Ridge augmentation for an atrophied posterior mandible using NanoBone block

Part I: Treatment outcome of complications

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_Introduction

Reconstruction of the posterior mandible is challenging because the deformity involves deficiencies in both bone and mucosa,[1] and unlike the maxillary sinuses, the alveolar ridge does not provide a natural cavity to contain particulate grafting material.[2] Therefore, the graft must have sufficient strength and rigidity to be fixated at the recipient site. It must also be three-dimensionally stable to withstand muscular forces.[3] Constraints in autogenous bone block graft availability from intra-oral sites often limit treatment possibilities.[4] Among the possible alternatives to autogenous bone block grafting is the use of synthetic NanoBone block (ARTOSS GmbH). This article will discuss the potential complications during atrophied posterior mandible augmentation using NanoBone block, practically focusing on outcome of complications treatment (Figs. 1&2).

Complication from ridge augmentation may be related to problems in bone management such as bone block fracture or improper block fixation or problems in soft tissue management. The volume added by insertion of bone block graft often requires release cuts and dissection of the periosteum. Dissection of the periosteum is a common technique for elongation of the flap. However, excessive periosteum releasing incisions can also result in overthinned or overstretched soft tissue which when placed over the bone block graft may lead to perforation or flap necrosis. Tension-free wound closure is a key factor for success in bone block grafting procedures. So, full-thickness flaps should be prepared in the area of the grafted site and split-thickness flaps beyond the site to provide tension-free wound closure. Sharp edges of the bone block should be carefully avoided to prevent flap injuries.[5]

Fig. 1_ NanoBone block fixation at ridge augmentation procedures.
Fig. 2_ Bone gained six months after ridge augmentation.

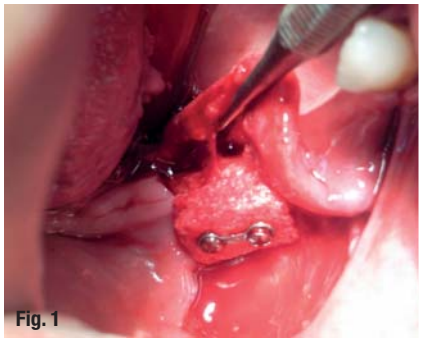
Fig. 1

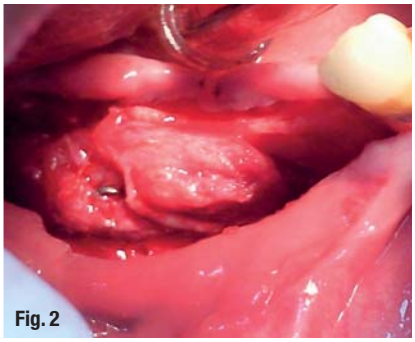
Fig. 2

_Complications during block grafting

Complications related to problems in bone block management

Shaping of the bone block for a perfect fit into the surgical site using rotating instruments may pose a risk of injury to the surgeon and fracture of the bone block.

Complications related to problems in soft tissue management

Soft-tissue related problems are even more difficult to handle and are often underestimated. Delicate mucosa, scar tissue and lesions may complicate coverage with sufficient soft tissue. The volume added by the insertion of bone block often requires release cuts and dissection of the periosteum. Opening of the wound due to flap retraction or flap necrosis with subsequent graft infection is one of the major complications in bone grafting procedures. However, this problem is predominantly one of soft tissue. Tension-free

