Bone Morphogenic Protein
Application in Implant Dentistry

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KEYWORDS

- Bone morphogenic protein • Vertical and horizontal ridge augmentation
- Maxillary sinus lift • Implant site grafting and preparation

KEY POINTS

- Alveolar bone that is insufficient to support implant placement due to lack of height or width may be augmented with grafting materials including bone morphogenic protein (BMP) to create sites that are adequate for implant placement and long-term stability of an implant-supported prosthesis.
- BMP can be used alone or in concert with other bone graft materials as an alternative to invasive allograft bone-harvesting procedures.
- Patients who would otherwise not have been suitable candidates for major autologous bone grafting procedures can continue to benefit from implant reconstruction, with a less debilitating bone reconstructive procedure.

INTRODUCTION

Implant-supported prostheses are currently widely accepted as the preferred treatment, by patients and doctors alike, for the partially and completely edentulous patient. Even though implant treatment is preferred, many patients present with insufficient alveolar bone to obtain implant osseointegration. Such a lack of quality alveolar bone (**Fig. 1**), a contraindication of implant placement, is common in patients with long-standing or traumatic edentulism. Many treatments have been developed to prepare the site for implant placement and increase the likelihood of long-term implant stability.

Bone grafting, in particular the autogenous bone graft, has emerged as the treatment of choice of many dentists and oral surgeons. Autogenous bone grafts from the hip and tibia are considered to be the gold standard for large bony defects, but

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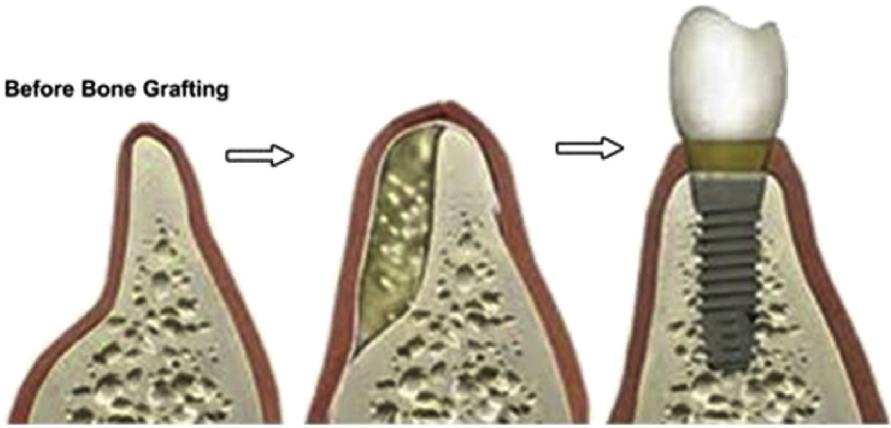

Fig. 1. Common alveolar buccal atrophy in need of preimplant reconstruction. (*From* Dym H, Pierse J. Advanced techniques in bone grafting procedures. Dent Clin North Am 2011; 55(3):454; with permission.)

they can be less than ideal for a large number of patients. These procedures often require general anesthesia, hospitalization, and potentially serious postoperative complications at the donor site. Elderly patients, who often are the most in need of extensive preimplant grafting, are particularly susceptible to many postoperative complications including donor site morbidity, delayed wound healing, and gait disturbances. Given the potential complications and additional surgical sites, many patients are not good candidates for such grafting procedures, and additional patients may elect not to pursue what they view as such invasive treatment.

Given the large and growing patient population requiring nonautogenous bone grafting procedures, there is clearly a need in the general population for a nonautologous graft material that can be used to augment alveolar bone prior to implant placement. Many alloplastic materials and allografts (Table 1) have been used. Most alloplastic materials are considered adequate but less than ideal. The ideal alloplastic material should not only be osteoconductive, but also osteoinductive (Box 1, Table 2).

The search for such a material has led the dental community to bone morphogenic proteins (BMPs).

Table 1
Bone substitute synopsis

Graft Material	Characteristics	Examples
Allograft	A graft that is taken from a member of the same species as the host but is genetically dissimilar	Cadaver cortical/cancellous bone, FDBA, DFDBA
Xenograft	Graft derived from a genetically different species than the host	Bio-Oss, coralline HA, red algae
Alloplast (synthetic materials)	Fabricated graft materials	Calcium sulfate, bioactive glasses, HA, NiTi

Abbreviations: Bio-Oss, bovine bone derivative; FDBA, freeze-dried bone allografts; HA, hydroxyapatite; NiTi, nickel titanium alloy.

Data from Kao ST, Scott DD. A review of bone substitutes. Oral Maxillofac Surg Clin North Am 2007;19:514.