An Alternative Approach for Augmenting the Anterior Maxilla Using Autogenous Free Gingival Bone Graft for Implant Retained Prosthesis

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Numerous factors may keep surgeons from placing implants in the anterior maxilla in order to avoid suboptimal restorative outcomes. This paper describes a technique of an autogenous-free gingival–bone block graft, which allows bone and gingival augmentation and a primary seal to be achieved simultaneously. Additionally, it describes a technique for achieving primary soft tissue closure of maxillary extraction sockets using a rotated pedicle palatal connective tissue flap.

Key Words: implants, esthetic, socket, graft

INTRODUCTION

Numerous factors may restrain surgeons from placing implants in the anterior maxilla in order to avoid suboptimal restorative outcomes. Anterior sites often represent a considerable challenge for clinicians and dental technicians. In this area, various local risk factors have the potential to compromise the predictability of the result.[1,2]

Several clinical and histologic studies have shown the dynamic resorptive process that unfolds after tooth extraction.[3] Clinical measurement of buccal tissue resorption confirms that: (1) the alveolar dimension is dynamic; and (2) resorption occurs even after the placement of a dental implant into an extraction socket.[3] Therefore, much interest has been shown towards minimizing or even arresting bone resorption following tooth extraction. In addition, attention has been shown in providing treatment that aims at preserving the natural tissue contours in preparation for a future implant site.[4] Currently, most literature in this field results from animal studies.[5]

Despite some recent advances in bone-substitute technology, autogenous bone grafts remain the "gold standard" in reconstructive surgeries due to their osteoinductive, osteoconductive, and non-immunogenic properties. Autogenous bone can be harvested from extra or intraoral donor sites, which increases the morbidity of the procedures.[6,7] Because of this, several factors must be taken into consideration when choosing the donor site, including the location of the recipient bed, the quality and quantity of the required bone graft, and the potential for surgical complications.[8]

Guided bone regeneration (GBR) is a procedure often employed for an implant site that presents buccal dehiscence or fenestration defects.[9] A barrier membrane is necessary for this procedure. Despite soft tissue problems related to membrane exposure, nonresorbable membranes are often preferred because of their inert biological features and the predictability of the barrier effect .[10] They also fulfill the prerequisites of an ideal barrier membrane,

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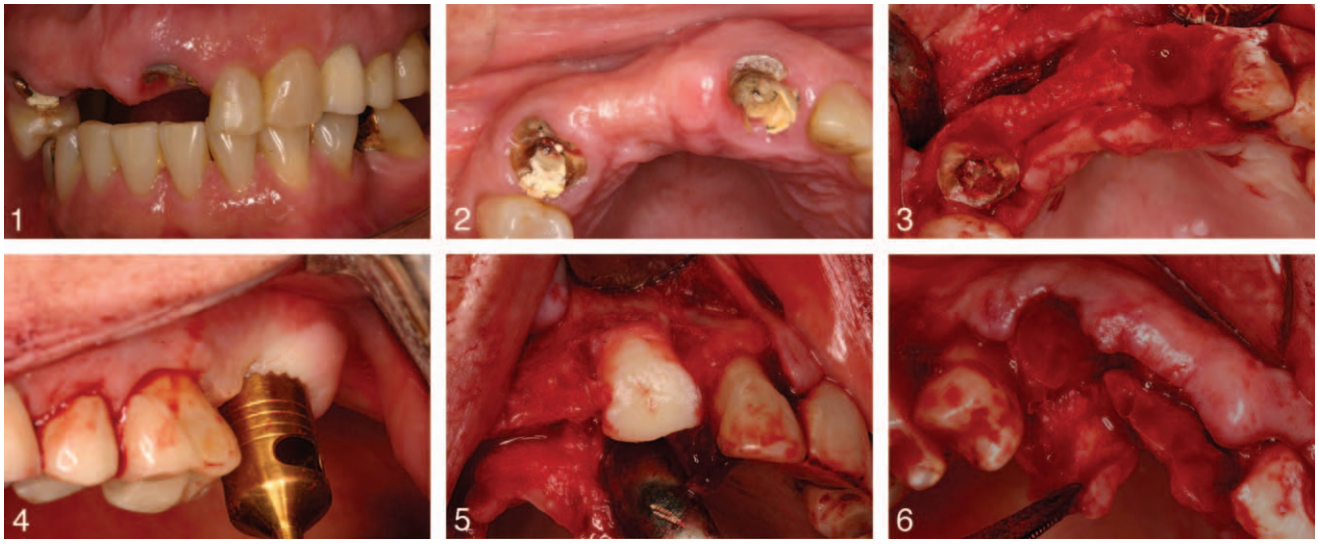


