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Non-Newtonian Study of Blood Flow in an Abdominal Aortic Aneurysm with a Stabilized Finite Element Method[1] VICTOR MARRERO, ONKAR SAHNI, KENNETH JANSEN, JOHN TICHY, Rensselaer Polytechnic Insitute, CHARLES TAYLOR, Stanford Univeristy — In recent years the methods of computational fluid dynamics (CFD) have been applied to the human cardiovascular system to better understand the relationship between arterial blood flow and the disease process, for example in an abdominal aortic aneurysm (AAA). Obviously, the technical challenges associated with such modeling are formidable. Among the many problems to be addressed, in this paper we add yet another complication – the known non-Newtonian nature of blood. In this preliminary study, we used a patient-based AAA model with rigid walls. The pulsatile nature of the flow and the RCR outflow boundary condition are considered. We use the Carreau-Yasuda model to describe the non-Newtonian viscosity variation. Preliminary results for 200K, 2M, and 8M elements mesh are presented for the Newtonian and non-Newtonian cases. The broad fundamental issue we wish to eventually resolve is whether or not non-Newtonian effects in blood flow are sufficiently strong in unhealthy vessels that they must be addressed in meaningful simulations. Interesting differences during the flow cycle shed light on the problem, but further research is needed.

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