AB042. Evaluation of the influence of wall shear stress features on endothelial cell phenotypes

Aisling Kelly[1], David Power[1], David O'Connor[2], Marco Franzoni[2], Michael Walsh[2], Eamon Kavanagh[1], Michael Anthony Moloney[1]

[1]Department of Vascular Surgery, University Hospital Limerick, Limerick, Ireland; [2]Biomaterials Cluster, Bernal Institute and Health Research Institute, University of Limerick, Limerick, Ireland

Background: Patency rates for arteriovenous fistulae (AVF) range between 40-50% at 4 years with neointimal hyperplasia of the venous limb being a significant determining factor. The wall shear stress (WSS) is a potent stimulus of neointimal hyperplasia.

Methods: We analysed WSS using both *in vitro* & *ex vivo* models. In-vitro experiments: 10 idealized waveforms were created ranging for WSS peak magnitude of 0.5 to 2.5 Pa, t-WSSG from 2 to 20 Pa/s and from 0 to 0.5 of oscillatory shear index (OSI) value. Evaluation of protein and gene expression was completed using reverse transcription polymerase chain reaction (RT-PCR), Western blot and immunofluorescence staining. *Ex vivo* experiments: AVFs were fashioned in the usual manner utilizing bovine renal arteries and veins. The tissue was perfused for 1–3 weeks. Hematoxylin and eosin staining allowed evaluation of structural components of the tissue along with viability.

Results: We show tissue and cell viability at a two-week period confirming that the system can provide a platform for AVF *ex vivo* simulation. Our results indicate that WSS waveforms with a peak magnitude of 1.5 or 2.5 Pa can induce a protective phenotype in endothelial cells in culture.

Conclusions: Unsteady WSS profiles and atherogenic time-averaged WSS thresholds should be reconsidered and reduced significantly, in particular for venous endothelial cells. Similarly, preliminary results from *ex vivo* tests suggest differential protein expression at the sites of disturbed WSS patterns within the tissue samples correlating with previous flow studies.

Keywords: Arteriovenous fistula; wall shear stress; neointimal hyperplasia

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