Histometry and histomorphology of bone reactions after human sinus floor augmentation with Bio-Oss® or Endobon®

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INTRODUCTION: Augmentation of the atrophic maxillary sinus floor prior to endosseous dental implant placement is a well documented method. Over the last decade, deproteinized bovine bone mineral (Bio-Oss®, Geistlich Biomaterials) has emerged as the material of choice for most of the clinicians. The aim of this maxillary sinus augmentation mirror study was to compare the amounts of new bone generated with Bio-Oss® to another bovine bone-derived material (Endobon®-Biomet 3i), produced by a high-temperature sintering process.

METHODS: In a prospective and controlled multicenter study [1] a total number of 94 sinus augmentation procedures (38 unilateral/28 bilateral) were performed in 66 patients by the „lateral window technique". One of the two bovine bone-derived bone substitute materials (Bio-Oss®, Geistlich Biomaterials, 0.25-1.0 mm granulate) or (Endobon®, Biomet 3i, 0.5-1mm granulate) was used according to randomization. After six months healing trephine biopsies (2 mm inner/3 mm outer diameter) were retrieved before implant placement. Only eight of the retrieved biopsies were processed in HP's laboratory, and Giemsa-surface stained undecalcified ground sections were prepared for histomorphological and histometrical evaluation. For histometry digital micrographs were taken at 40x magnification and merged to overview images. Under microscopic control, new bone (NB) and bone substitute particles (BS) were identified, demarcated and false colour labelled, using Adobe Photoshop® CS5. On TIFF-images, the region of interest ROI (excluding the original sinus floor), area %NB and %BS per ROI, and BS surface% with NB contact were measured in NIS-Elements AR 3.2 (Nikon Laboratory Imaging Inc.), and calculations made with MSOffice Excel.

RESULTS: Light microscopy of Bio-Oss® shows orderly lamellar bone structures with osteons and clearly visible empty osteocyte lacunae. The Endobone® particles have a more "ceramic" granular structure, but also empty osteocyte lacunae and former Haversian canals are visible.

On both materials direct new bone apposition and growth into Haversian canals is visible (Fig.1), but no obvious signs of BS resorption.

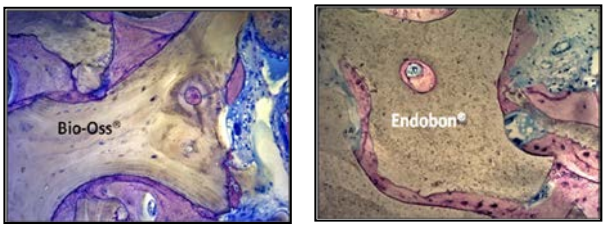
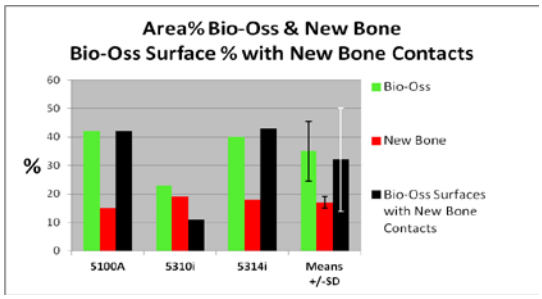
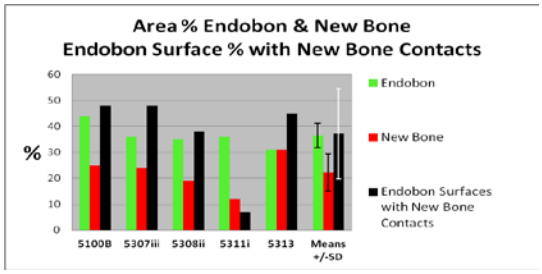


Fig.1: Details (100xmagn.) from Giemsa-surface stained ground sections show direct apposition of purple stained new bone to Bio-Oss® and Endobon® granulate surfaces.





DISCUSSION & CONCLUSIONS: Histometry demonstrated in this study that both bone substitute materials have similar "biological profiles" with regard to area% new bone formation and surface% contacts. However, histometric data varied greatly between biopsies of the same group, or even between sections of the same biopsy, making statistical significance calculations so far pointless.

REFERENCES: [1] M.Weinlaender, G.Krennmair, S.Schmidinger, W.Lill, H.Plenk Jr (2011) 20th Ann.Meet. EAO, Athens, P 341.

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