Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Womersley analysis for arbitrarily unsteady flow in elastic vessels

G. BRERETON, J. SLADE, R. MEYER, Michigan State University — In the 1950's, Womersley developed a theoretical analysis of flow in elastic-walled vessels that is continuous and periodically unsteady. In this talk, we describe a similar analysis of flows that can have arbitrary non-periodic unsteadiness and are at some instant stationary, as are found in some of the smaller arteries. The resulting analytical flow relationships are compared with MRI measurements of flow-rate and of local-velocity time histories in the popliteal arteries of patients. They are found to be in good agreement over conditions that both precede and follow acute patient exercise.

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Date submitted: 07 Aug 2007 Electronic form version 1.4