Feasibility of a Nanomaterial Tissue Patch for Vascular and Cardiac Reconstruction in a Porcine Model

ABSTRACT:
Vascular disease is one of the leading causes of morbidity and mortality. It includes vascular stenosis due to atherosclerosis seen mainly in carotid arteries and the most reliable treatment is endarterectomy and patch angioplasty. Synthetic and biologic patches on the market, that are the standard for cardiac and vascular reconstruction, typically have problems with rupture, calcification, and re-stenosis. My research involves the development of a vascular patch material consisting of decellularized porcine arterial tissue conjugated with gold nanoparticles (AuNP). Here we have characterized this material using a variety of methods such as histology, cell culture assays, and SEM. In vivo studies were performed using porcine aortas and carotid arteries collected from freshly euthanized animals and decellularized. Patches were implanted into pigs and left for 3 or 9 weeks. There was a 100% success rate of implantation and a 0% mortality rate in survival animals. All patches were patent on ultrasound at each time point. There was no evidence of rupture, pseudo aneurysm, or rejection. Superior reintegration and equivalent patency was demonstrated by the use of nanoparticle cross linking. Longer term studies will be conducted to further evaluate the biologic reactions to the patch material and durability.

BIOGRAPHICAL:
Dr. Allison M. Ostdiek did her undergraduate work at the University of Minnesota and received her DVM from the University of Illinois College of Veterinary Medicine in 2010. Since 2010 she has been an NIH fellow in a dual residency/degree program. She finished her residency in Comparative Medicine in May of 2013 and is now pursuing her Ph.D. in veterinary pathobiology in Dr. Sheila Grant’s lab. There she is investigating and characterizing a new material for vascular repair utilizing decellularized animal arteries and gold nanoparticles.

DATE • TIME • LOCATION:
Tuesday September 24, 2013 4:00 PM, 105 Agricultural Engineering Building