Δ Progenitor Cell Therapy to Improve Fracture Healing in a Diabetic Rat Critical Size Defect Model

***Hilary Gortler, BSc**; Charles Godbout, PhD; Emil H. Schemitsch, MD; Aaron Nauth, MD*
Keenan Research Centre, St. Michael's Hospital, Toronto, Ontario, CANADA

Purpose: The purpose of this study was to examine the effect of endothelial progenitor cells (EPCs) isolated from healthy and diabetic animals on bone healing in healthy and diabetic recipients. We hypothesized that local EPC therapy would effectively promote bone healing in all recipient animals, though EPCs from healthy donors would be the most effective.

Methods: Diabetes was induced in rats via streptozotocin. EPCs were isolated from the bone marrow of healthy and diabetic animals and expanded in culture for 7 days. A 5-mm segmental bone defect was surgically created in the right femur and stabilized. Gel foam scaffolds seeded with cells or medium alone were implanted in the defect, creating 6 study groups (Table 1). Radiographs were taken biweekly until animal sacrifice at 10 weeks. Radiographs were scored for the presence of union and extent of healing by 2 blinded orthopaedic surgeons.

Results: Treatment with EPCs resulted in significantly higher radiographic scores than diabetic controls, irrespective of a healthy or diabetic state (Fig. 1A). Although not statistically significant, lower scores were observed in diabetic animals receiving cells compared to healthy animals receiving cells. Representative radiographs are shown in Figure 1B.

Conclusion: Our preliminary results suggest that EPCs can promote bone healing in a model of diabetic fracture healing. However, the rate of union and extent of bony healing on radiographs were increased in healthy animals versus diabetic animals, irrespective of the cell source. Thus the diabetic versus healthy state of the host appears to be more critical to fracture healing than whether the EPCs are derived from a diabetic or healthy source.

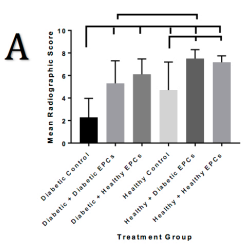

Table 1: Study Treatment Groups

Recipient Animal Type	Treatment Received
Healthy	1) Healthy EPCs (1 million) 2) Diabetic EPCs (1 million) 3) Control (Medium alone)
Diabetic	4) Healthy EPCs (1million) 5) Diabetic EPCs (1 million) 6) Control (Medium alone)

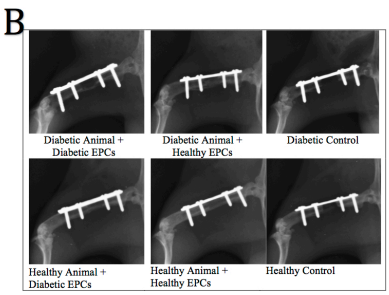

Figure 1. (A) Graphical representation of radiographic scores (* = p values <0.05) and (B) representative radiographic images from all 6 treatment groups

Δ OTA Grant