UniversityHospital Heidelberg

European Association for Osseointegration
17th Annual Scientific Meeting
September 18 to 20, 2008 · Warsaw, Poland

Immunohistochemical observations after sinusfloor elevations with a reduced healing period

Mertens C[1] · Kosmehl H[2] · Frankmann-Pricoli J[1] · Steveling HG[1]

[1]Department of Oral and Maxillofacial Surgery · University of Heidelberg · Head of Department: Prof. Dr. Dr. J. Mühling
[2]Institute of Pathology · HELIOS Clinics Erfurt · Head of Department: Prof. Dr. H. Kosmehl

Objective

Tenascin, an extra cellular matrix glycoprotein, is present in the matrix surrounding osteoblast precursors and osteoblasts during bone development, but is absent from mineralized bone matrix and connective issues adjacent to bone. In this study, biopsies harvested 4 months after sinus floor elevations were stained immuno-histochemically with Tenascin-specific an ibodies and evaluated. Additionally, histomorphemetric analyses were performed to quan ify the amount of new bone.

Material and Methods

In his clinical study, 34 two-stage sinus floor elevations were performed in 24 patients in accordance with the method described by Tatum. The chosen augmentation material was a synthetic bone graft material based on Calcium phosphate (BONITmatrix®, DOT GmbH, Rostock, Germany), consisting of nano HA- and nano ß-TCP-crystals (60:40) embedded in a bioactive Silicon dioxide matrix. No autologous bone was added. The material was mixed wi h blood taken from he operation site.

After 4 months of healing he patients received implants. During surgery ten cylindrical bone biopsy specimens were taken from he grafted posterior maxilla using a trephine bur. The bone cores were analysed immuno-histochemically and histomorphometrically.

Results

All bone core cylinders showed high tenascin activity, indicating bone growth after 4 months of healing. The extracellular matrix molecule is substan ially evident in newly formed bone material. In completely differentiated adult bone-, however, it is only detectable focally, especially in association with vascular structures. In fibrous marrow a trabecular tenascin matrix pattern is visible. The bone graft material gets enveloped and penetrated by tenascin.

Histomorphometry revealed that 35.47% of the tissue volume was bone tissue, 14.04% residual graft and 50 5% connective tissue.

After 4 months of healing, microscopic observations showed complete osseous integration of the residual graft material in a bone matrix. New bone formations could be seen throughout all graft surfaces. Signs of inflammation or foreign body reactions were not to be documented. The homogeneous stabilisation reached such a quality that all implants clinically proved a high primary stability on insertion.

Discussion

While normal histologic analysis can only show a bone remodelling process at a given moment in time, immuno-histochemical analysis can help to investigate and measure bone growth and thus contribute to the assessment of the ongoing process itself. Using the highly specific glycoprotein tenascin, our study proved that the newly formed bone was actively growing. Through additional histomorphemetric analysis the exact amount of newly formed bone and the rate of resorption of graft material could be quantified.

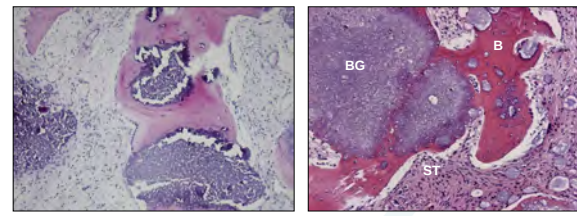


Fig. 1 + 2: *B opsy taken from the grafted site after 4 months of hea ing good osseointegrat on of the grafted material (HE-staining) BG bone graft B bone ST soft tissue*

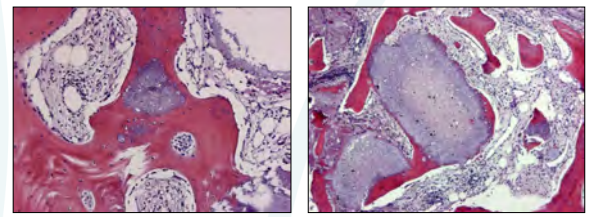


Fig. 2 + 3: *the grafted material is complete y covered with bone (HE-staining)*

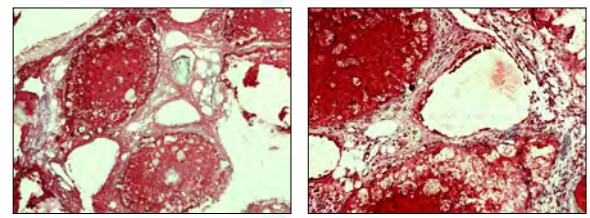
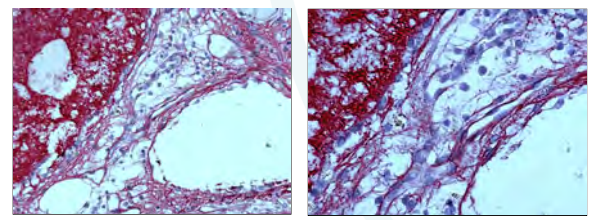


Fig. 5 + 6: *Immunohisto ogic staining shows high bone growth activity surrounding the grafting material (Fig. 5 Tenascin-C Fig. 6 Osteoca cin)*



EAO European Association for Osseointegration
17th annual Scientific Meeting September 18-20, 2008

CORRESPONDENCE TO:
Mertens, Christian · Department of Oral and Maxillofacial Surgery
University of Heidelberg · INF 400 · 69120 Heidelberg
E-ma l christian.mertens@med.uni-heidelberg.de