

Soft- and hard-tissue reconstruction of a severely deficient site prior to implant placement: a case report

# Management of a complex case

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**Restoration of a single missing tooth with an implant-supported prosthesis can be a challenge where severe hard- and soft-tissue loss is present. These severely deficient cases often require bone and soft-tissue reconstruction, in multiple stages, prior to implant placement to achieve an optimum clinical outcome. This case report describes how the severely deficient site of an upper left first molar was reconstructed using biomaterials and soft-tissue grafting prior to the restoration of the area with an implant-supported crown.**

The predictability of implant treatment and also the long-term stability of the implants in function depend on the quality and quantity of the available bone. Augmentation of the alveolar ridge is often a prerequisite before implant placement due to unfavourable local conditions caused by previous infections, periodontal conditions, surgical trauma or atrophy – especially in order to place the endosseous implants in their optimum prosthetic position.

## Case report

A fit and healthy 42-year-old male patient presented at our clinic to have his missing upper left first molar (tooth 26) replaced with a fixed restoration. His dentition was heavily restored but well maintained, with good oral hygiene. His occlusion was stable.

Having suffered few bouts of pain, infection and swelling, he had this tooth removed by his general dental practitioner a year earlier. The baseline radiograph, taken by the dentist, showed a heavily restored molar with endodontic treatment and two prefabricated posts in its palatal and distobuccal roots (Fig. 1). Deep root caries and bone loss at the furcation was obvious. The patient explained that the extraction had been complicated by root fractures and subsequent sinus exposure; therefore, the dentist referred the patient to a local oral surgeon who then closed the area by a buccal advancement flap. The area healed up without further complications. The dentist had taken a digital pantomograph a few months after the extraction, which revealed highly compromised bone (Fig. 2).

On our clinical examination one year after the surgical extraction, we realized that the soft-tissue architecture was also severely compromised subse-

quent to the buccal advancement flap (Fig. 3). As is obvious in this image, the buccal frenulum had been repositioned and was very close to the gingival margin of tooth 25, which might have caused further gingival recession and discomfort at this tooth later on. Furthermore, the buccal mucosa was extended almost to the midcrestal of the site of the missing tooth 26. A CBCT was taken to assess the bone morphology of this area in detail (Fig. 4). It was obvious from the scan that the sinus floor had been perforated at the bottom of the socket, but with the membrane still intact. The tip of the distobuccal root was also evident just above the sinus membrane. The palatal bone was also thin and highly compromised.

After explaining the existing complex problem to the patient and discussing different treatment options, he decided to have this missing tooth replaced with an implant-supported restoration. He was informed that there was a complex bone and soft-tissue deficiency at that site and that, to restore the area with an implant-supported restoration successfully with a predictable long-term prognosis, the lost alveolar bone would have to be reconstructed and the soft-tissue profile improved around the future implant site. The patient agreed to the proposed treatment plan, which was carried out in stages as follow:

During the first treatment phase, a full mucoperiosteal flap was raised after a supracrestal incision and mesial and distal releasing incisions incorporating teeth 25 and 27. There was virtually no alveolar bone at site 26. The cavity had mesial, distal and palatal walls. The membrane was exposed at the bottom of the defect (Fig. 5). A sinus lift procedure was performed through the floor of the defect after



Fig. 1 Failing upper tooth 26.



Fig. 2 Digital pantomograph few months after extraction.



Fig. 3 Loss of attached gingiva and a displaced buccal frenulum are evident.

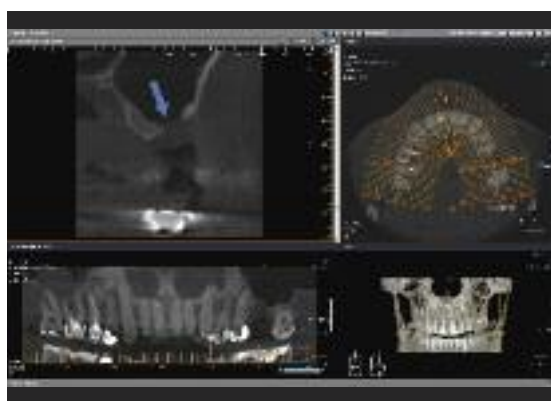


Fig. 4 CBCT scan of the area depicting the bone fenestration in the sinus floor.



Fig. 5 Exposed intact sinus membrane.



Fig. 6 Periapical view six months after the augmentation.



Fig. 7 Two months after the free gingival graft.



Fig. 8 Healed palatal donor site.

extending the existent bone perforation. This space and the alveolar defect were filled and reconstructed with Regenaform (Exactech Dental Biologics). The whole of the augmented area was covered with a resorbable membrane, Bio-Gide (Geistlich Biomaterials). The flap was replaced after periosteal release, and the surgical site was sutured and closed primarily without any tension. The area healed without complication, and a periapical radiograph six months postoperatively confirmed an optimum outcome (Fig. 6).

During the second treatment phase, six months after the first phase, a free gingival graft was harvested from the left side of the palate and grafted to site 26 after raising a full mucoperiosteal flap incorporating the buccal frenulum and repositioning it apically. Upon reentry, the grafted alveolar ridge was found to be completely transformed to a solid mass. The donor and recipient sites had healed uneventfully. Figures 7 and 8 show these areas two months postoperatively.



Fig. 9 Implant with healing abutment.



Fig. 10 Implant with healing abutment.



Fig. 11 Integrated implant.



Fig. 12 Prefabricated abutment on the master model.



Fig. 13 Ceramic-bonded crown on the master cast. The soft-tissue mask was removed.



Fig. 14 Implant with abutment in place.



