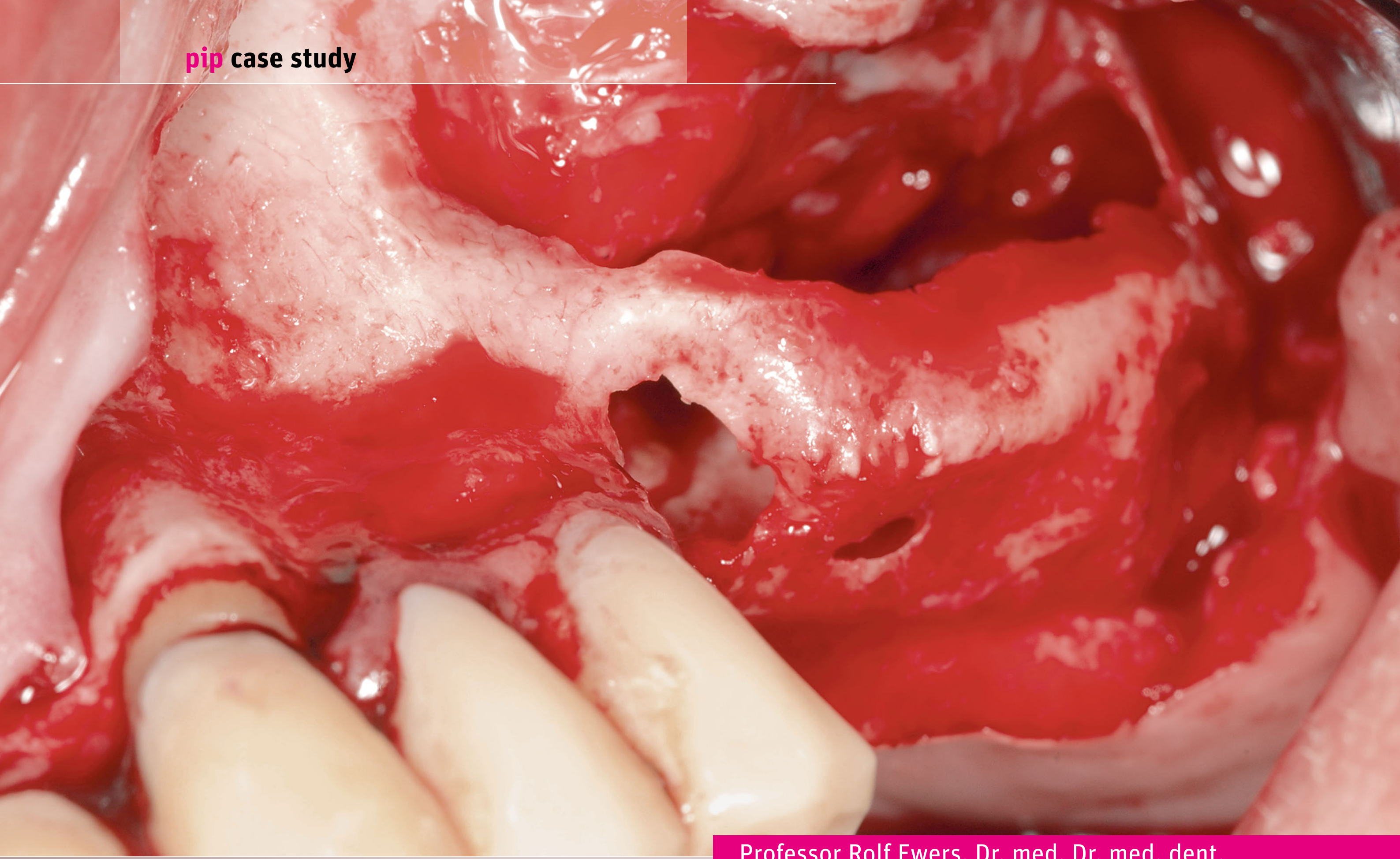

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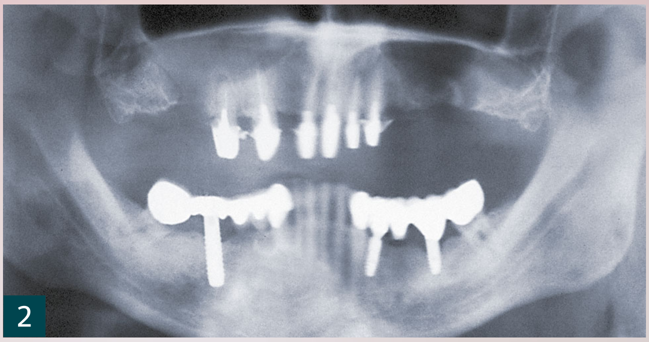
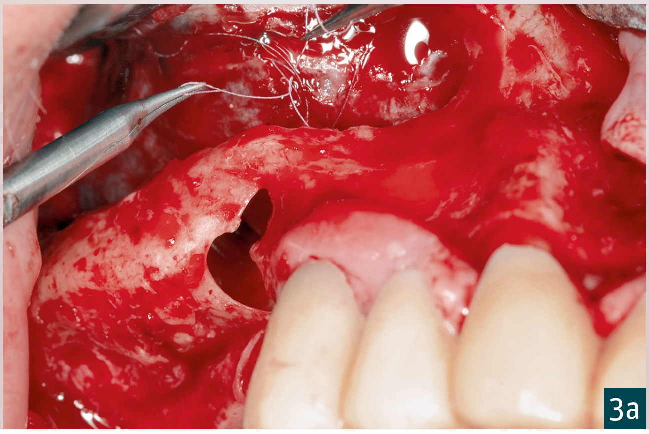
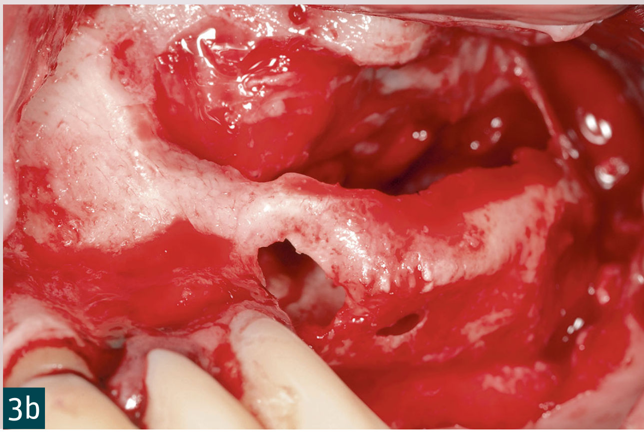
AlgOss 100 plant-based bone regeneration material for sinus lifts and implantation

Long-term observation over 15.7 years







Implantology is becoming an increasingly important part of modern dentistry. One of the prerequisites for prognostically favourable implant insertion is the presence of sufficient bone volume along with suitable bone quality to ensure that the implant is anchored securely and the forces exerted are distributed well. If not enough bone substance is present (both horizontally and vertically) to allow an enossal implant to be inserted, augmentation is required to compensate.

Building up absent bone substance is ideally meant to ensure that not only is the lost volume restored (bone substitution), but the supporting function lost along with the bone is also provided again. This should involve regeneration, not repair, enabling the reconstruction of substance, form and function [1]. Bone grafting with xenogeneic and/or alloplastic materials is standard clinical practice worldwide today. The most frequently used calcium phosphate bioceramics consists of hydroxylapatite (HA) and/or tricalcium phosphate (TCP). These materials fill in the defect and provide a lead structure for the newly forming bone. Using the ideal bone graft material results in bone regeneration, involving the material gradually degrading and simultaneously being replaced by bone produced by the body itself, forming a functional unit with the recipient tissue [2–5].

Bone substitution refers to when the body's own bone is merely replaced by augmentation materials, or the absent volume is merely filled in. However, that does not automatically mean that vital bone is created again in that location – in other words, that regeneration occurs [6,7].

