The Use of Freeze-Dried Bone Allograft as an Alternative to Autogenous Bone Graft in the Atrophic Maxilla: A 3-Year Clinical Follow-up

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Freeze-dried bone allograft is an interesting treatment alternative to autogenous bone grafts. This clinical report presents a 3-year follow-up of an atrophic maxilla treated with freeze-dried bone allograft. Ridge augmentation was conducted with freeze-dried tibial allografts. Eight implants were used to support a full-arch prosthesis. Three years later, clinical and radiographic follow-up showed bone surrounding the dental implants. Histologic sections showed the presence of biologically active bone. This clinical case supports the use of freeze-dried allograft as an alternative for the reconstruction of the atrophic maxilla. (Int J Periodontics Restorative Dent 2009;29:643–647.)

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Insufficient bone in sites that might host implants is one of the greatest challenges facing the dental implant surgeon, especially in the maxilla. Sufficient bone quantity and quality are imperative for an ideal implant placement and prosthetic outcome.

Zygomatic implants are recommended in cases that involve bone graft failure, or even when significant maxillary bone resorption has occurred and bone grafting is contraindicated.[1] Therefore, they may be considered as an alternative to bone augmentation procedures in the management of severe maxillary atrophy.[2]

The most frequently used grafting materials for bone reconstruction are autogenous bone grafts, allografts, xenografts, and osteopromotion via either barrier membranes or distraction osteogenesis. These materials and techniques can serve to support the bone's inherent capacity to repair itself, or to maintain the bone tissue at the grafted site by means of osteoinduction and osteoconduction.[3]

Freeze-dried bone allografts alone or in conjunction with autogenous bone grafts for maxillary dental implant rehabilitations have shown success

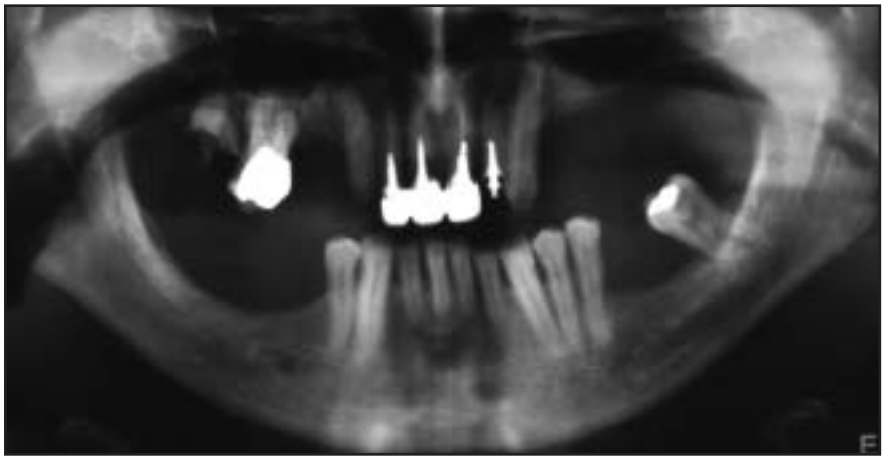

Fig 1 (left) *Pretreatment panoramic radiograph. Note the extensive alveolar bone loss.*

Fig 2 (above) *Clinical view of the remaining teeth. Note the loss of vertical dimension.*

rates of 99%[4] and 96.5%[5] with dental implants receiving delayed and immediate loading, respectively. These studies showed that this type of material can be used as an alternative for treatment of the atrophic maxilla, with a high degree of predictability. Clinical and histologic studies have shown satisfactory incorporation of the allograft to the host bone.[5–7] Freeze-dried bone allografts derived from femoral heads were described in a clinical case report for ridge augmentation of the anterior region of the maxilla prior to dental implant placement. This allograft enabled the formation of lamellar bone after a 4- to 6-month postoperative period. Upon reentry, the newly formed bone showed little contraction and high resistance to torque during dental implant tightening.[8]

The aim of the present report is to present a 3-year follow-up of a periodontally compromised patient with an atrophic maxilla rehabilitated with freeze-dried bone allograft prior to placement of implants to support a fixed prosthesis.

Case report

A 62-year-old man was referred to the dental office. The patient had a history of periodontal disease and presented with alveolar bone resorption, extensive caries lesions, generalized periapical lesions and periodontitis, and residual teeth indicated for extraction. The patient had not consulted a dentist for a period of 10 years. Clinical and radiographic analysis showed a need for ridge augmentation (Figs 1 and 2) after extraction of the maxillary

Fig 3 (left) *Implants are placed bilaterally in the canine areas. Note the lack of bone width in the incisor fossa bilaterally.*

Fig 4 (right) *Tibial ring acquired for grafting.*

Fig 5 (right) *Freeze-dried bone allografts, trimmed and fixated in place. Note the presence of the bone chips mixed with platelet-rich plasma compacted between the bone blocks.*

teeth, prior to the placement of implants that would support a fixed prosthesis.