Figures 1–6. Figure 1. Preoperative frontal view in maximum habitual intercuspidation. **Figure 2**. Preoperative occlusal view of the ridge and the residual roots for teeth #6 and #9. **Figure 3**. After flap reflection showing thin ridge. Central incisor was extracted atraumatically due to vertical line fracture. **Figure 4**. An 8 mm trephine bur was used to harvest a bone-tissue cylinder from the tuberosity that was compatible with the alveolar defect of the site #9. **Figure 5**. The free gingival bone graft is positioned in the defected of site #6. **Figure 6**. Subepithelial connective tissue pedicle flap was harvested from the palate and rotated to close the surgical wound over site #6.

which are: (1) biocompatibility; (2) tissue integration; (3) space-making effect; and (4) clinical manageability.[11]

This paper describes a technique of an autogenous-free gingival–bone block graft, which allows bone, gingival augmentation, and a primary seal to be achieved simultaneously. Additionally, it describes a technique for achieving primary soft tissue closure of maxillary extraction sockets using a rotated pedicle palatal connective tissue flap.

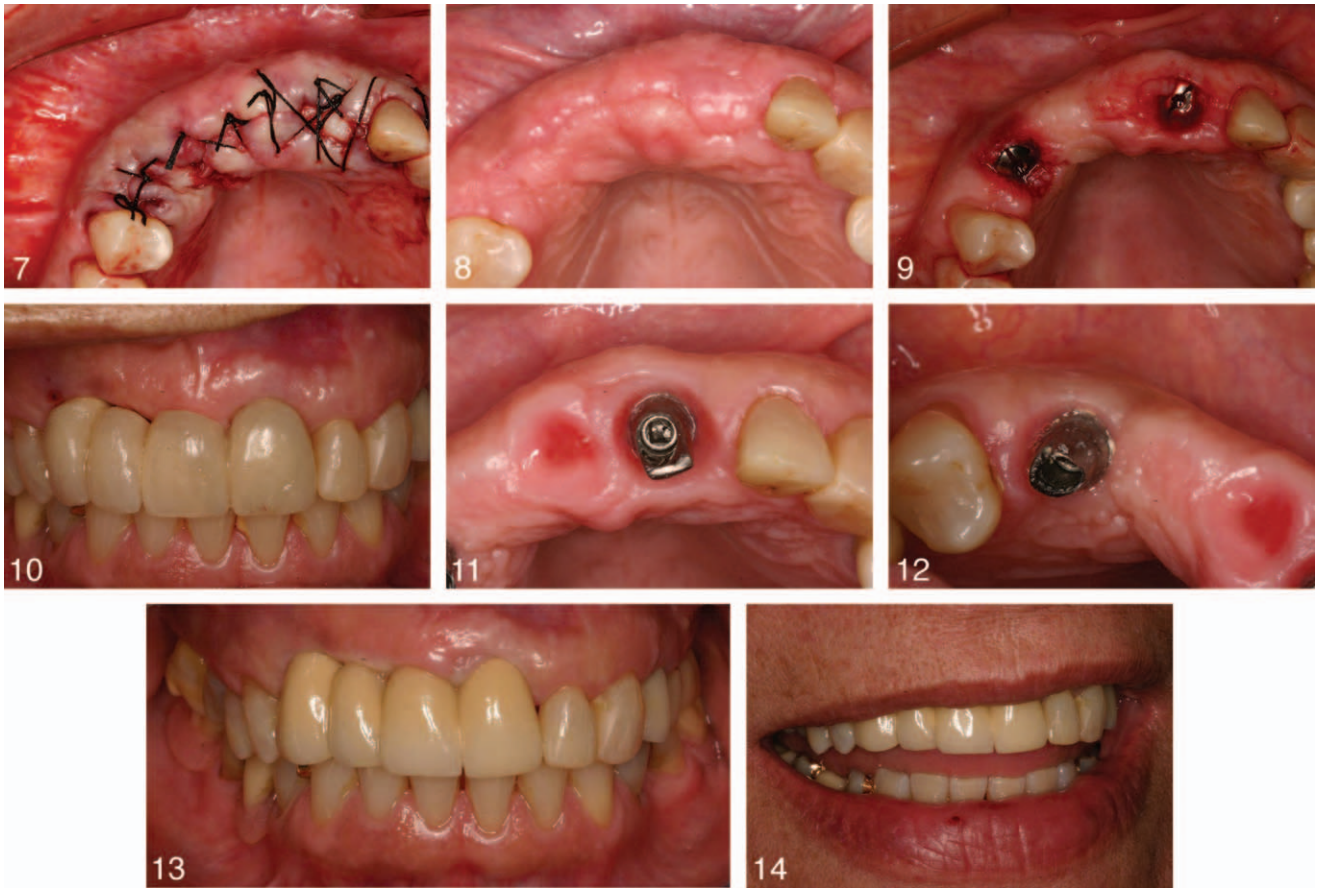
Case Report

A 60-year-old female patient was referred to the Department of Implantology at the Universidade Federal de Juiz de Fora in Brazil (Federal University of Juiz de Fora-UFJF), with the chief complaint of instability of her anterior dental supported fixed partial prosthesis. The presence of root fracture of tooth #9 was suspected. Her medical history was noncontributory. The patient was informed of the restorative options and she showed interest in an implant supported fixed prosthesis, due to the fact that she did not want to involve sound teeth for crown preparations for a tooth retained bridge.

After removal of the crown, the oral exam showed fracture of tooth #9 (Figures 1 and 2). A full-thickness mucosal flap was raised and allowed us to confirm the fracture of tooth root #9 as well as to diagnose a root fracture line on tooth #6 (Figure 3). During tooth extractions, periotomes were used to facilitate the removal of the fractured roots and to reduce trauma to the adjacent bone. After careful luxation with the periotomes, atraumatic removal of the teeth was performed with forceps.

Tooth #9 showed resorption of the buccal wall, so a graft was selected with the appropriate dimensions to fit this defect site. Shape, width, and depth of the socket, and defect were assessed and an adequate trephine was selected. The trephine bur was mounted on a low-speed trepan, which cut both gingival soft tissue and bone under sterile saline cooling. The maxillary tuberosity was chosen as the donor site due to the ease of technique and availability of the necessary tissues (Figure 4). After drilling, the graft was easily harvested with light pressure, by using a thin lever or a periotome that had been inserted between the bony walls of the donor site and the bony portion of the graft. The donor site was sutured after tissue retrieval. Afterwards, no regenerative procedures were conducted.