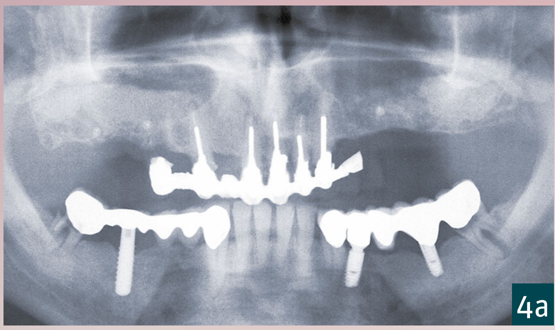
All materials on the market lead to bone substitution, but only a few of them result in bone regeneration, whereby the bone graft material is converted into functional bone and does not permanently remain as a foreign body in the organism [8, 9]. The absorption of bone graft material is especially important

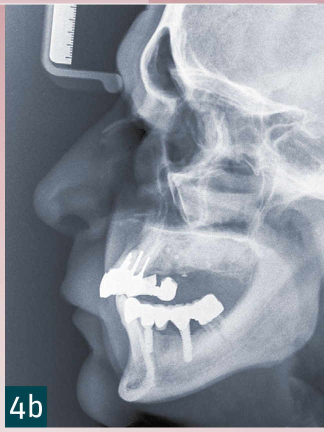
1 OPG of a 60-year-old patient with extreme bilateral alveolar ridge atrophy and a blade implant in left maxilla.

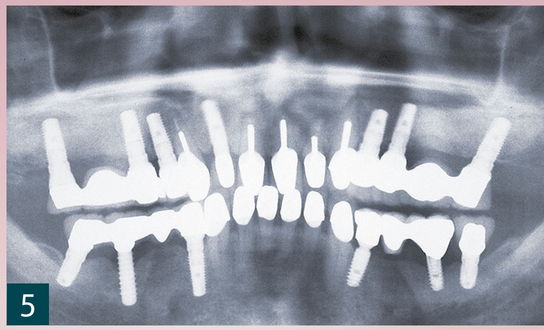
2 OPG following removal of the blade implant. Clearly visible perforations in the alveolar process areas on both sides.

3a Right-side intraoperative situs with bone perforation and suturing of a perforation in the oral mucosa.

3b Left-side intraoperative situs with bone perforation and augmented maxillary sinus mucosa.







with regard to the osseointegration of implants. This is a highly dynamic process incorporating remodelling the existing bone and modelling new bone and is thus crucial to optimal healing and the long-term preservation of the implant. Foreign material not being absorbed may also lead to secondary infections occurring even years later.

In the current clinical case, a plant-based alloplastic absorbable hydroxylapatite material was used in sinus floor augmentation. The bone graft material made from red algae has been clinically established and scientifically documented for more than 35 years [10–13]. Dentsply Sirona has been selling it under the Algipore brand for years. myplant GmbH currently markets its algae product under the name AlgOss 100. AlgOss 100 is chemically and morphologically very similar to human bone. Sustainably harvested and naturally grown marine red algae forming a hard mineral scaffold are used as a raw material. Thanks to the special manufacturing process, the structure of this mineral frame is retained, creating a continuous (interconnecting) microporous honeycomb structure that promotes the growth of bone cells and provides an osteoconductive lead structure. This frame gradually degrades and is replaced over time by newly formed vital bone. These remodelling processes ensure constant volume stability at the augmentation site [2].

Clinical case

We are presenting a male patient (60 years old) who consulted us due to a loose blade implant in his left maxilla (Figure 1). Once the blade implant had been removed, the patient wanted to wait and see what would happen. This waiting time lasted a year (Figure 2). An augmentation operation was then performed.

The sinus lift including augmentation of the maxillary sinus mucosa was conducted on both sides under endotracheal anaesthesia, with considerable lateral access (Figures 3a and 3b). There was a small perforation in the mucous membrane on the right side. This was closed with 7/0 Vicryl sutures and also stabilised with a collagen membrane secured with fibrin glue.

