Unique Bone Substitution of TCP-Granulates (Cerasorb®) during Degradation in Human Sinus Floor Elevations

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INTRODUCTION: Classical bone replace-ment materials, such as synthetic hydroxy-apatite ceramics, or the bone-derived BioOss®, show osteoconductivity, but minimal resorba-bility, leaving "functional foreign bodies" in repaired bone structures. In contrast, "bone formation materials", such as tricalcium-phosphate (TCP) ceramics, are also resorbable, leading to true bone regeneration, capable of functional remodelling (1). An unique process of creeping bone substitution of degrading TCP-granulates will be demonstrated in human biopsies (2).

METHODS: For sinus floor elevations, spheric microporous classic granules (Ø 500-1000 µm), or polygonal multiporous M-granules (Ø 1000-2000 µm) of the pure phase ß-TCP-ceramic Cerasorb® (Curasan AG, D-63801 Kleinostheim) were used (Fig.1). After 4.5 to 11 months bone biopsies were taken before dental implant insertion, and plastic-embedded unde-calcified sections were Giemsa-surface stained for light microscopic evaluation and histometry.

RESULTS: Already after 4.5 months (Fig.2 a-d), both granulates in new bone contact showed different stages of degradation and simultaneous invasion of the enlarged microporosity by bone matrix and bone cells. Classic granule centers seemed to degrade more rapidly, making space for vascularized connective tissue ingrowth, similar to macropores of M-granules. Only around M-granules, or with particulate after mechanical granulate destruction, phagocytosing cells could be seen. Larger spaces first filled with woven bone, and then even formation of osteons was found within granules. However, up to 11 months, in both granulates many granules showed connective tissue contact only, and no bone formation could be observed directly adjacent to favourable bone reactions. On radiographs up to 38 months after insertion the sinus floor elevations around implants seemed to slowly change to normal bone structure/density.

DISCUSSION & CONCLUSIONS: Lacking osteoconductivity in adjacent particles is also common in similar biopsies after BioOss®-augmentation. The different degradability of Cerasorb®-granules, possibly due to manu-facture of a more stable TCP-ceramic, could also be one reason for different tissue acceptance which delays clinical outcome of this unique bone substitution and regeneration.

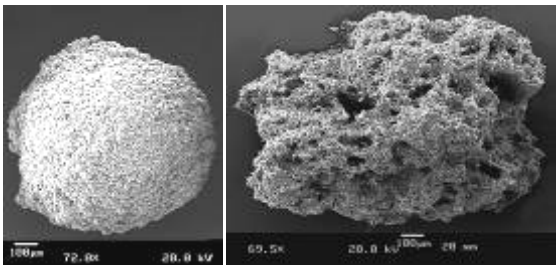

Fig.1: SEM-images of Cerasorb® - Classic and -M granules

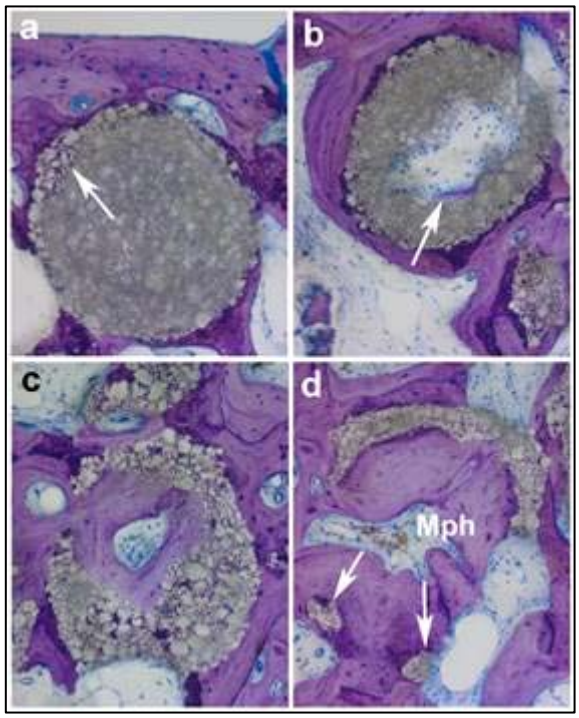

Fig.2a-d: (Giemsa-surface stained ground sections, magn.150x): Different stages of degradation and creeping bone substitution of Cerasorb® –Classic granules after 4.5 month

REFERENCES: [1] H.A.Merten et al. (2003) Implantol **11:** 215-36. [2] H.Plenk Jr. and J.Lederer (2005) Z Oral Implant **1:** 32-38.R.

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