

Repair of nonunion defects in rat femurs using multipotent adult stem cells

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Nonunions represent a continuing clinical problem. Adult stem cells are one possible treatment. Multipotent adult stem cells (MASCs) are easily isolated and have an unlimited proliferation potential. MASCs in a polyglycolic acid felt (PGA) have been shown to regenerate bone in a critical-size rat calvarial defect. In this study we ask if unique adult stem cells, MASCs, will differentiate into bone forming cells in vivo and regenerate bone in a standard nonunion defect? MASCs isolated from an adult rat transduced with green fluorescent protein (GFP) were seeded into PGA and cultured for 7 days in vitro in an undifferentiated state. Seventeen adult male rats had a 8-10 mm defect created in the right femur of Einhorn et al.¹⁷ and divided into 3 groups: empty defect, PGA alone, and PGA + MASCs. Animals were euthanized at 8 weeks and union assessed by histological evaluation. The empty defects, PGA alone treated groups showed no histological union. In contrast, all 7 of the PGA + MASCs had histological union with bone. Mean scores for the empty, PGA alone, and PGA + MASC defects were 0.6, 2.0, and 5.7 respectively. Undifferentiated MASCs embedded into a PGA mesh were able to achieve bone regeneration and union 8 weeks post operation in this nonunion defect. Additionally, MASCs differentiated into bone forming cells in vivo without the need of additional transducers. MASCs are easily obtained and can be expanded to virtually unlimited numbers and thus may represent an effective prevention or treatment of nonunion fractures.

Biography

John Swietlik is a second year MD candidate at New York Medical College, and completed his B.A. in Biology from the University of Minnesota. He has completed research in tissue engineering under Paul Lucas, PhD, at New York Medical College. Dr. Lucas has done extensive research on Multipotent Adult Stem Cells and use of them for regeneration of various tissues.

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