Abstract Submitted
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Experimental Measurement of Pulsatile Blood Pressure in 3D Printed Stenosed Arteries.[1] J. TALAMANTES, C. RUMBERGER, Indiana University - Purdue University Indianapolis, M. BUGANSKI, Butler University, A. SAWCHUK, Indiana University School of Medicine, H. YU, Indiana University - Purdue University Indianapolis — Quantification of proximal ($P_{a)}$ and distal P_d pressure to arterial stenosis is critical to assess the hemodynamic severity of stenosis via fractional flow reserve (P_d/P_a) or trans-stenotic pressure gradient (P_a-P_d). Invasive measurement via catheterization requires patient exposure to risk and high medical costs. We built up a pulsatile flow loop, mimicking the blood flow in the human circulatory system, to measure vascular hemodynamics. The loop is equipped with a pulsatile heart pump, elements of resistance and compliance, and measurement devices. The stenosed artery is segmented from computed tomography angiography data, then 3-D printed out and mounted in the loop. The pressure (P_a and P_d) is measured by medical-grade transducers through an in-house built filter/amplifier. The data acquisition system collects pressure and flow-rate signals simultaneously and visualizations are live via LabVIEW. The system can accommodate rigid or flexible 3D printed arteries and real human arteries. The pulsatile flow loop provides a unique capability to validate non-invasive computed pressure and to quantify patient-specific pathophysiological properties of diseased arteries.

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