DES: atherosclerotic plaques and drug sorption

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Abstract

Atherosclerosis is the most common cardiovascular disease that is characterized by the narrowing and hardening of arteries. This process is caused by cholesterol deposition due to inflammation of the intima. Drug eluting stents(DES)- metallic structures coated by a polymer containing an anti-proliferative agent which is gradually released - are the most common drug delivery systems used in the treatment of atherosclerosis. Such devices were proposed to overcome the re-narrowing of the blood lumen after intervention, the so called restenosis, which is a common complication of bare metal stents (BMS). In fact, DES provide inhibition of neointimal proliferation as a response to endothelial injury.

In this work we study the drug release from DES coated with polylactic acid (PLA) where a drug is dispersed. We aim to show that the sorption of the drug by the vessel wall is a spatially heterogeneous process that highly depends on the local composition of the atherosclerotic plaques. We consider that at initial stage the drug is in the solid phase, dissolves in presence of the plasma and its transported occurs in a porous medium. The viscoelastic properties of the arterial wall as an indicator of its heterogeneous stiffness, the location and composition of different types of atherosclerotic plaques (lipid and hard plaques with a non-diffusible core) are also taken into account. This presentation is based on the papers [1, 2, 3].

Keywords: Drug eluting stents, atherosclerotic plaques, viscoelastic properties.

References

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