Existence of strong solutions for some 2D/1D fluid-structure interaction problems

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We are interested by existence of solution for some unsteady nonlinear fluid-structure interaction problems which can be viewed as simplified models to describe blood flow through (visco)-elastic arteries. We consider a Newtonian incompressible two-dimensional flow described by the Navier-Stokes equations set in an unknown domain depending on the displacement of a structure, which itself satisfies a linear (visco)-elastic beam or rod equation. The fluid and the structure are fully coupled via interface conditions prescribing the continuity of the velocities at the fluid-structure interface and the action-reaction principle. In a first part we will prove the existence of a strong solution locally in time, with a particular focuss on the case where no viscosity is added to the structure equation. In the second part we prove that, for a viscous beam in flexion, the strong solution obtained previously is global-in-time. We obtain in particular that contact between the viscoleastic wall and the bottom of the fluid cavity does not occur in finite time.