Proceedings of German Society for Stem Cell Research (PGSSCR)

Murine femoral defect model for evaluation of local bone regeneration approaches

Hagedorn GM, Lauer G

Department of Oral and Maxillofacial Surgery, Medical Faculty Carl Gustav Carus, Fetscherstr. 74, 01307 Dresden, Germany
manolo.hagedorn@uniklinikum-dresden.de

Published online on 16 May 2007

Introduction:

Therapeutical concepts of local gene therapy for bony defects need to be verified in vivo. Since permanent genetic alterations, i.e. transgenic animals are realised most easily in mice, an in vivo model for bone healing should be a mouse model, too. Existing mouse fracture models are either externally fixed osteotomies with very narrow bony gaps or internally fixed non reproducible fractures that will always heal spontaneously. This pilot study aimed to establish a mouse model for the investigation of bone healing in a critical size bony defect of the femur.

Materials and Methods:

25 BL/6 mice underwent femoral osteotomy creating externally fixed bony gaps of 3.5mm. Bone healing was studied radiographically and histologically for up to 6 weeks. Fixateur design was optimised to allow for highest reproducibility, widest extension of the bony defect, sufficient mechanical stability, and for stereotactical injection of cell containing material into the defect.

Results:

For the established model critical size of the bony defect could be demonstrated for a period of at least 6 weeks. The constructed external fixateur proved to be sufficiently mechanically rigid. The surgical procedure appeared to be safe (loss of one out of 25 mice perioperatively). Injection of bone marrow stromal cells into the defect led to partial ossification within 3 weeks.

Discussion:

Standardised critical size bone defects are necessary to evaluate bone healing using gene therapy based therapeutical strategies. With the proposed external fixation bone healing in a highly reproducible critical size bone defect of the murine femur may be analysed for a least 6 weeks. Stereotactical injection into the bone defect of e.g. genetically manipulated cells with increased osteogenic competence is easily possible and qualifies the models for a great variety of experimental settings.