Surgical predictability of vertical GBR in the posterior mandible: flap design, management and passivation of soft tissues as principal keys for success

Authors_Ronda Marco, DMD, and Claudio Stacchi, DDS

The effectiveness of guided bone regeneration (GBR), a technique used to promote horizontal or vertical bone regeneration, has been well-documented since the early 1990s. The stability of the regenerated bone and its positive response in time, once functioning, has also been well-demonstrated.

Vertical GBR is a technique with great potential but one that requires both the precise adherence to surgical protocols and application by operators with the appropriate knowledge and manual skills to ensure optimum management of soft tissues. In addition to achieving primary closure of the flaps, maintaining this closure during the entire period necessary for the formation and maturation of the new bone is a pre-requisite for the avoidance of membrane exposure, which inevitably leads not only to bacterial contamination but, nearly always, to the impairment of the surgical procedure of regeneration.

Numerous studies have described various clinical protocols regarding the management of soft tissues in both the upper and lower arches. This retrospective analysis describes the surgical technique of the management of soft tissues applied during GBR with non-resorbable membranes in 127 cases of vertical defects of the posterior mandible and evaluates the clinical results obtained.

Materials and techniques

Between 2000 and 2012, a total of 127 cases
of vertical bone defects in edentulous posterior mandibles were treated with the use of GBR with non-resorbable membranes. The technique was applied by following a surgical protocol, which has undergone few variations during the years.

From 2000 to 2008, expanded polytetrafluoroethylene (e-PTFE) titanium-reinforced non-resorbable membranes (Gore-Tex TR9, W.L. Gore & Associates, Flagstaff, Ariz.) were used as a barrier device in 72 cases (Fig. 1). From 2009 to 2012, high-density polytetrafluoroethylene (d-PTFE) titanium-reinforced non-resorbable membranes (Cytoplast TI250XL, Osteogenics Biomedical, Lubbock, Texas) were used as a barrier device in 55 cases (Fig. 2).

All the membranes were fixed mesially and distally on the lingual side with the use of titanium pins (Helmut Zepf Medizintechnik, Seitingen, Germany) or mini-screws (Pro-Fix, Osteogenics Biomedical, Lubbock, Texas) (Fig. 3).

After positioning the graft material around the implants, which were left protruding from the crest (Fig. 4), the membranes were also stabilized on the buccal side with the use of titanium pins (Helmut Zepf Medizintechnik, Seitingen, Germany) or mini-screws (Pro-Fix, Osteogenics Biomedical, Lubbock, Texas) (Fig. 5).

Multiple cortical perforations, which created openings for osteopromotion, were then made with a piezoelectric OP5 insert (Piezosurgery, Mectron, Carasco, Italy) in order to stimulate blood and cell migration from the bone marrow spaces to the regeneration area. During the period of time analyzed, various graft materials, alone or combined, were used together with the membranes: autologous bone; tricalcium phosphate; DBM (Dynagraft, Keystone Dental, Burlington, Mass.); MFDBA (Puros, Zimmer Dental, Carlsbad, Calif.); or combinations of mineralized and demineralized allograft bone (MFDBA & DFDBA, enCore, Osteogenics Biomedical).

_Surgical management of soft tissue_

All surgeries as well as postoperative care are carried out by a single operator. For each patient, treatment includes the analysis of a diagnostic wax-up and CT or CBCT scan performed with a template. The objective is not only to position the implants where the quantity of residual bone allows but to position their platforms on the ideal line situated approximately 2 mm under the cement-enamel junction of the adjacent teeth.

After performing local anesthesia, (articaine hydrochloride 4 percent with epinephrine 1:100,000, Septanest, Ogna, Muggiò, Italy), a horizontal, mid-crestal, full thickness incision is performed in keratinized tissue. The incision extends from the distal margin of the last tooth adjacent to the treatment area to the ramus of the mandible, ending with a releasing incision on its buccal surface.

In the proximal vestibular zone, the incision continues intrasurally involving the last two teeth adjacent to the area to be treated and concludes with a vertical hockey stick releasing incision. Lingually, the incision continues intrasurally until the gingival zenith of the last tooth and continues along the crest of the ridge for approximately 1 cm in the thickness of the keratinized
gingiva. Full thickness flaps are then elevated and the mental nerve is isolated. The mobilization and release of the buccal flap is obtained with a horizontal periosteal incision performed with a new blade for the entire length of the flap, from the distal to the mesial release.

This longitudinal incision is performed approximately 5 mm apically from the crestal incision and should only affect the periosteal fibers. The passivation of the vestibular flap, thus obtained, allows for a mean coronal elevation of the flap of approximately 20 mm: this is the sum of the amount of tissue present above the periosteal line of incision (5 mm) and the stretching of the flap following the periosteal incision (15 mm) (Figs. 9, 10).

The lingual flap is also full thickness, elevated until the mylohyoid line is reached. This maneuver allows for the obtaining of a mean coronal elevation of approximately 15 mm (Fig. 11). At this point, following the technique previously described by Ronda and Stacchi, the mylohyoid muscle insertion on the inner surface of the lingual flap is identified, approximately 5 mm apically from the crestal line of incision.

This insertion, with the use of a blunt instrument, is first isolated (Fig. 12) and then separated from the flap by applying light tensile force. This maneuver allows for the near doubling of the lingual flap passivation and brings the coronal elevation from approximately 15 mm to approximately 30 mm (Figs. 13, 14).

The flaps thus passivated can be sutured, covering the membrane without tension, using two different suture lines: one horizontal mattress suture with 3-0 PTFE approximately 5 mm apically from the crestal line of incision (Cytoplast Suture, Osteogenics Biomedical) and a series of interrupted sutures with 4-0 PTFE to complete the flap closure. The releasing incisions are closed with resorbable sutures (6-0, 7-0) (Serafit, Serag Wiessner, Naila, Germany).

The sutures are removed after approximately 12-15 days and, during this period, the patient uses a chlorhexidine 0.2 percent mouthrinse twice a day for one minute. In addition, antibiotics (amoxicillin/clavulanic acid 875+125mg) and NSAIDs (ibuprofen 600 mg) are prescribed for one week.

After a period of approximately six months,
implants

The current flap passivation techniques available to the specialist have significantly reduced the percentage of failure associated with early exposure of the membrane.

Therefore, we can surmise that vertical GBR is a realistically feasible solution in regard to surgical success (treatment results’ stability over time has already been extensively demonstrated), despite the technique being considered highly “operatorsensitive.”

The fact that vertical GBR is a difficult procedure is not, by any means, to be underestimated. It requires extensive knowledge and should be carried out after appropriate training, which must enable the specialist to acquire a complete theoretical and practical knowledge both in the fields of periodontology and implant dentistry.

References are available upon request from the publisher.