Fig. 15 Periapical radiograph shortly after crown delivery.



Fig. 16 The cement-retained ceramic-bonded crown.

During the third treatment phase, two months afterwards, a 13-mm wide-platform Nobel Replace Tapered implant (Nobel Biocare) was placed in the healed site after raising a minimal full-thickness flap. Figures 9 and 10 show the healed site with a healing abutment in place. Three months after implant placement (Fig. 11), a head-of-fixture impression was

taken and a cement-retained ceramic-bonded crown was fabricated (Figs. 12 and 13). Periapical radiographs confirmed the correct fit of the abutment and crown (Figs. 14 and 15) and showed the integrated implant with a good bone level. Figure 16 shows the fitted crown on the same day. The soft tissue around the implant-supported crown appeared healthy at the



Fig. 17 One year after delivery.

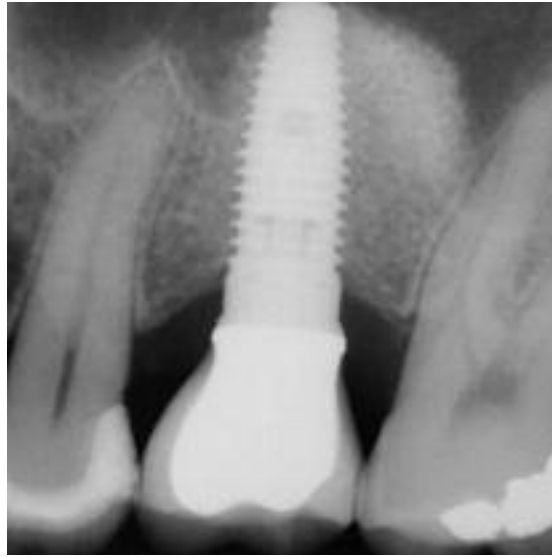


Fig. 18 Periapical radiograph one year after delivery.

review appointment one year after crown delivery (Fig. 17) and a periapical radiograph also showed a stable bone level around the implant (Fig. 18).

## Discussion

Severe local bone deficiency together with an altered gingival contour presented a real challenge in restoration of the area with an implant-supported prosthesis. Destruction of the bone due to previous and ongoing infections and subsequent bone loss after tooth extraction and sinus-floor remodelling were extensive.

Clinical evidence supports vertical and lateral ridge augmentation procedures to enable implant placement [1,2] with autogenous grafts widely considered to be the gold standard for the predictable correction of severe localized ridge deformities [3]. However, there are a few limitations, including constraints related to the available donor-tissue volume and morbidity secondary to graft harvesting. Nerve injury, soft-tissue injury, wound dehiscence and infection are some of the possible complications associated with cortico-cancellous block grafts harvested from intra-oral sites [4,5]. Increased cost and total treatment time are some of the other drawbacks.

In this case, however, using a bone block to reconstruct the alveolar bone was very difficult, as there was no bone wall to readily secure and stabilize the graft against, using fixation screws. On the other hand, further increases in bone height would probably have required sinus augmentation prior to block grafting.

The posterior maxilla with pneumatized sinuses often requires sinus augmentation before implant

placement [6]. *Boyne* and *James* published a technique for augmenting the maxillary sinus in 1980, using autogenous bone [7]. Since then, many different techniques have been developed [8-10]. In this patient, sinus augmentation was carried out using a Piezotome (Satelec), extending the existing defect at the bottom of the cavity; consequently, bone removal and further damage to the site was kept to a minimum.

With this technique, sinus augmentation and alveolar reconstruction were performed simultaneously using Regenaform, a single-donor allograft paste. Due to its inert biological carrier matrix [11], Regenaform is easily mouldable to any shape and turns into a resilient solid at body temperature. It contains an optimum concentration of demineralized bone matrix (DBM) for osteoinduction, which provides for the formation and development of bone tissue [12]. The osteogenic properties of DBM were demonstrated in 1965 [13]. Regenaform also contains cortico-cancellous bone chips, which provide osteoconductivity. Cortico-cancellous bone chips have been used in surgery since 1947 [14]. The inert biological carrier matrix of Regenaform also facilitates rapid vascularization [15].

The grafted site was covered with Bio-Gide to avoid immediate connective-tissue proliferation and infiltration into the grafted area. The resorbable membrane was shown to be effective in stabilizing graft particles and preventing soft-tissue infiltration [16].

Nearly all of the attached gingiva had been lost in this area subsequent to the buccal advancement flap, and the buccal frenulum was displaced close to the gingival margin of tooth 25. This new position of the frenulum would probably have resulted in

gingival recession, inflammation and root sensitivity in the future. On the other hand, there is a relation between the width of keratinized tissue and the health of the peri-implant tissue. Bleeding on probing and mean alveolar bone loss are increased for implants surrounded by less than 2 mm of keratinized mucosa than for implants with a wider zone of keratinized mucosa [17]. Both these issues were addressed and corrected by gingival grafting in the second phase of the treatment.

### Conclusion

Successful management of this complex case with a predictable outcome required multiple surgical interventions. This obviously took rather a long time to accomplish. Although autogenous bone is the material of choice in bone grafting, other bone substitutes may also be reliably used. This is less invasive to the patients with fewer complications; therefore, it may be more acceptable to them.

I would like to draw the reader's attention to an article which was published recently in the European Journal for Dental Implantologists (EDI Journal 2/2012, p. 56f.) [18]. A very similar situation was handled with a different technique, which makes the article interesting reading. ■

Visit the web to find the list of references ([www.teamwork-media.de](http://www.teamwork-media.de)). Follow the link "Literaturverzeichnis" in the left sidebar.

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