

simulus

The clinical and histologic efficacy of xenograft granules for maxillary sinus-floor augmentation

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What Was Done?

Techniques for augmenting pneumatized maxillary sinuses have proven to be safe and effective for creating sufficient amounts of vital bone to enable implant placement. A number of biocompatible and non-viable osteoconductive bone substitutes have been introduced to minimize the use of autogenous bone grafts. Bovine xenografts, whose chemical and physical properties are similar to those of human bone, have been effective in the formation of vital bone in the pneumatized sinus and have achieved high implant-survival rates. Hydroxyapatite xenograft granules (Endobon®, BIOMET 3i) derived from cancellous bovine bone have been introduced to function as a non-resorbable osteoconductive scaffold. The two-step processing of these granules (using pyrolysis at a temperature above 900°C and sintering at a temperature above 1,200°C) allows complete deproteinization, as well as destruction of potential residual bacteria, viruses, and prions. The aim of this study was to investigate the potential of xenograft granules to form vital bone in the non-natural bone-forming areas of maxillary sinuses.

How Was It Done?

At six dental offices, 14 sinus augmentations were performed in 14 patients, all of whom were documented to have less than 5mm of remaining alveolar bone height in the posterior edentulous maxilla. Lateral window osteotomies were created, and the exposed sinus membranes were elevated. The sinus cavities were filled with 500- to 1,000-µm granules of Endobon Xenograft Granules and covered with resorbable collagen barrier membranes (OsseoGuard®, BIOMET 3i). Primary closure was achieved. After six months, CT scans were taken,

and sinus-core biopsies were obtained, processed, and analyzed using both light and scanning electron microscopes.

What Were the Results?

Surgical outcomes were uneventful, and sufficient radiopaque volume was present radiographically to enable placement of dental implants. Clinical reentry at six months revealed bone formation at the osteotomy sites. The histologic evaluations showed the xenograft granules to be integrated and surrounded by woven bone. The granules appeared to be in close contact with the particles. Around some particles, rims of osteoblasts were observed depositing osteoid matrix. No inflammatory cells were noted around the particles, nor were there any obvious signs of xenograft resorption. The woven bone appeared to be undergoing remodeling and maturation to become well-organized lamellar bone.

Clinical Relevance

Predictable formation of vital bone can be achieved using osteoconductive Endobon Xenograft granules. No osteoclastic bone resorption was observed in the sinus-augmentation sites in this study. The two-step high-temperature processing undergone by the particles results in a crystalline-like structure of more than 95% of the hydroxyapatite, which probably explained the graft particles' slow resorption rate; HA resorption has been documented to increase as crystallinity decreases. It is possible that the amount of vital bone content could be additionally increased by lengthening the time until biopsy.

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