Bone Marrow Mononuclear Cell Therapy Reduces Post-Angioplasty Neointimal Formation in Rabbits

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Background: Bone marrow (BM) contains a population of multipotent mononuclear cells (MNCs) that are thought to play a role in vasculogenesis and wound repair. Neointimal hyperplasia after vascular injury represents a failure in wound repair. Thus we hypothesize that IV delivery of MNCs will reduce neointimal formation after experimental angioplasty.

Methods: Cholesterol-fed NZW rabbits underwent endothelial denudation by a balloon catheter in the right external iliac artery. Half the animals underwent BM biopsy to harvest MNCs. Within one hour after injury, 2-4 x 10^6 MNCs (n=5) or vehicle (Control, n=6) were injected intravenously. At 4 weeks, arteries were harvested.

Results: Morphometric analysis revealed significantly less neointima (Nil 0.48±0.022 mm^2 vs. 0.37±0.057 mm^2, p<0.01) and decreased N/Media ratios in MNC versus control animals (Figure 1). Medial area did not differ significantly in these two groups (MNCs 0.597±0.05 mm^2 vs. Control 0.638±0.06 mm^2). Immunohistochemistry revealed decreased macrophage and inflammatory cell activity in the vessel wall after MNCs as compared to Controls. Both groups exhibited smooth muscle cell infiltration in the neointima and complete re-endothelialization.

Conclusions: Acute, intravenous administration of MNCs decreases neointimal formation after balloon arterial (endothelial) injury. The ability of MNCs to modulate local macrophage and leukocyte accumulation within the vessel wall may explain the observed benefit.