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A biphasic model for bleeding in soft tissue YI-JUI CHANG, KWITAE CHONG, JEFF D. ELDREDGE, Mechanical Aerospace Engineering, University of California, Los Angeles, JOSEPH TERAN, Mathematics, University of California, Los Angeles, PEYMAN BENHARASH, Surgery, University of California, Los Angeles, ERIK DUTSON, Surgery, University of California, Los Angeles, — The modeling of blood passing through soft tissues in the body is important for medical applications. The current study aims to capture the effect of tissue swelling and the transport of blood under bleeding or hemorrhaging conditions. The soft tissue is considered as a non-static poro-hyperelastic material with liquid-filled voids. A biphasic formulationeffectively, a generalization of Darcys law—is utilized, treating the phases as occupying fractions of the same volume. The interaction between phases is captured through a Stokes-like friction force on their relative velocities and a pressure that penalizes deviations from volume fractions summing to unity. The soft tissue is modeled as a hyperelastic material with a typical J-shaped stress-strain curve, while blood is considered as a Newtonian fluid. The method of Smoothed Particle Hydrodynamics is used to discretize the conservation equations based on the ease of treating free surfaces in the liquid. Simulations of swelling under acute hemorrhage and of draining under gravity and compression will be demonstrated. Ongoing progress in modeling of organ tissues under injuries and surgical conditions will be discussed.

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