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A Magnetorheological Hemostatic Agent YONATAN TEKLEAB, Massachusetts Institute of Technology, NIKOLAOS KOKOROSKOS, GEORGE VELMAHOS, Massachusetts General Hospital, GARETH MCKINLEY, WESLEY HARRIS, Massachusetts Institute of Technology — Magnetorheological (MR) suspensions are used in systems requiring responsive fluids with fast-acting, tunable properties. MR valves, have been effective in rapidly and locally arresting pressure-driven flows in mechanical systems. Motivated by these applications, we developed a magnetically-actuated valve for use in the human body, to reduce or halt hemorrhage. 80% of trauma related deaths in the first hour of hospital admission are due to hemorrhagic shock. Such a hemostat would provide a prehospital intervention opportunity to stem bleeding, giving physicians more time to resuscitate patients upon trauma facility admission. The valve comprises an injectable, biocompatible MR suspension with externally-placed permanent magnets. To trigger the MR effect near the injury site in bleeding patients, the fluid was designed for biocompatibility, rapid injectability, and local actuation within blood vessels. We have synthesized, characterized, and demonstrated efficacy, through benchtop and *in vivo* rat tests, a novel, minimally invasive, MR hemostatic agent. Using magnets in 3D printed holders that can be worn by field surgeons, we demonstrate arrest of a major hemorrhagic event, dramatically reduced lost blood volume, sustained blood pressure, and significantly increased survival time.

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