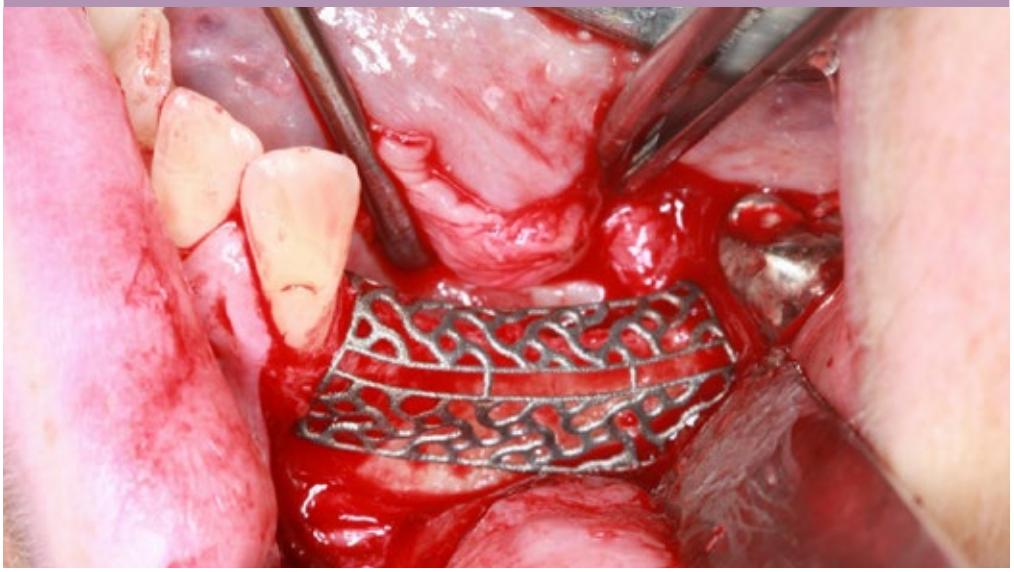
Horizontal Augmentation



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> Complex vertical and horizontal augmentations with a patient-specific 3D printed titanium scaffold (Yxoss CBR®), autologous bone, Geistlich Bio-Oss® and Geistlich Bio-Gide®

1. Indication profile

Area	☒ esthetic area	☒ not esthetic area	
	☐ loss of a single-tooth	☒ partially edentulous ridge	☐ completely edentulous ridge
		☒ gap situation	☐ free-end situation
Bone situation	☐ vertical bone defect	☐ horizontal bone defect	☒ combined vertical and horizontal bone defect
Soft tissue situation	☒ soft tissue correction not required	☐ soft tissue correction required	
		☐ before the augmentation	☐ with the implantation
		☐ with the augmentation	☐ in a separate procedure
	☒ primary wound closure possible	☐ primary wound closure not possible	☐ open healing planned
	☒ thick biotype	☐ thin biotype	
	☐ adequately keratinized mucosa	☒ inadequately keratinized mucosa	
Augmentation	☒ autologous bone chips	☐ autologous bone blocks	☐ soft tissue transplant
	☒ Geistlich Bio-Oss®	☒ Geistlich Bio-Gide®	☐ Geistlich Mucograft®
	☒ autologous growth factors	☒ stabilization (Yxoss CBR®)	
Implantation	☐ 1-stage with augmentation	☒ 2-stage after 6 months	☐ none

2. Background information:

› The use of conventional titanium mesh (TM) was initially described for the reconstruction of extensive bony maxillofacial defects (1–3). These TM went on to be used for local augmention of the alveolar ridge with simultaneous and two-stage implantation (4–6). This has produced good results for lateral and vertical bone augmentation in several clinical studies (7). In addition, TM was recommended in the last systematic review (Troeltzsch et al. 2016) when you need to increase bone more than 3.7mm in combined defects (8). Conventional TM is delivered as a flat mesh which is then adapted to the defect intraoperatively. This procedure is technically demandingand time-consuming. Furthermore, there is the hazard of oral mucosal dehiscence caused by protruding edges and corners of the mesh. Modern CAD-CAM technology provides a promising solution to overcome these disadvantages. Using the CBCT data from the patient defect, it's possible to produce a 3D customized titanium scaffold which fits exactly into the bone defect (Yxoss CBR®), also reducing the preparation time and avoiding sharp edges. Use of an autologous bone mixture and Geistlich Bio-Oss® as an augmentation material was performed in order to obtain sufficient stability and ossification. To optimise the stability and healing of soft tissue, the 3D titanium scaffold was covered with a Geistlich Bio-Gide® membrane and a layer of autologous platelet-rich-fibrin (PRF) to enhance the soft tissue healing.

3. Treatment targets:

› Vertical and horizontal bone augmentations to create sufficient bone volume at complex defects prior to implantation.

