Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Fluid-structure interaction analysis of the flow through a stenotic aortic valve HODA MALEKI, Mech. Eng. Dept., Concordia Univ., Montreal, Canada, MICHEL R. LABROSSE, Mech. Eng. Dept., Ottawa Univ., Ottawa, Canada, LOUIS-GILLES DURAND, Institut de Recherches Cliniques de Montréal, Montreal, Canada, LYES KADEM, Mech. Eng. Dept., Concordia Univ., Montreal, Canada — In Europe and North America, aortic stenosis (AS) is the most frequent valvular heart disease and cardiovascular disease after systemic hypertension and coronary artery disease. Understanding blood flow through an aortic stenosis and developing new accurate non-invasive diagnostic parameters is, therefore, of primarily importance. However, simulating such flows is highly challenging. In this study, we considered the interaction between blood flow and the valve leaflets and compared the results obtained in healthy valves with stenotic ones. One effective method to model the interaction between the fluid and the structure is to use Arbitrary Lagrangian-Eulerian (ALE) approach. Our two-dimensional model includes appropriate nonlinear and anisotropic materials. It is loaded during the systolic phase by applying pressure curves to the fluid domain at the inflow. For modeling the calcified stenotic valve, calcium will be added on the aortic side of valve leaflets. Such simulations allow us to determine the effective orifice area of the valve, one of the main parameters used clinically to evaluate the severity of an AS, and to correlate it with changes in the structure of the leaflets.

Hoda Maleki

Date submitted: 10 Aug 2009 Electronic form version 1.4