A surgical procedure was planned for ridge augmentation using freeze-dried tibial allografts (Muscle-Skeletal Bone Bank of the Federal University of Paraná, Curitiba, Brazil). The grafting procedure was necessary to augment the height and width of the anterior maxilla and for bilateral sinus lift. The canine areas showed sufficient bone width to support 3.75- × 13-mm implants (Fig 3). Standard drills were used to prepare the receptor sites and bone blocks (Fig 4), which were trimmed and fixed in the anterior maxilla (Fig 5). A bone block was ground (Bone Grinder, Neodent) into bone chips, mixed with platelet-rich plasma, and compacted into both maxillary sinuses. Bone blocks were trimmed, adapted, and fixed to the maxilla by means of titanium miniscrews (Neodent). Augmentation and the placement of two implants were done in a single surgical procedure.

Fig 6 (left) *Nine months after grafting, six additional dental implants were placed. Note the increased bone volume in the grafted area.*

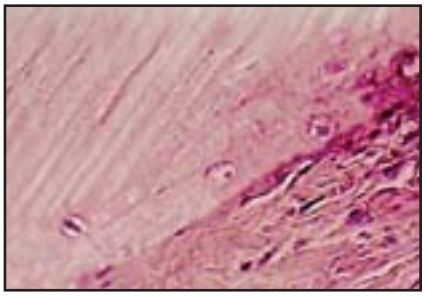

Fig 7 (right) *Histologic section of the grafted area. Note the presence of organized bone tissue suggesting biologically active bone. Notice that the areas between the freeze-dried bone allografts, which were augmented with bone chips mixed with platelet-rich plasma (see Fig 6), do not show new bone after healing.*

Fig 8 (left) *Maxillary full-arch fixed prosthesis. Note recovery of the vertical dimension.*

Fig 9 (right) *Satisfactory esthetic outcome of the definitive maxillary full-arch fixed prosthesis.*

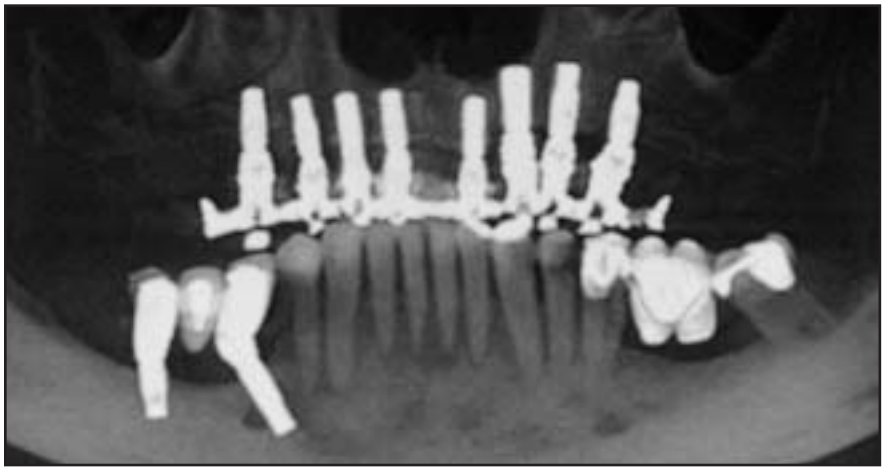

Fig 10 *Three-year follow-up panoramic radiograph. Note the presence of adequate bone surrounding the dental implants.*

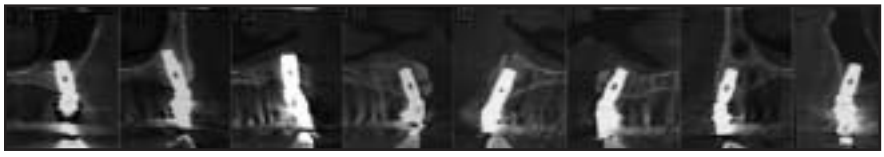

Fig 11 *Three-year follow-up computed tomographic scan (Cone Beam, Cefalo-X Clinic). Note the presence of adequate bone surrounding the implants (left side of the maxilla).*

A second surgery was conducted 9 months later; six more implants were placed (Fig 6). Nine more months later, during reentry, bone material was harvested from around the implants and submitted to histologic analysis. The histologic sections showed biologically active bone (Fig 7). The eight implants were loaded with a fixed full-arch prosthesis (Figs 8 and 9). Three-year computed tomographic scans (Figs 10 and 11; Cone Beam, Cefalo-X Clinic) showed satisfactory bone density in the implanted areas.

The treatment reported here shows the surgical-prosthetic benefits of the use of freeze-dried allografts for rehabilitation of the atrophic maxilla. In addition to reducing the usual number of surgical procedures required, there was an improvement in the maxillo-mandibular relationship because of the increase in bone quantity. This enabled the placement of dental implants in a more adequate position for the prosthesis. The histologic section of the site that received the allograft showed biologic viability of the bone tissue.

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