P1.165. Shear Conditioning Of Adipose-Derived Stem Cells Increases Retention On Decellularized Vein Grafts

S.E. Mcilhenny, D.J. Grabo, N.A. Tarola, P. Zhang, I.M. Shapiro, T.N. Tulenko and P.J. Dimuzio

Thomas Jefferson University, Philadelphia, PA

Background: Stem cell seeded vascular grafts exposed to sudden shear stress via non-linear step functions experience a severe detachment of cells and loss of all benefits of graft seeding. We hypothesize that a continuous, linear application of fluid shear stress, provided by a novel flow bioreactor, will circumvent this cellular loss, thus preparing grafts for in vivo use. Methods: Grafts were prepared by seeding the lumen of decellularized saphenous veins with human adipose-derived stem cells (ASC)(CD13+39+90+31-45-). Cells were allowed 24 hours to attach to the basement membrane under media exchange (3mL/min), followed by increasing shear via step function (3 dynes/cm2 step per day) or our novel computer controlled flow system increasing shear continuously and linearly (3 dynes/cm2 ramp per day). After 1, 2, or 3 days, flow was ceased, grafts were splayed, and cells were visualized via confocal microscopy. Results: Grafts exposed to step function shear result in substantial cell loss after 1 day (3 dynes/cm2). By day 2 (6 dynes/cm2), grafts show a near complete cell loss. In contrast, grafts exposed to linear shear show high cell retention after 3 days (9 dynes/cm2). Beginning at two days (6 dynes/cm2), cells exhibited alignment in the direction of flow; an endothelial phenotype. Conclusions: To gain benefit from lumen seeding, grafts must be flow conditioned via linear ramp prior to high shear stress exposure within the systemic vasculature to facilitate cell retention. Our novel, computer controlled system allows for high cell retention at near physiologic shear.