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**Numerical Simulations of the Mechanics of Vitrectomy** ETHAN YOUNG, JEFF ELDREDGE, JEAN-PIERRE HUBSCHMAN, University of California, Los Angeles — Vitreous is the clear, gel-like substance that fills the cavity between the lens and retina in the eye. Treating certain eye abnormalities requires removing this substance using a minimally-invasive device called a vitreous cutter. Understanding the behavior of this viscoelastic biofluid during surgeries is essential to improving the effectiveness of the procedure. In this study, three-dimensional computational models of vitreous cutters are investigated using an immersed boundary method paired with a viscoelastic constitutive model. The solver uses a fractional-step method to satisfy continuity and traction boundary conditions to simulate the applied suction. The current work extends previous efforts to accurately model the rheological parameters measured by Sharif-Kashani et al. using the Giesekus constitutive equation [Retina, 2013]. The simulations were used to quantify both the average and time-varying flow rate through the device. Values for flow rate are compared with experimental results from Hubschman et al. [Retina, 2009]. Flow features associated with the cutting dynamics are of particular interest, as is the geometry of the cutter itself. These operational and design changes are a target for improving cutter efficacy while minimizing potential tissue damage.

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