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Fig. 3a

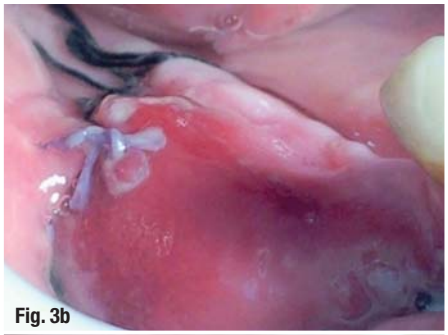
Fig. 3b

Fig. 4

Fig. 5

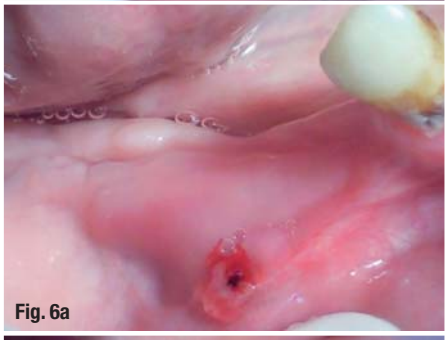
Fig. 6a

Fig. 6b

Fig. 7a

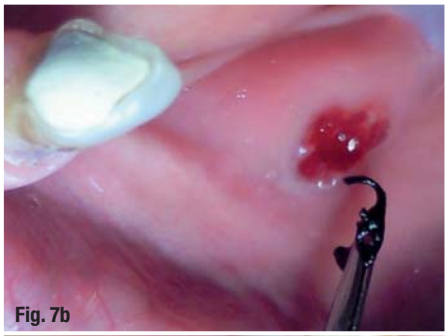
Fig. 7b

Fig. 8a

Fig. 8b

Fig. 9a

Fig. 9b

Fig. 10a

Fig. 10b

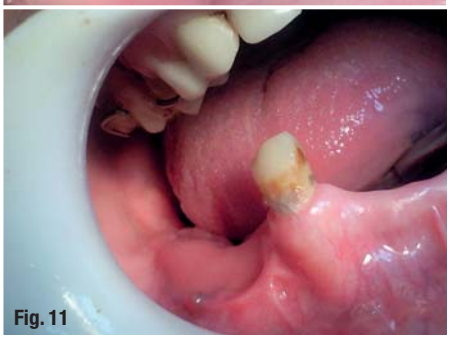
Fig. 11

Figs. 3a & b_Trauma to overlying mucosa from upper molar.
Fig. 4_Upper denture made to maintain centric occlusion.
Fig. 5_Complete healing of the traumatic ulcer.
Figs. 6a & b_Infection to NanoBone graft (right side) and Fisiograft (left side).
Figs. 7a & b_Suture removal.
Figs. 8a & b _Complete healing.
Figs. 9a & b_Cover screw exposure.
Figs. 10a & b_Cover screw removal.
Fig. 11_Healing of the overlying tissue.

Fig. 12

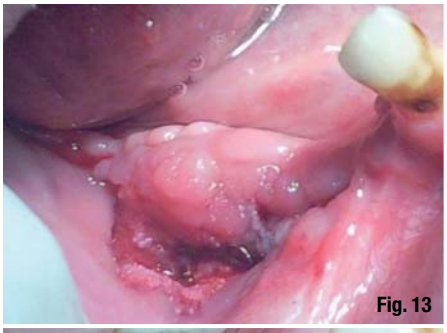
Fig. 13

Fig. 14

Fig. 15

Fig. 16

Fig. 17

Fig. 18a

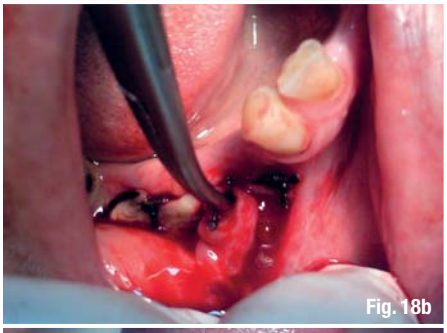
Fig. 18b

Fig. 19a

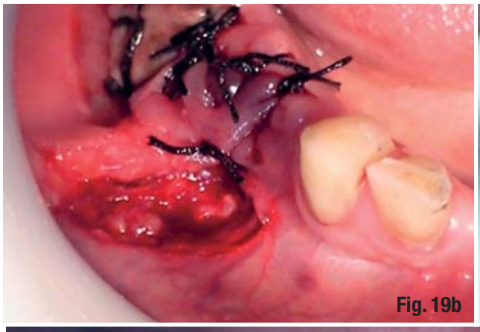
Fig. 19b

Fig. 20a

Fig. 20b

Fig. 21a

Fig. 21b

Fig. 12_Inflammation of NanoBone block graft.
Fig. 13_Vestibular incision.
Fig. 14_Removal of miniplate and miniscrew.
Fig. 15_Suturing.
Fig. 16_NanoBone graft healing.
Fig. 17_NanoBone block graft exposure.
Figs. 18a & b_Vestibular incision and pedicle flap to cover NanoBone block graft.
Figs. 19a & b_Suturing.
Figs. 20a & b_Partial distal graft exposure.
Figs. 21a & b_Distal pedicle flap.

