscle and obtain a tension-free lingual flap. The implant sites were prepared using the CAD surgical guide, and two tissue-level implants (ELEMENT, Thommen Medical) were positioned. The implants presented with a buccal dehiscence of 3 mm at implant #36 and 2 mm at implant #35. Cortical perforations were performed using a carbide bur (Fig. 5).

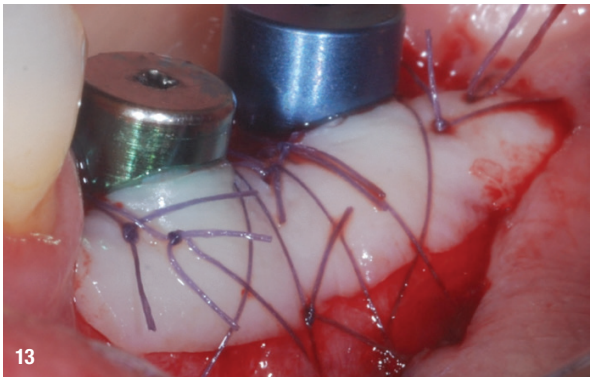
A graft composed of deproteinised bovine bone mineral, delivered as a block (Geistlich; Fig. 6), was trimmed using a high-speed diamond bur in order to obtain a homogeneous thickness of 3–4 mm and was adapted beneath the periosteal layer to completely cover the exposed implant surface (Fig. 7). Using a resorbable #6/0 suture, the periosteal layer was stabilised to the lingual flap by means of internal mattress sutures. The mucosal layer was coronally advanced to achieve primary closure of the wound (Figs. 8 & 9).

Six months after the implant placement, a re-entry procedure for implant exposure was performed using a buccal split-thickness flap (Fig. 10). It could be seen that the previously exposed implant surfaces were completely covered by new hard tissue, and a peri-implant buccal tissue thickness of ≥ 3 mm was present at the most coronal portion of both implants (Figs. 11 & 12). A free epithelial and connective tissue graft was placed to augment the peri-implant soft-tissue phenotype (Fig. 13).

A digital impression was taken four weeks after the implant exposure to digitally plan the shape and emergency profile for the definitive restoration (Fig. 14). Two splinted







Figs. 12a & b: Peri-implant buccal tissue thickness of ≥ 3 mm at the most coronal portion of both implants. **Fig. 13:** Augmentation of the peri-implant soft tissue with a free epithelial and connective tissue graft.

crowns were milled from a zirconia monobloc and cemented on to the titanium inserts according to the manufacturer's instructions. The definitive restoration was screwed on four weeks after impression taking (Fig. 15). The peri-implant tissue conditions appeared adequate on both clinical and radiographic examination (Fig. 16).

Conclusion

The present case report indicates that the combination of a subperiosteal peri-implant augmented layer and deproteinised bovine bone mineral may be successfully used to achieve an increase in buccal tissue thickness at the most coronal portion of an exposed implant.

about the author

Prof. Leonardo Trombelli is professor and chair of the department of periodontics of the dental school at the University of Ferrara in Italy and has been dean of the school since 2013. He is director of the Research Center for the Study of Periodontal and Peri-implant Diseases at the University of Ferrara and director of the dental clinic at the Ferrara university hospital. He practises periodontics and implantology in private practice. From 2007 to 2009, he served as President of the Italian Academy of Osseointegration, of which he is still an active member. He is also an active member of the Italian Society of Periodontology and Implantology and the International Association for Dental Research. Prof. Trombelli serves as a member of the editorial boards of several peer-reviewed journals.

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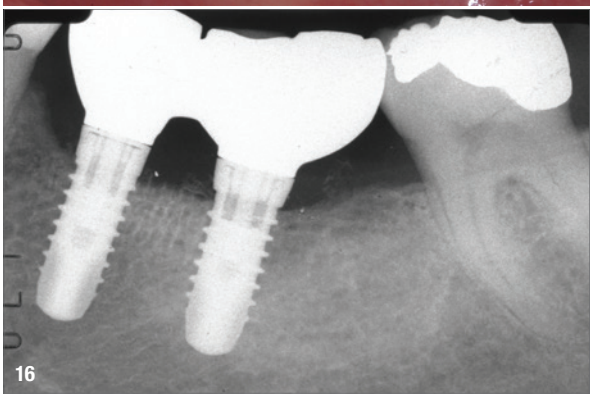

Fig. 14: Digital impression taking four weeks after implant exposure. **Figs. 15a & b:** Definitive restoration four weeks after impression taking. **Fig. 16:** Radiographic examination after definitive restoration.

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