Next, the free gingival–bone graft was adapted to the post extraction socket. The gingival part of the graft was maintained in position with an interrupted suture. For optimal results, the gingival



Figures 7–14. Figure 7. Tension-free primary wound closure. **Figure 8**. Six month postop occlusal view. Note the width and healthiness of the soft tissues. **Figure 9**. Second-stage surgery conducted 6 months postop. Healing caps placed for implants #6 and #9. **Figure 10**. Acrylic provisional prosthesis placed 1 week after second-stage surgery. **Figure 11**. Preparable titanium abutment in position. Note the healthy tissues for the peri-implant site #9 and the morphology attained by soft tissue management for site #8. **Figure 12**. Preparable titanium abutment in position. Note the healthy tissues for the peri-implant site #9. **Figure 13**. Frontal view of final porcelain-fused to metal prosthesis 12 months postop. **Figure 14**. Patient's smile showing the aesthetic result.

margins were closely adapted and sutured (Figure 5). A barrier membrane (GenDerm, Genius Baumer, São Paulo, Brazil) was inserted around the extraction socket for tooth #6 to avoid epithelium in growth, for the bony walls were intact.

Then, an undermining incision was conducted to allow the flap to cover the membrane and to obtain primary closure of the surgical wound without tension. A sharp incision of the subepithelial tissue was then made parallel to the first incision in the same manner to harvest a pedicle connective tissue graft. The subepithelial connective tissue flap was then reflected (Figure 6) and rotated to cover the defect and to augment the soft tissue. As only a subepithelial connective tissue flap was removed, the palatal wound at the donor site could be closed by primary intention (Figure 7). The patient was advised to rinse with 0.02% chlorhexidine for 2 weeks.

After 3 months of healing, the patient received 2 rough-surface acid-etched self-tap screw type implants with 3.75 mm in diameter and 13 mm in length (Conexão, Sistemas de Prótese, São Paulo, Brazil) under local anesthesia (2% lidocaine with 1:80.000 epinephrine - xylocaine-adrenalin; AstraZeneca, Sodertalje, Sweden). Prophylactic (2 g of amoxicillin 1 hour before surgery) and therapeutic (500 mg every 8 hours for 7 days) antibiotic regimen was administered.

