

Tissue Engineered Recellularized Small Diameter Vascular Grafts

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Introduction: A need exists clinically for tissue engineered small diameter vascular grafts. Previously, we have used a strategy of recellularization of naturally-derived extracellular matrix scaffolds to engineer contractile skeletal muscle constructs and nerve graft substitutes. In this experiment, we utilized this acellularization-recellularization method to produce naturally-derived small diameter vascular grafts *in vitro*, for use *in vivo*.

Methods: Aortic grafts were harvested from F344 rats. Acellularization was performed via a series of detergent solutions using an established protocol. The grafts were then incubated with isolated F344 endothelial cells for 12 hours prior to reimplantation. Recellularized constructs were placed as interposition grafts in the common femoral artery. No systemic anticoagulants were administered. Vessel patency was monitored at 48 hr intervals using Doppler ultrasound. Grafts were explanted at multiple time points for histologic examination.

Results: Doppler ultrasound (Figure 1) demonstrated the presence of pulsatile flow distal to the constructs throughout the study in four recellularized grafts. Graft patency was confirmed at the time of explantation. Histologic evaluation demonstrated an organized endothelial neointimal layer. Smooth muscle cells had also migrated in to the construct.

Conclusions: Recellularization of acellularized vascular tissue with recipient-immunocompatible cells appears to hold promise as a viable strategy in tissue engineering. In this study, we have demonstrated good short-term patency of recellularized small diameter grafts. Further work should be directed to investigating long-term patency rates and factors that influence patency.

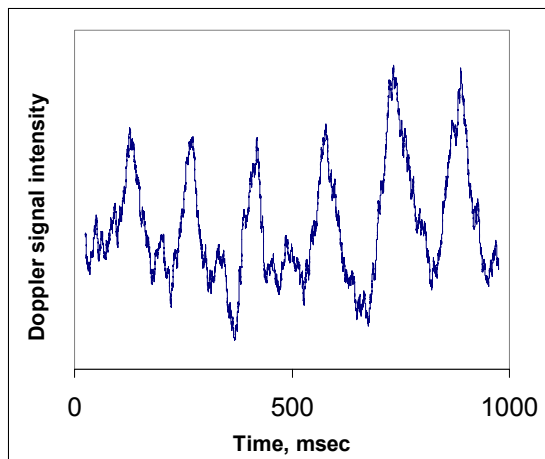


Figure 1: Doppler ultrasound signal obtained from a point distal to the recellularized graft, demonstrating pulsatile arterial flow.