

Abstract Submitted  
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**Fluid Dynamics of Contrast Dispersion in Coronary Arteries:  
Mechanism and Implications for Identification of Flow-Limiting Lesions<sup>1</sup>**

PARASTOU ESLAMI, JUNG-HEE SEO, ALBERT C. LARDO, RAJAT MITTAL,  
Johns Hopkins University — Recent coronary computed tomography angiography studies have noted the presence of axial contrast concentration gradients in stenosed coronary arteries, but the mechanism responsible for this phenomenon is not well understood. We use computational fluid dynamics to study intracoronary contrast dispersion and the correlation of concentration gradients with intracoronary blood flow and stenotic severity. Simulations of flow and contrast dispersion in both canonical and patient derived models of the left coronary artery (LCA) are carried out with a prescribed contrast bolus profile, and stenoses of varying severities (0% to 80%) considered. Data from our CFD simulations show the presence of measurable contrast gradients, the magnitude of which is found to decrease monotonically with stenotic severity and increase monotonically with the pressure drop across the stenosis. All simulated cases indicate a strong inverse correlation between contrast gradients and coronary flow rate. The study reveals that contrast gradients are generated by intracoronary advection effects, and therefore, encode coronary flow velocity.

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Rajat Mittal  
Johns Hopkins University

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