New perspectives in the treatment of severe mandibular atrophy: “double sandwich” osteotomy

Albino Triaca a,1, Daniel Brusco a,1, Paolo Asperio b,2, Raquel Guijarro-Martínez c,*

a Zentrum für Kiefer- und Gesichtschirurgie, Klinik Pyramide am See, Bellerivestrasse 34, CH-8034 Zürich
b Resident, Department of Oral and Maxillofacial Surgery, Cardinal Muxaia Hospital, Corso Dante, 202, ITA-14100 Asti
c Fellow, Zentrum für Kiefer- und Gesichtschirurgie, Klinik Pyramide am See, Bellerivestrasse 34, CH-8034 Zurich

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The gold standard for treatment of advanced mandibular atrophy continues to be autologous bone grafting. 1,2 Since its description in the 1970s, the sandwich technique has been found to be reliable for the reconstruction of atrophic mandibles (Cawood and Howell types IV-V). 1,3–5 Its main advantages are the potential for three-dimensional reconstruction, minimal morbidity, and stable long-term outcomes. 1,3–5 However, beyond certain cranialisation of the cut fragment of bone, the vertical vector becomes mixed and the reconstructed alveolar ridge may be morphologically inadequate for the placement of implants.

A horizontal osteotomy of the edentulous mandibular bone is then made with a thin bur or piezoelectric saw. The osteotomy is finished by 2 (mesial and distal) slightly divergent vertical osteotomies (Fig. 1). The bone fragment, which remains anchored to the lingual and crestal periosteums, is raised cranially with a Gillies hook so that it “faces” the operator (Fig. 2). At this point, a second horizontal osteotomy is made to divide the freshly cut surface into 2 fragments: the first (the former buccal aspect), which remains attached to the crestal periosteum, becomes the roof of the defect, and the second (lingual aspect), which remains attached to the

Operative technique

A full-thickness incision is made buccally 1 mm below the mucogingival line. Soft tissues are tunnelled cranially in a subperiosteal plane. Moderate lateral extension of the subperiosteal dissection facilitates eventual mobilisation of the cut bone. However, the crestal periosteum must be preserved to ensure adequate vascularisation of the future cranial segment.

Fig. 1. Horizontal osteotomy finished by 2 vertical osteotomies. Note that the crestal periosteum remains attached to the cranial segment.

1 Corresponding author. Tel.: +41-44-388 14 88; fax: +41-44-388 14 99. E-mail addresses: a.triaca@pyramide.ch (A. Triaca), d.brusco@pyramide.ch (D. Brusco), asperio@asl.at.it (P. Asperio), guijarro.raoj@gmail.com (R. Guijarro-Martínez).
2 Tel.: +41-44-388 14 88, fax: +41-44-388 14 99.
3 Tel.: +39-0141-489352, fax: +39-0141-485438.

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lingual periosteum, becomes the lingual wall of the defect (Fig. 3).

The ensuing structure is a three-dimensional scaffold that can be filled with heterologous bony substitutes alone or in combination with autologous bone, depending on the degree of atrophy of the jaw. In our practice, autologous bone grafts of intraoral (mandibular ramus) or extraoral (iliac crest) origin are routinely used. The vertical dimension is stabilised by the cortical component of the bony blocks. The initial buccal height of the cut segment, now the roof of the three-dimensional framework, becomes the width of the new ridge. The underlying space is filled with a mixture of medullary bone and demineralised bovine bony particles (Bio-Oss® and/or Bio-Oss Collagen®, Geistlich Pharma AG, Wolhusen, Switzerland). The reconstruction is stabilised with osteosynthesis material and finally covered with a resorbable collagen membrane (Bio-Gide®, Geistlich Pharma AG, Wolhusen, Switzerland) (Fig. 4). After release of the buccal periosteum, the wound is closed in 2 layers.

Figs. 5 and 6 show a computed tomographic scan taken at the 2-year follow-up of a patient in whom the “double sandwich” osteotomy was used to augment the left hemimandible. A fixed prosthesis supported by 3 implants was designed.

The “double sandwich” osteotomy creates a vascularised 3-wall defect that permits vertical and transverse bony regeneration. Compared with the classic sandwich technique, it generates a firm vertical augmentation vector, and the new transverse width of the alveolar ridge is firmly maintained by the initial buccal height of the cut segment. Predictable bony regeneration and stable long-term results are guaranteed by the undisturbed vascularisation of the lingual and crestal periosteums.

References