



3D Simulation of Inflammatory Process in Coronary Arteries

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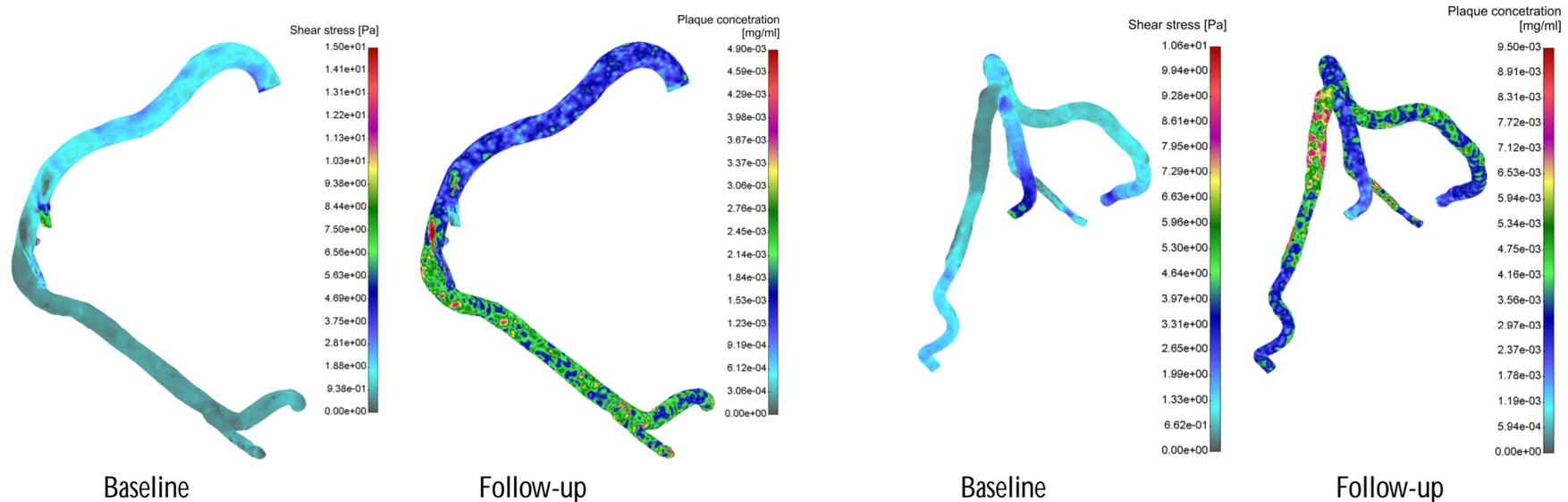
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- **Introduction** – Atherosclerosis is a disorder in the function of the membrane of the first layer of the blood vessel that leads to accumulation of lipids in the intima layer of the blood vessel.
- **Aim** – The purpose of this paper was to determine hemodynamic parameters such as mass flow and wall shear stress with computational fluid dynamics in the coronary artery using patient-specific data obtained from computed tomography. Also, plaque concentration in the arterial wall was calculated.
- **Materials and methods** – The Navier-Stokes equations govern the blood motion in the lumen, the Darcy law is used for model blood filtration, Kedem-Katchalsky equations for the solute and flux exchanges between the lumen and the intima. The system of three additional reaction-diffusion equations that models the inflammatory process and lesion growth model in the intima was used.
- **Results** – Two time periods were analyzed: baseline (0 months) and follow-up (after 8 months). A three-dimensional simulation of blood flow through lumen and plaque progression in vessel wall was simulated. The bio molecular parameters such as LDL, HDL and triglycerides are used for the computer simulation.
- **Conclusion** – By knowing bio-molecular parameters such as LDL, HDL and triglycerides, it is possible to predict the sites of plaque occurrence as well as concentration in certain places of the artery using computer simulation.



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