

Sandra Loerakker

“Computational mechanobiology approaches in the context of cardiovascular tissue engineering”

Engineered cardiovascular tissues have the intrinsic ability to grow and adapt to changes in their hemodynamic environment. This fascinating adaptive capacity gives these tissues the potential to overcome the limitations of current cardiovascular replacements that are unable to accommodate changes in the recipient's demands. For cardiovascular tissue engineering to be successful, however, we need to understand the responsible growth and remodeling mechanisms of (engineered) cardiovascular tissues, and be able to steer tissue development towards establishing a physiological tissue organization that ensures long-term tissue functionality. In this talk, I will discuss how computational modeling, particularly when integrated with experimental research, can aid in addressing both challenges. I will give a conceptual overview of the computational models that we developed to analyze the growth and remodeling of cardiovascular tissues, with a primary focus on heart valves and blood vessels.



Sandra Loerakker is an Associate Professor at Eindhoven University of Technology (TU/e), The Netherlands. She obtained her PhD at TU/e in 2011, for which she was awarded the ESB Best Doctoral Thesis in Biomechanics Award (2012) and the EPUAP Novice Investigator Award (2012). Sandra was appointed as Assistant Professor at TU/e in 2015, and was promoted to Associate Professor in 2019. From May 2016 – April 2017, supported by a Marie Curie Individual Fellowship, she also was a Visiting Assistant Professor at Stanford University (USA). Sandra's research focuses on developing experimentally informed computational models to understand and predict how mechanical factors regulate soft tissue regeneration and adaptation, with a primary focus on cardiovascular regenerative medicine. She is the recipient of prestigious personal grants (ERC Starting Grant in 2018, Vidi grant from the Dutch Science Foundation (NWO) in 2022), and she has been elected as Best Master Teacher of TU/e's Biomedical Engineering Department (2018, 2019, 2022, 2024) and of TU/e (2022). She also serves as Associate Editor of the 'Journal of Biomechanical Engineering', and is Editorial Board Member of 'Biomechanics and Modeling in Mechanobiology'. In 2024, she was elected as Council member of the European Society of Biomechanics.