Figures 3a and 3b show the existing bilateral perforations in the paper-thin alveolar bone. Each of the large cavities created on both sides was filled with 8 ml of phycogenic AlgOss 100 granules, grain size 0.1–1.0 mm, saturated with venous blood and mixed with approximately 0.5 ml of collected autogenous bone chips. The grafts on both sides were covered with collagen membranes fixed in place by titanium pins. The primary wound closure healed without any complications. Immediate post-operative examination with panoramic tomographic imaging and lateral cephalometric radiography showed a very good outcome of the augmentation process. Both images show an augmentation height of at least 13 mm to allow later insertion of

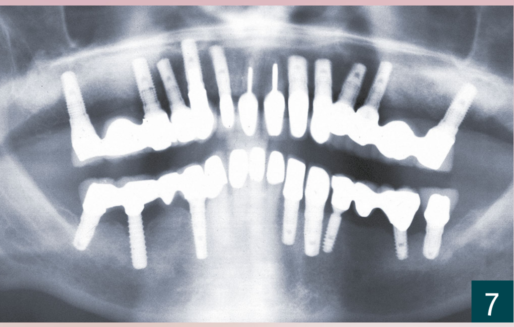
4a OPG following bilateral sinus lift. Augmentation with vegan, phycogenic bone graft material, blood and endogenous bone.

4b Lateral cephalometric radiograph with clearly identifiable maxillary sinus augmentation.

5 Panoramic tomographic image at start of problem.

6a Lateral intra-oral mirror image showing implant-supported bridge and crown on right side.

6a Lateral intra-oral mirror image showing implant-supported bridge and crown on left side.



long standard implants (Figures 4a and 4b). After a seven-month healing period for the augmentation material, three Camlog implants measuring between 11 mm and 13 mm in length were inserted on both sides. Five months, later, the bridge structures were inserted (Figure 5). The patient was very happy with the prosthodontic work done and felt fully rehabilitated in terms of mastication (Figures 6a and 6b).

The outcome of the augmentation with the aid of the two lateral sinus lift operations was very successful. The implants inserted in the augmented areas have remained stable and (functionally) resilient to date. This positive finding was established at a recent check-up performed 15.7 years after the sinus lift with augmentation (Figures 7, 8a and 8b).

Discussion and summary

The patient presented provides an example of a successful bone graft with volume stability in the maxillary sinus lasting many years. The case in question involved extreme bone atrophy in the alveolar ridge on both sides of the maxilla with paper-thin residual bone and multiple perforations. There was a further complication presented by the extensive periostomy caused by lateral access with detachment of the vestibular mucoperiosteal flap. In addition, vascularisation of the alveolar bone was further decreased by the detachment of the maxillary sinus mucosa. Only because of the pronounced osteoconductivity of the AlgOss 100 (myplant dental) absorbable vegan and plant-based bone graft material did new bone grow despite this reduced vascularisation, allowing implants to be inserted after a seven-month healing period and later subjected to loading as well. Because the material is slowly absorbed over several years whilst simultaneously being replaced by newly formed vital bone, the process results in bone that can stably withstand functional loads over many years. Owing to the reduced vascularisation in the local bone, absorption occurred as expected in the crestal areas of the implants, as can clearly be seen in the recent panoramic tomographic image (Figure 7). The most immediately apparent is the crestal bone loss around the implants in positions 15 and 27 (FDI/ISO)/UR5 and UL7 (Palmer/alphanumeric).

Because the local bone in these areas is absorbed over the years, the implants are located only in the newly formed bone created as a result of augmentation with the phycogenic bone graft material. The regenerated, newly created bone in the augmented area can therefore be referred to as ‘AlgOss bone’. ●

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BIBLIOGRAPHY
for this publication

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7 OPG following 15.7 years of functional load on implants in newly formed bone (AlgOss bone).

8a Lateral intra-oral mirror image showing implant-supported bridge and crown on right side after 15.7 years in place.

8b Opposite lateral intra-oral mirror image showing implant-supported bridge and crown on left side after 15.7 years in place.