ARE TENDON-DERIVED STEM CELLS A BETTER SOURCE FOR BONE REGENERATION?

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Despite significant advancements in bone tissue engineering applications, the clinical impact of bone marrow stromal cells (BMSCs) for the treatment of large osseous defects remains limited. Therefore, other cell sources are under investigation for their osteogenic potential to repair bone. In this study tendon-derived stromal cells (TDSCs) were evaluated in comparison to BMSCs to support the functional repair of a 5mm critical-sized, segmental defect in the rat femur.

Analysis of the trilineage differentiation capacity of TDSCs and BMSCs cultured on collagen sponges revealed an impaired osteogenic differentiation and mineral deposition of TDSCs in vitro, whereas chondrogenic and adipogenic differentiation was evident for both cell types. Radiographic assessment demonstrated that neither cell type significantly improved the healing rate of a challenging 5mm segmental femoral defect in vivo. Both, transplanted TDSCs and BMSCs led to the formation of only small amounts of bone in the defect area and histological evaluation revealed non-mineralized, collagen- rich scar tissue to be present within the defect area. Newly formed lamellar bone was restricted to the defect margins resulting in closure of the medullary cavity. Interestingly, in comparison to BMSCs, significantly more TDSC-derived cells were present at the osteotomy gap up to 8 weeks after transplantation and were also found to be located wihin newly formed lamellar bone, suggesting their capacity to directly contribute to de novo bone formation. To our knowledge this is the first study investigating the in vivo capacity of TDSCs to regenerate a critical-sized defect in the rat femur.