Computational fluid dynamics in coronary plaques predict coronary artery disease

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Computational fluid dynamics (CFD) simulation based on 3D luminal reconstructions of the coronary artery tree can be used to analyze local flow fields and flow profiling resulting from changes in coronary artery geometry. Research conducted at Curtin University in Perth, Australia, used the technique to identify risk factors for development and progression of coronary artery disease.

Both idealized and realistic coronary models were successfully generated using CFD simulations of hemodynamic flow. Results showed a direct correlation between left coronary angulation and wall shear stress changes.

"Analysis of CFD complements cardiac CT imaging by being able to define internal biomechanics, including stresses and strain within the coronary artery system," said the study's author Zhonghua Sun, PhD. "Accordingly, by combining these capabilities, cardiac CT imaging supported by the qualitative and quantitative insights provided by computation becomes a far more powerful tool for diagnosis and risk-assessment of coronary artery disease."

The study was featured in an electronic exhibit at the ARRS 2015 Annual Meeting in Toronto.

More information: View the abstract.