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Xenogeneic tissue engineered small diameter vascular grafts

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Small diameter vascular grafts utilization during vascular reconstructive surgery remains a major clinical challenge. The availability of micro- or macro-vessels is very limited and harvesting autologous graft required additional surgery which led to development of tissue engineered vascular graft substitutes. Harvesting vascular grafts from xenogeneic sources open a new door for on-demand customized vascular grafts ready for surgeries. There are many challenges that need to be addressed, related to low immunogenicity, non-thrombotic and graft mechanical properties. In our work, we customized the detergent based method for decellularization of vessels. Decellularization process was examined by histology, DAPI, DNA quantification, and SEM analysis. For Transplantation studies, a small-diameter vascular graft was fabricated from decellularized vascular sheets. Surface

modification was achieved by heparin coating on the luminal side of conduit, for antithrombotic activity. Heparin immobilization was examined by platelet adhesion test. In vivo study of tissue-engineered vascular grafts showed neo-intimal layer formation with early endothelialization. Biomarkers of endothelial cells, medial smooth muscle cells, and angiogenesis were observed in the transplanted graft. Tissue engineered acellular vascular graft with surface modification and physiological atmosphere will provide better surface for cell attachment, migration and cellular differentiation. Our study demonstrates that xenogeneic decellularized vascular graft with surface modification could be useful for the replacement of small diameter vessels.

Key words: Xenogeneic, Vascular Graft, Decellularization, Small Diameter Vessels, Heparin Surface Modification.

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