A new HA/TTCP material for bone augmentation: an in vivo histologic pilot study in primates sinus grafting.

Authors: Piccinini M.1, Rebaudi A.2, Bucciohti F.3, Robotti P.3, Sglavo V.M.1

1Department of Materials Engineering and Industrial Technologies, University of Trento, Italy
2Assistant Professor of University of Genova, Italy and BioCra, Genova, Italy
3Eurocoating SpA, Cirè-Pergine Valsugana (TN), Italy

Objective: Synthetic calcium phosphates bone grafts are widely used in sinus graft procedure thank to their osteoconductive and biocompatible properties. Hydroxyapatite (HA), beta-tricalcium phosphate (βTCP) and HA/βTCP are the most applied biomaterials. The aim of the present work was to introduce a new formulation, HA/Tetracalcium phosphate (TTCP), as biomaterial for bone regeneration in the maxillary sinus.

Methods: Sinus grafts were performed using granules of an HA/TTCP blend and a collagen membrane. Bone response at time points of 14 and 17 weeks was histologically evaluated.

Results: After 14 weeks of healing histomorphometric analysis showed the formation of new bone trabecucale among HA/TTCP granules. After 17 weeks the bone trabeculae were thicker than at 14 weeks. HA/TTCP granules were still present after 17 weeks. Histomorphometric analysis revealed a bone graft contact (BGC) of 64%. Bone volume (BV) and vital bone (VB) were high as well corresponding with a medium bone density (D2-D3), which is an ideal bone density for implant placement.

Conclusion: After 17 weeks of implantation HA/TTCP synthetic bone graft, performed very well as osteoconductive material, indeed BGC was found very high and BV and VB showed an ideal bone density for implant placement. According to these data HA/TTCP granules may be supposed to accelerate new bone formation, and reduce the time needed for the graft healing, achieving high quantity of new bone formed.

Key Words: bone regeneration, maxillary sinus lift, hydroxyapatite, synthetic bone grafts, tetracalcium phosphate