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CFD-based Thrombotic Risk Assessment in Kawasaki Disease Patients with Coronary Artery Aneurysms[1] DIBYENDU SENGUPTA, ETHAN KUNG, ANDREW KAHN, JANE BURNS, ALISON MARSDEN, UC San Diego — Coronary aneurysms occur in 25% of untreated Kawasaki Disease (KD) patients and put patients at increased risk for myocardial infarction and sudden death. Clinical guidelines recommend using aneurysm diameter >8mm as the arbitrary criterion for treating with anti-coagulation therapy. This study uses patient-specific modeling to non-invasively determine hemodynamic parameters and quantify thrombotic risk. Anatomic models were constructed from CT angiographic image data from 5 KD aneurysm patients and one normal control. CFD simulations were performed to obtain hemodynamic data including WSS and particle residence times (PRT). Thrombosis was clinically observed in 4/9 aneurysmal coronaries. Thrombosed vessels required twice as many cardiac cycles (mean 8.2 vs. 4.2) for particles to exit, and had lower mean WSS (1.3 compared to 2.8 dynes/cm^2) compared to vessels with non-thrombosed aneurysms of similar max diameter. 1 KD patient in the cohort with acute thrombosis had diameter < 8mm. Regions of low WSS and high PRT predicted by simulations correlated with regions of subsequent thrombus formation. Thrombotic risk stratification for KD aneurysms may be improved by incorporating both hemodynamic and geometric quantities. Current clinical guidelines to assess patient risk based only on aneurysm diameter may be misleading. Further prospective study is warranted to evaluate the utility of patient-specific modeling in risk stratifying KD patients with coronary aneurysms.

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Dibyendu Sengupta
UC San Diego

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