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Fluid Flow of Vitrectomy POORIA SHARIF-KASHANI, TINGTING JUAN, JEAN-PIERRE HUBSCHMAN, JEFF D. ELDREDGE, H. PIROUZ KAVEHPOUR, University of California, Los Angeles — Vitrectomy is a microsurgical technique to remove the vitreous gel from the vitreous cavity. Due to the viscoelastic nature of the vitreous gel, its complex fluidic behavior during vitrectomy affects the outcome of the procedure. Therefore, the knowledge of such behavior is essential for better designing the vitrectomy devices, such as vitreous cutters, and tuning the system settings such as port and shaft diameters, infusion, vacuum, and cutting rate. We studied the viscoelastic properties of porcine vitreous humor using a stressed-control shear rheometer and obtained its relaxation time, retardation time, and shear-zero viscosity. We performed a computational study of the flow in a vitreous cutter using the viscoelastic parameters obtained from the rheology experiments. We found significant differences between the modeled vitreous gel and a Newtonian surrogate fluid in the flow behavior and performance of the vitreous cutter. Our results will help in understanding of the vitreous behavior during vitrectomy and providing guidelines for new vitreous cutter design.

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