wound closure is a key factor for success in bone grafting procedures. Dissection of the periosteum is a common technique for elongation of the flap. However, excessive periosteum releasing incision can also result in overthinned or overstretched soft tissue, which when placed over the bone graft may lead to perforation or flap necrosis. Full-thickness flaps should be prepared in the area of the grafted site and split-thickness flaps beyond the site to provide tension-free wound closure. Sharp edges of the graft should be carefully avoided to prevent them from injuring the flap or affecting the microcirculation of the tissue. Double layer wound closure, pouch or tunnel approaches, and pedicle connective tissue flaps are suitable techniques for prevention of these problems.[6]

_Postoperative complications

Early Complications

1) Haematoma, swelling and ecchymosis: Swelling is a normal surgical effect, but it is also a cause of great concern to the patient. For this reason, patients must be informed that the surgical site or the face may swell. The patient must be assured that the degree of swelling is not an indicator of the success or failure of the surgery or the degree of difficulty of the case. Haematoma can complicate and prolong the postoperative phase. Ecchymosis is primarily an aesthetic problem. Discoloration of the facial and oral soft tissue is caused by extravasation and subsequent breakdown of blood in subcutaneous tissues. Ecchymosis is more common in fair-skinned patients and in elderly patients with fragile capillaries. It is basically the deposition of the blood from the surgery in the interstitial tissue spaces and will be resorbed. Heparin gel may accelerate the process of resorption.[5]
2) Dehiscence and flap necrosis: These soft-tissue complications are frequently the result of vascular compromise caused by inadequate planning, insufficient flap range or excessive surgical trauma, especially in smoking patients. Also, mechanical overloading of the grafted area with a removable prosthesis or through biting of the antagonist teeth could also be the cause of complication, with exposure of the graft to the complex microbiological spectrum in the mouth and graft infection which leads to graft degradation and total failure of the procedures. Dehiscence may occur because of premature separation of sutures as a result of inadequate suture technique or tension of the soft tissues. Retraction of a soft tissue flap is most likely where the vestibule is shallow or the muscle pull is great.[5]

Late complications

1) Exposure of the screws: During the healing process, a decrease in graft volume is a normal sign of the remodeling process. Vorhoeven et al. 2000 reported a loss of up to 25% of the overall height of bone graft.[7] While the bone volume decreases, the fixation screws stay in their original position and may emerge through the overlaying soft tissue. In the early stages of the healing, the screws have to stay in place for proper stabilisation of the graft. In the later stage, exposed screw can be removed. The soft tissue perforation will heal properly after a couple of days.[5]
2) Exposure of part of the graft: Knife-edge graft can provoke perforation of the overlying soft tissue with subsequent dehiscence. In addition, pressure from a removable temporary prosthesis can create local irritation and dehiscence, which will jeopardise the success of the operation. Hollowing out of existing provisional prosthesis to avoid direct contact with the wound bed is another key factor for success in bone graft procedures.[5]

If a small dehiscence occurs after block grafting, treating the site with chlorhexidine gel and mouth rinse can be attempted until wound closure. Exposed bone chips have to be removed. Exposed parts of the graft are considered to be contaminated and debridement with a bur has to be performed. Surgical intervention is used to achieve soft tissue closure only when the early stage of soft tissue healing is over. After the initial healing process, debridement of the graft has to be performed and a conventional flap design may be used to try to close the soft tissue. If the site is not covered with soft tissue during the first two weeks after intervention, the complete graft has to be removeds.[5]_

Editorial note: To be continued in the next issue of implants: international magazine of oral implantology, *with an extensive description of complications and conclusion.*
A complete list of references is available from the publisher.