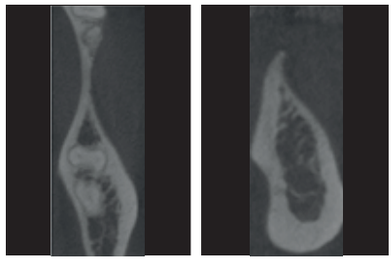

Fig. 1. Preoperative CBCT of the patient with horizontal and vertical deficiency in the left mandible.

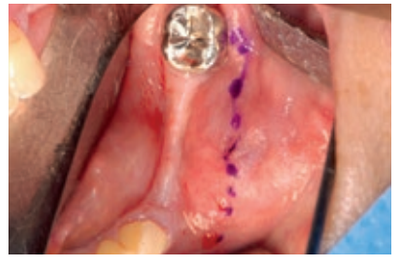

Fig. 2. Preoperative clinical picture of the patient with marked poncho incision to avoid dehiscence. This involves an incision being made a long way into the vestibule to position the subsequent suture at a distance from the 3D titanium scaffold. This cutting technique is performed in vertical defects.

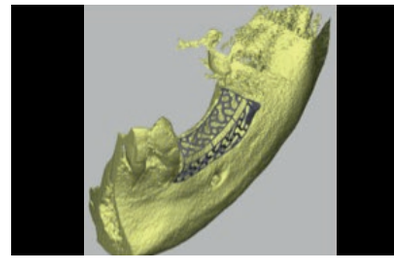

Fig. 3. Planning the CAD-CAM using a digital workflow (Yxoss CBR®). This involves the DVT dataset being sent to the manufacturer ReOss GmbH, which provisionally plans the 3D titanium scaffold and sends it to the surgeon for review. The product is manufactured following confirmation by the surgeon.

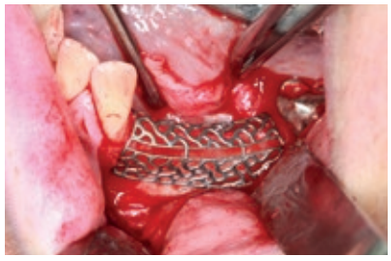

Fig. 4. Depiction of the defect and evaluating the fit of the 3D printed material (Yxoss CBR®).

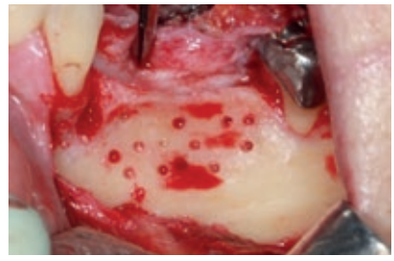

Fig. 5. Perforation of the cortex with the round bur to boost blood supply.

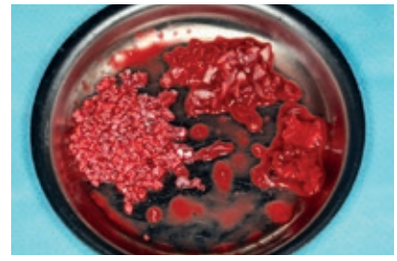

Fig. 6. Autogenous bone is mixed 50:50 with Geistlich Bio-Oss®. In this case, bone was harvested from the iliac crest, but augmentation is generally also possible with locally harvested bone (e.g. using BoneScraper).

Geistlich Biomaterials

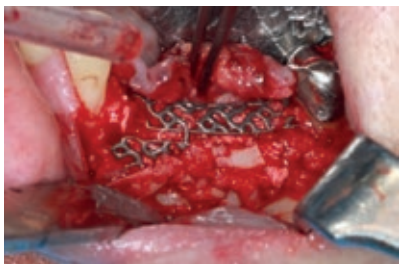

Fig. 7. The 3D titanium scaffold is filled with the augmentation material and introduced into the defect. It is usually enough to stabilize using one or two screws.

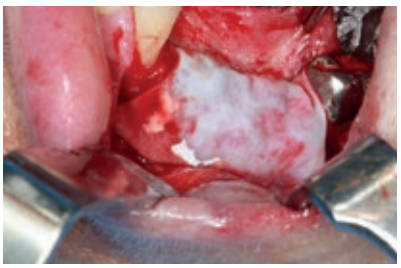

Fig. 8. Covering the 3D titanium scaffold with a Geistlich Bio-Gide® membrane to supports reliable hard tissue regeneration and secluding the grafted area from ingrowth of soft tissue.

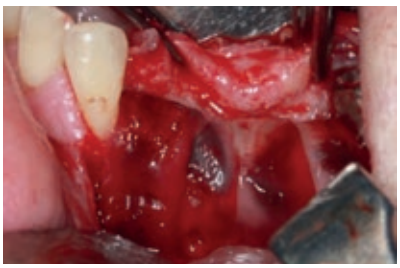

Fig. 9. Covering the Geistlich Bio-Gide® membrane with autologous platelet-rich-fibrin (PRF) to promote soft tissue healing.

