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Simulation of balloon angioplasty
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– application of a gradient-enhanced fibre damage model

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Abstract

In this contribution we study the balloon angioplasty in a residually stressed artery by means of a non-local gradient-enhanced fibre damage model. The balloon angioplasty is a common surgical intervention used to extend or re-open narrowed blood vessels in order to restore the continuous blood flow in, for instance, atherosclerotic arteries. Inelastic, i.e. predominantly damage-related and elastoplastic processes are induced in the artery during its inflation resulting in an irreversible deformation. As a beneficial consequence, provided that the inelastic deformations do not exceed a specific limit, higher deformations can be obtained within the same pressure level and a continuous blood flow can be guaranteed. In order to study the mechanical response of the artery in this scenario, we make use of the non-local gradient-enhanced model proposed in Waffenschmidt et al. (2014). In this contribution, we extend this model to make use of an incompressible format in connection with

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