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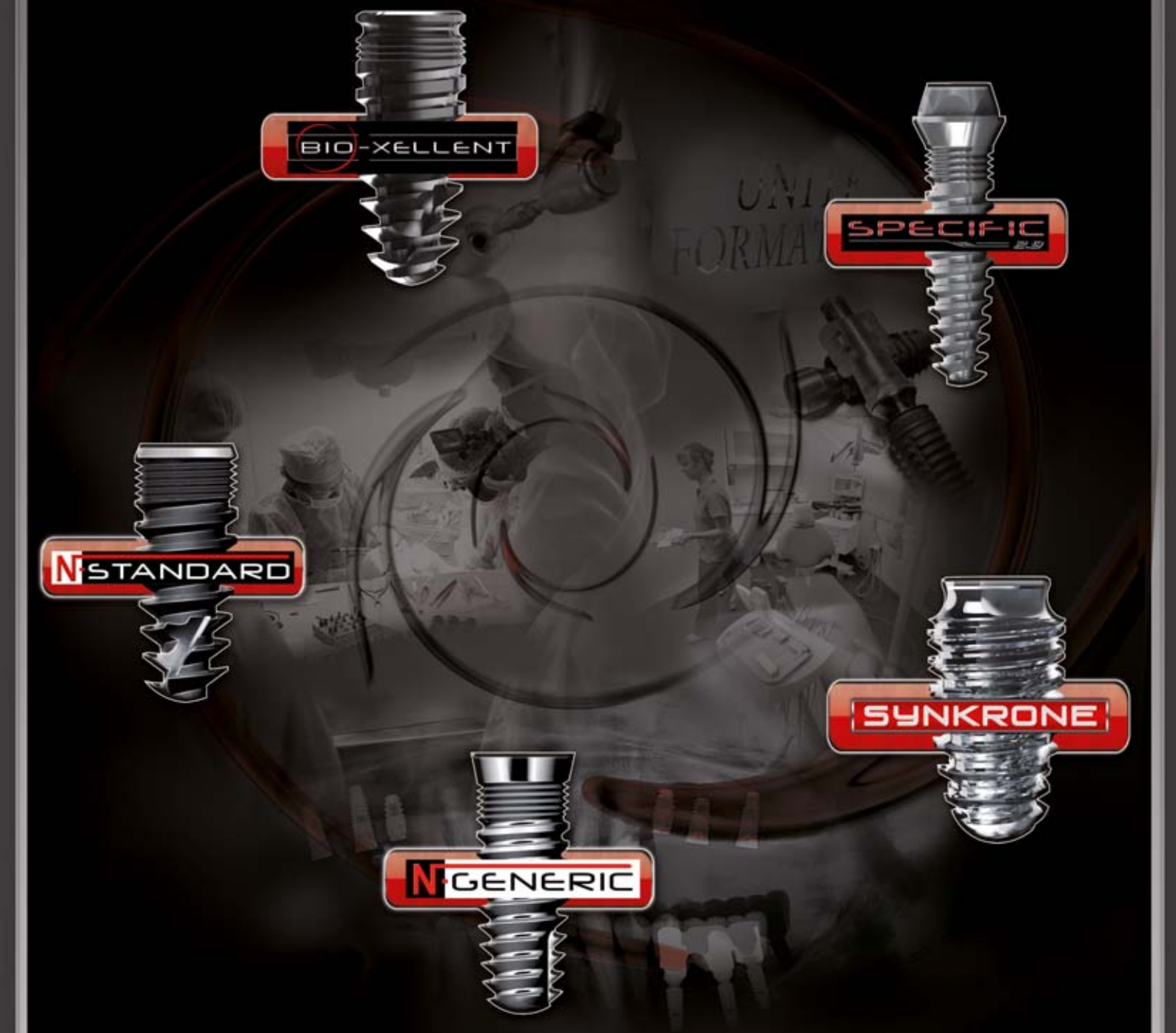

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