# Computation of Eigenstresses in Three-Dimensional Patient-Specific Arterial Walls

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## ABSTRACT

Residual stresses are present in a number of soft tissues. In the case of arterial walls they are supposed to be responsible for a smoothed circumferential stress gradient in radial direction. In the recent past, several publications dealt with residual stresses based on a multiplicative split of the deformation gradient using a cylindrical coordinate system, cf. for example [1], [2] and [3] and the references therein. Nevertheless, in patient-specific arteries a unique circumferential or radial direction does not exist. Therefore, in this contribution we will focus on the smoothing of stress invariants which account for the distinct anisotropic behavior of arterial walls, cf. [4]. The artery is first loaded with the internal blood pressure without considering any residual stresses. To incorporate the residual stresses the geometry is divided into sectors. With help of stress related average values of the sectors, the stress gradient is iteratively decreased in radial direction. In order to assess the accuracy of the method, three-dimensional patient-specific arterial geometries, suffering from atherosclerosis, are considered. These were reconstructed from ultrasound based medical imaging, see [5]. Moreover, the radially sliced arteries can be loaded exclusively with the calculated residual stresses in order to measure the opening angle and gauge the suitability of the discussed method.

## REFERENCES

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