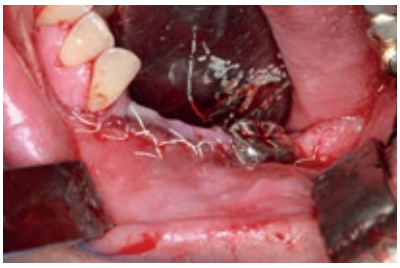

Fig. 10. Primary closure of the defect with GoreTex sutures. The suture is positioned at a distance from the device by means of the poncho incision.

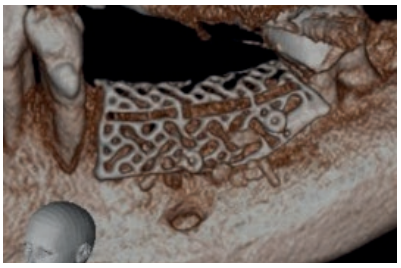

Fig. 11. Postoperative CBCT check on the augmented defect.

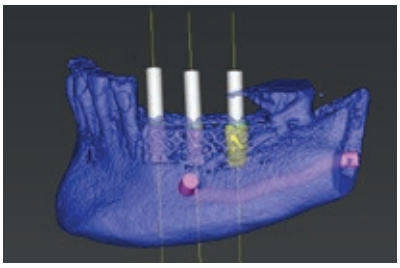

Fig. 12. Three-dimensional implant planning.

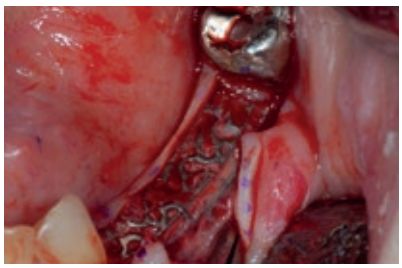

Fig. 13. Re-entry 6 months after augmentation. The 3D scaffold is easily removed in the crestal area after intraoperative visualisation by the Easy Removal Design®.

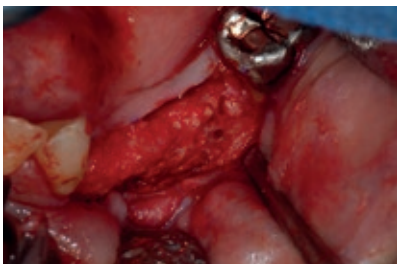

Fig. 14. Stable bone is visible after Yxoss CBR® removal.

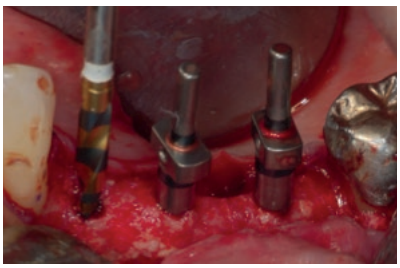

Fig. 15. Implant placement after 3D planning in accordance with the manufacturer's drilling protocol.

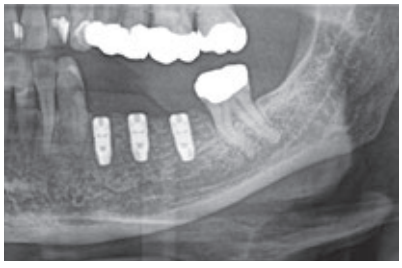

Fig. 16. Radiography of the patient after implant placement.

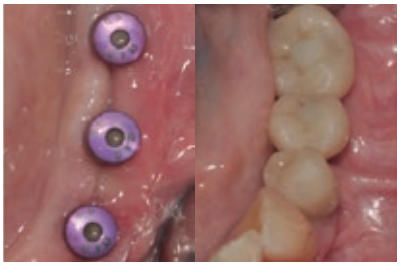

Fig. 17. Clinical picture after soft tissue healing (left). Clinical situation after implant placement with final prosthetic restoration (right).

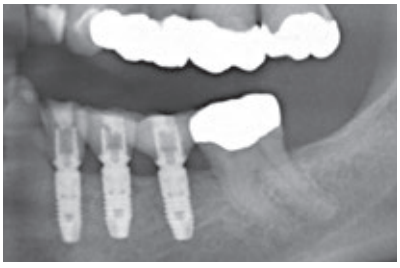

Fig. 18. Radiography after prosthetic restoration.

Literature:

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Suppliers:

- Yxoss CBR® – 3D printed titanium scaffold: ReOss GmbH, Talstr. 23, 70794 Filderstadt (Germany) / www.reoss.eu
- Fixation screws: Medartis AG, Hochbergerstrasse 60E, 4057 Basel (Switzerland)
- Suture material: W.L. Gore&Associates, Inc. 1505 N. Fourth Street Flagstaff, Arizona (USA)
- Implants: Dentsply Implants, Steinzeugstraße 50, 68229 Mannheim (Germany)
- Medication: Amoxycomb 875/125 mg

Contact:

- Clinic for Oral and Maxillofacial Surgery – Plastic Surgery, University Medical Center Mainz. Address: Building 901, Augustuspl. 2, 55131 Mainz (Germany)

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