Abstract Submitted
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Multi-scale patient-specific simulations for evaluation of surgical revascularization techniques in coronary artery bypass surgery[1] JONG-MIN SEO, Stanford University, ABHAY RAMACHANDRA, Yale University, JACK BOYD, Stanford University, ANDREW KAHN, University of California San Diego, ALISON MARSDEN, Stanford University — Coronary artery bypass graft (CABG) surgery redirects blood flow around sections of diseased coronary arteries to improve myocardial perfusion using arterial and venous grafts. Cardiothoracic surgeons are often faced with a choice of different revascularization configurations and sizes for saphenous vein grafts (SVGs). However, there is a current lack of understanding surrounding how SVG configuration affects hemodynamics, graft performance and patency. We investigated hemodynamic characteristics in native coronary arteries and vein grafts of varying configurations using computational CABG models. We constructed patient-specific anatomic models and performed virtual surgery by modifying SVG geometry to simulate single, Y, and sequential graft configurations and SVG diameters ranging from 2 mm to 5 mm. Our simulation results demonstrate that coronary artery flows are insensitive to the choice of the SVG revascularization geometry. The wall shear stress of SVG notably increases when the diameter decreases, following an inverse power scaling with diameter, consistent with a Poiseuille flow assumption. For a given diameter, the spatially averaged wall shear stress on the vein graft increases from the single, to the Y, and the sequential graft configuration.

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