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Large-Eddy Simulation of Flows Through a Novel Vascular Access Device for Hemodialysis Access[1] ALEKSANDR OBABKO, Argonne National Laboratory, EDUARD TSYRULNYKOV, Kenvelo LLC, ROBERT RAINSBERGER, XYZ Scientific Applications, ALVARO V. TORREIRA, HASSAN NAGIB, Illinois Institute of Technology, ANIL AGARWAL, Ohio State University, PAUL F. FISCHER, University of Illinois at Urbana-Champaign — The preferred vascular access in patients on hemodialysis (HD) is an arteriovenous (AV) fistula or graft. The majority of the HD patients in the US are dialyzed with an AV fistula where two needles are used for cannulation in most cases. However, this approach can be painfully invasive, extremely difficult to gain access in patients with challenging geometry of vascular access, and is often inadequate to provide optimal blood flow. This work attempts to address the shortcomings of the above procedure and introduces a novel cannulation device that allows less painful easy single access to difficult vessel geometries, and have a potential of improvement of overall increase in efficacy of HD and enhanced patient experience. We present the preliminary Nek5000 large-eddy simulations results of the flows through the device that employs a single 18-gauge needle for cannulation and is able to provide blood flow rates up to 600 ml/min. The range of flow rates and Reynolds numbers up to Re=2,600 are considered and blood recirculation rates are computed.

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