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# Constitutive modeling of vascular tissue with application to the abdominal aortic aneurysms wall

**T.C. Gasser**

KTH Solid Mechanics, School of Engineering Sciences,

Royal Institute of Technology (KTH), Stockholm, Sweden

gasser@kth.se

Robust and physiologically relevant constitutive models are central to better understand and more effectively treat vascular diseases. Although vascular tissue is known to sense and response actively to changes in its mechanical environment, only a few models account for that crucial tissue property. The present study reviews existing histomechanical models and proposes a novel constitutive multi-scale framework for collagenous tissue. The new approach provides an interface to include basic vascular biology through the collagen fibril level, where a stretch-based stimulus determines their production and spatial organization. The model was calibrated to mechanical and histological data of the wall from electively repaired abdominal aortic aneurysms (AAAs). Wall stress in a patient-specific AAA was predicted and compared between different constitutive models. In conclusion, accounting for active remodeling allowed to simulate realistic AAA growth and caused a significantly smoother wall stress than it was predicted by purely passive models.

**Keywords:** Constitutive modeling, Remodeling, Arterial tissue