

Mesenchymal stem cells of dental origin and their influence on bone regeneration - An animal study

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Background: Mesenchymal stem cells (MSC) are unspecialized precursors cells, which have the ability to replicate and differentiate in different tissue forming cells (e.g. osteoblasts). Tooth germs represent a suitable source to isolate MSC and thereby a promising opportunity to enhance bone regeneration after augmentative procedures.

Objectives: Aim of this animal study was to evaluate the influence of MSC of dental origin on the consolidation of an alloplastic bone substitute material (BSM) at different phases of bone regeneration.

Methods: Ex vivo cultivated cells were seed on BoneCeramic® and subsequently added to a freshly prepared monocortical calvarial bone defect in 20 domestic pigs. Defects filled with autologous bone served as control. 7, 14, 30 and 90 days after surgical procedures 5 randomly selected pigs were sacrificed and ossa frontalia removed for specimen fixation. At every time point de novo bone formation was quantitatively analyzed by microradiography and toluidin- blue staining. Bone volume/total defect volume (BV/TV) and the mineralization rate of newly formed bone were compared among the groups.

Results: Toluidin- blue staining as well as microradiography show differences within the groups at an early and late time point after surgical procedures. At an early stage of wound healing defects with autologous bone were superior. However 90 days after defect preparation bone formation rate of MSC modified defects was higher than in defects without MSC.

Conclusion: Our results indicate that the efficiency of homologous MSC transplantation following ex vivo cell expansion enhances bone formation in comparison to defects without MSC modification.

Biography

In 2011 Tobias Moest has completed dental school with 25 years at the Friedrich Alexander University of Erlangen- Nuremberg in Germany. In 2012 he finished postdoctoral studies (assessment: "magna cum laude") in the Oral- and Maxillofacial Department at the same University. In his work he investigated the influence of diabetes on the osseointegration of dental implants. Based on this work a publication was formulated, which won the "André- Schröder Research Price" in 2012.

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