After 6 months of healing (Figure 8), a surgical re-entry procedure was performed. Full-thickness flaps were reflected to access the marginal portion of the implant sites. The cover screws were first replaced with healing caps (Figure 9) then subse-

quently replaced with provisional abutments and a provisional prosthesis (Figure 10). Relineable long-term provisional restorations played an important role in determining the contact area of the pontic and in remodeling the soft tissue recipient site, which resulted in optimal esthetics. For further shaping of the soft tissue, the basal surface of the long-term provisional pontic was slightly roughened with diamonds burs or by air abrasion. Subsequently, a light-curing, low-viscosity resin composite was used to build the pontic up in small increments. The long-term provisional restoration was used for a time period of at least 6 months.

A full-arch impression was taken using a polyether impression material (Impregum Penta Soft, 3M ESPE AG, Seefeld, Germany) in a disposable tray in order to allow the use of the open tray technique. Impression of the opposing arch was taken using alginate. Preparable titanium abutments were used (Conexão, Sistemas de Prótese, São Paulo, Brazil; Figures 11 and 12). The prosthesis was fitted, adjusted and cemented permanently with zinc phosphate cement (S.S. White, Rio de Janeiro, Brazil) (Figures 13 and 14). Occlusion had already been checked. Thereafter, prosthetic procedures were conducted uneventfully.

Discussion

In the esthetic area, successful implant treatments require stable soft tissue as well as the success of osseointegration. At implant sites with thin or absent buccal plates, soft tissue stability could be threatened by marginal bone loss and gingival recession.[12]

In the attempt to maintain or regain the anatomic dimensions of the alveolar ridge, various biomaterials, such as bone autografts, allografts, guided tissue regeneration procedures, xenografts and most recently growth factors have been pursued with varying degrees of success.[13] Autogenous bone, considered historically to be the gold standard, has osseoinductive, osseoconductive, and osteogenic properties and poses no risk of immunologic rejection. The harvesting of autogenous bone has been associated with various complications and morbidity, and it may be difficult to obtain in sufficient quantity.[14,15] However, the autogenous free gingival–bone graft technique removed from tuberosity used in this case report allows for easier retrieval of a graft and its secure stabilization in the prepared site. Rapid healing and integration of the graft were seen clinically and confirmed by histologic results. Fast graft healing is preferred because it reduces the time needed to obtain gingival and bone augmentation for implant placement or papilla reconstruction and allows for earlier functional loading of implants.[12]

Maxillary tuberosity grafts have been described in the literature and used in clinical practice as a source of autogenous bone.[16] There are many advantages of using this region over other intraoral sources of autogenous block grafts (eg, symphysis and ramus). Symphyseal (chin) block grafts carry the risk of lower incisor tooth numbness or wooden sensation, temporary or permanent mental nerve injury,[17,18] incisor tooth injury, lingual cortex fracture and perforation into the lingual soft tissue,[19] uncomfortable scarring of the lower buccal mucosa, as well as esthetic disharmony of the lower facial contours. Ramus block grafts bear a possibility of inferior alveolar nerve paresthesia or anesthesia, decreased sensitivity in the posterior vestibular mucosa (corresponding to the injury of the long buccal nerve),[17] significant postoperative discomfort, swelling, and bleeding, among other complications. Both autogenous block grafts (chin and ramus) have the inherent technical challenges of removing a block graft from the usually dense cortical bone with a saw or bur, as well as lack of postoperative complete regeneration of the donor site to the preoperative level.[18]

Sealing extraction sites with autogenous soft tissue grafts enables the optimal preservation of ridge topography after tooth extraction. Free gingival grafts have been used to cover extraction sockets since 1994.[20] The problem with these grafts, however, is that their blood supply depends on the gingival wall of the socket and the subjacent blood clot. This technique has a very high failure rate.[21] In addition to providing graft containment, the rotated pedicle palatal connective tissue flap technique (RPPCTF) can also serve as a barrier membrane for bone regeneration procedures. When the pedicle graft is rotated, the periosteal side of the tissue is placed against the bone. Although it has been hypothesized that this relationship may enhance the barrier and osteoconductive capacity of the bone graft, there has been no research to validate this concept.[22]

Therefore, this case report was conducted with the addition of a resorbable barrier membrane. In ridge preservation procedures, one of the most difficult clinical challenges is how to achieve primary closure without changing the gingival architecture.[23,24] Use of the RPPCTF provides a quick and effective solution to primary closure and helps to preserve the natural gingival scallop for esthetics.

Conclusion

This clinical case describes a successful technique using a free gingival–bone graft to allow hard and soft tissue reconstruction when the alveolar ridge of an extraction socket is thin or when one or two bone walls are absent. This case also depicts the possibility of the preservation of bony walls after tooth extraction by using a resorbable barrier membrane with a rotated pedicle palatal connective tissue flap to cover the barrier.

Abbreviation

RPPCTF: rotated pedicle palatal connective tissue flap

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