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In this work, we analyze the mathematical modeling and simulation of a biological interaction between an arterial wall, the blood within and the spinal fluid surrounding the arterial vessel. This fluid-structure interaction is modeled by a spring mass system representing the arterial wall coupled with the Navier-Stokes Equation describing the spinal fluid flow. An analytical solution is derived using Laplace transforms with numerical results provided to validate the model for various test conditions. (Received September 20, 2007)