A Multiscale model for mass transport by a drug eluting stent

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Abstract

In order to study the influence of the stent geometry in local hemodynamics and drug diffusion we propose a fully coupled model over realistic 3D domains. The model consist of a system of partial differential equations coupled with suitable interface conditions between the different sub-regions that represent the physical domains of the problem. To describe the blood flow in the lumenal region and plasma filtration in the arterial wall we consider respectively the steady state Navier-Stokes equation and Darcy's equation. To cut down the computational cost of the numerical simulations associated to the tracking of the drug release from the polymeric coating of the stent to its surroundings, we replace the initial boundary value problem associated to the release, with a Robin type boundary condition. The diffusion of the drug in the lumen and in the arterial wall is governed by the advection-diffusion equations.

Keywords: Drug eluting stents , multiscale modelling, Fickian diffusion.

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