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Transplantation of tissue-engineered veins using peripheral blood

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Vascular diseases affect >25 million individuals in westernized societies. Transplantation using tissue-engineered vascular grafts using autologous cells will benefit them. Previous strategies for repopulating vascular conduits were dependent on successful *ex vivo* expansion of cells. Herewe demonstrate a new approach using peripheral whole blood (PWB) thus eliminating isolation and expansion difficulties associated with cells. We extracted 7-9 cmhuman allogeneiciliac vein segments and decellularized by agitation with 1% triton, 1% tnbp and DNase for 4 h with each until 9 cycles. They were re-cellularized for 10 days in a bioreactor by perfusing 25 ml PWB from healthy donors for 2 days followed by endothelial and smooth muscle cells media for 4 days with each. Further, two autologous PWB tissue-engineered vein conduits were prepared and used for by-pass procedures in a four-year and 20-months patients. The decellularized vein expressed several important extra cellular matrix proteins, angiogenic growth factors and maintained good biomechanical integrity. Re-cellularized veins showed a well-formed endothelial cell layer and presence of smooth muscle cells in media. Mainly, VEGFR-2+ /CD45+ and a smaller fraction of VEGFR-2+/CD14+ cells contributed to repopulation of the graft. Electron micrographs showed flat cells on the luminal surface of the grafts consistent with endothelial cells. Clinically, the grafted veins immediately provided the two recipients with a functional blood supply. Both patients have normal laboratory values at 30 and 28 months post-transplantation respectively. The patients have not received immunosuppressive drugs. Thus, a simple autologous blood sample can be used to generate personalized vascular conduits. This represents an important milestone for vascular tissue-engineering.

Biography

Vijay Kumar Kuna completed his MSc in Biotechnology in 2009 from Bangalore University, India and MSc in Molecular Biology 2012 from University of Skövde, Sweden and worked as research assistant from March 2013- September 2014, and started with PhD from October 2014 at University of Gothenburg. He published 5 papers in reputed journals while once in Lancet. He supervised 4 Master thesis projects till now. He attended four international conferences on vascular tissue-engineering and transplantation and gave oral presentation in two and poster presentation in two.

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