



Biomechanics of atherosclerotic plaque rupture

Speaker: Dr. Frank Gijsen, Associate Professor in the Department of Biomedical Engineering of the Thorax Center, Erasmus MC, Rotterdam

When: 4pm on Tuesday 4th of December 2018

Where: B2.72 – B2.74, Trinity Biomedical Sciences Institute

Atherosclerotic plaque rupture in coronary and carotid arteries triggers thrombotic processes and are recognized as the primary cause of cardiac and cerebral ischemic events. Predicting the rupture risk of atherosclerotic plaques is of great importance for effective treatment planning. However, currently no reliable methods exist for rupture risk assessment.

From biomechanical viewpoint, plaque rupture is mechanical failure of the plaque material where plaque loses its structural integrity due to the loading exerted upon. Hence, understanding the biomechanical mechanisms involved in plaque rupture and developing appropriate computational models will enable accurate and reliable plaque-specific rupture risk assessment tools.

In this presentation prof. Gijsen will provide a brief overview on atherosclerotic plaque rupture biomechanics and present the work from the Erasmus MC biomechanics lab in the field. The presentation will discuss experimental work on plaque tissue characterization, new imaging techniques and finite element modeling of atherosclerotic plaques.



Frank Gijsen's research covers image-based biomechanics of the cardiovascular system. His research interests include the influence of blood flow induced wall shear stress on plaque progression, composition and rupture. Furthermore, he focuses on plaque biomechanics in order to assess the mechanical stability of coronary and carotid plaques. For both research topics, he combines state of the art finite element analysis of both the blood flow and plaque mechanics with the latest imaging modalities. Research on cardiovascular biomechanics is carried out in genetically modified mice and patients suffering from cardiovascular disease.

Frank Gijsen studied mechanical engineering at the Eindhoven University of Technology. He obtained his PhD from the same university with a thesis on the modelling of blood flow in large arteries. After his PhD he was founder of a bioengineering company, and he was involved as a board member in setting up the department of Biomedical Engineering at the Eindhoven University of Technology in Eindhoven. He moved to the Erasmus MC in 2001, where he started as a post-doc and currently serves as assistant professor. Dr. Gijsen is (co-)author more than 100 scientific papers with more than 5000 citations, 6 book chapters, and he served as a guest editor for several special issues, including one on 'Plaque Mechanics' for the journal of Biomechanics one on 'The virtual physiological human' for the Royal Society Interface. He is the recipient of national and international grants and one of the founders and organizers of the international symposium on Biomechanics in Vascular Biology and Cardiovascular Disease.