Maxillary Sinus Elevation Surgery with ChronOS and Autogenous Bone Graft: Immunohistochemical Assessment of RUNX2, VEGF, TRAP, and Osteocalcin

Abstract
The purpose of this study was to evaluate a composite graft of ChronOS, a beta-tricalcium phosphate (beta-TCP), mixed 1: 1 with an autogenous bone graft in human maxillary sinus augmentation. A total of 12 maxillary sinuses were grafted with an autogenous bone graft (control group), and 9 maxillary sinuses were grafted with ChronOS mixed 1: 1 with an autogenous bone graft (test group). After 6 months, biopsy samples were obtained concurrent to the placement of dental implants and were subjected to histomorphometric and immunohistochemical analyses for Runt-related transcription factor 2 (RUNX2), vascular endothelial growth factor (VEGF), tartrate-resistant acid phosphatase, and osteocalcin. Histologic analysis of samples obtained from the test group revealed the presence of immature bone, while samples from the control group indicated lamellar bone formation. However, both types of bone grafts were well vascularized. The new bone formation averaged 25.4% +/- 6.4% in the test group and 38.6% +/- 10.5% in the control group (P = .001). Immunostaining of samples in the test group showed high cellular turnover. The outcomes of this study demonstrate a delay in bone formation but intense cellular differentiation after 6 months of bone graft healing in the test group. The amount of immature bone and the immunostaining for RUNX2 and VEGF provide evidence of an osteogenic pathway that can improve the bone formation rate. (AU)