KTH SOLID MECHANICS SEMINAR; Thursday, September 30th, 16.15; https://kth-se.zoom.us/j/62041281667

T.Christian Gasser's seminar "Biomechanical rupture risk assessment of abdominal aortic aneurysms. Achievements, clinical relevance, and tissue modeling"

Abdominal Aortic Aneurysm (AAA) disease, the local enlargement of the infrarenal aorta, is a serious condition that causes many deaths, especially in men exceeding 65 years of age. Over the past quarter of a century, computational biomechanical models have been developed towards the assessment of AAA risk of rupture, technology that is now on the verge of being integrated within the clinical decision-making process. The modeling of AAA requires a holistic understanding of the clinical problem, in order to set appropriate modeling assumptions and to draw sound conclusions from the simulation results. In this seminar we summarize and critically discuss the proposed modeling approaches and report the outcome of clinical validation studies for a number of biomechanics-based rupture risk indices. Whilst most of the aspects concerning computational mechanics have already been settled, it is the exploration of the failure properties of the AAA wall and the acquisition of robust input data for simulations that has the greatest potential for the further improvement of this technology. The second part of the talk will therefore focus on the multiscale description of AAA tissue and summarizes recent constitutive modleing attempts.

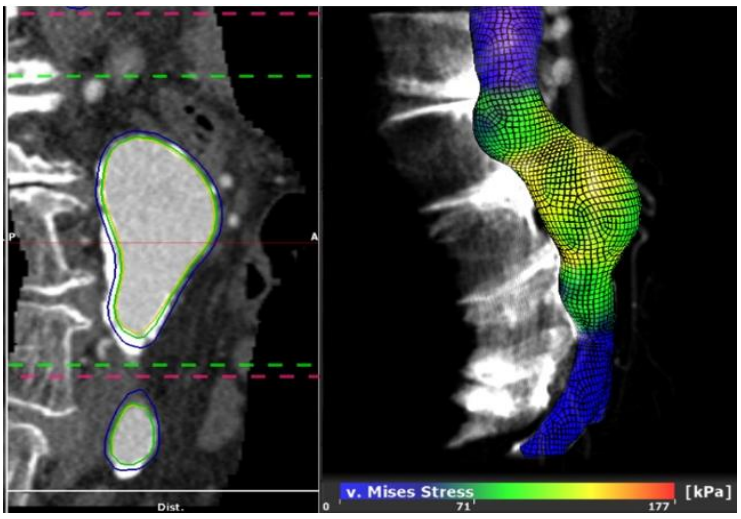

Figure 1: Reconstruction of an Abdominal Aortic Aneurysm (AAA) from Computed Tomography-Angiography (CT-A) images towards the computation of AAA wall stress.

T.Christian Gasser is Professor of biomechanics at KTH Royal Institute of Technology, Sweden, and holds also an adjunct Professor position at the University of Southern Denmark, Denmark. Christian received a MSc in Mechanical Engineering and a PhD in civil engineering, both from Graz University of Technology, Austria. Main scientific activities relate to the development and use of advanced numerical techniques to solve realistic (bio)engineering and clinical problems. Earlier constitutive models for the description of anisotropic finite strain materials have been implemented in Finite Element simulation packages, such as ANSYS, ABAQUS, and COMSOL. Vascular biomechanics research has led to collaboration with world-class clinical institutions, such as Karolinska University Institutet and Hospital, and translational research resulted in A4clinic, commercial biomechanical-based simulation software for clinical decision making. Christian wrote one book, 16 book chapters and co-authors almost 100 journal articles. Google scholar lists 13k+ citations, and Christian serves as associate editor of International Journal for Numerical Methods in Biomedical Engineering, Wiley, and Mechanics of Soft Materials, Springer.