Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A reduced-order model for flow in a coronary artery with bifurcations[1] JAERIM KIM, HAECHEON CHOI, Seoul National University, JI-HOON KWEON, DONG HYUN YANG, YOUNG-HAK KIM, University of Ulsan, College of Medicine, Asan Medical Center — Reduced-order models have been developed to estimate the distributions of the volume flow rate and pressure along a subject- or patient-specific artery with bifurcations. We suggest a reduced-order model by considering the losses due to the geometric parameters of coronary arteries such as tapering, curvature, and bifurcations. In this model, an artery is segmented into finite lengths of straight and curved pipes, and the continuity and one-dimensional energy equations are solved with given boundary conditions. The distributions of the volume flow rate and pressure along seventeen subject-specific coronary arteries at rest and exercise conditions are compared with those from three-dimensional numerical simulation (CFD). The present reduced-order model provides better prediction performance than existing reduced-order models. Also, fractional flow reserves (FFRs), which is defined to be the distal pressure of a stenosis to the inlet pressure, are calculated for fifteen patient-specific coronary arteries by combining the present reduced-order model with our zero-dimensional stenosis model for the pressure drop across a stenosis (Kim et al., 2020). FFRs obtained from the present model agree well with those obtained from CFD.

[1]Supported by 2019R1A2C2086237 and KSC-2020-CRE-0138

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Date submitted: 03 Aug 2020 Electronic form version 1.4