15th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering
and
3rd Conference on Imaging and Visualization
CMBBE 2018
P. R. Fernandes and J. M. Tavares (Editors)

Plenary Lecture

BIOMECHANICAL MECHANISMS OF HEART FAILURE

Martyn Nash

The University of Auckland, New Zealand
martyn.nash@auckland.ac.nz

Keywords: Cardiac mechanics, Heart failure modelling, Microstructural remodelling

Summary: Diagnosis and treatment of heart failure is hampered by a lack of knowledge of the underlying pathophysiological mechanisms on an individualised basis. Tissue-apecific biomechanical factors, such as diastolic myocardial stiffness and stress, are known to have important influences on heart function, but these factors cannot be measured directly. Mathematical modelling provides a rational basis for identifying these biomarkers by integrating the rich variety of physiological data that are now available in the laboratory and clinical settings. This presentation will discuss how image-based, individualised biomechanical models of the heart can be used to characterise the relative roles of anatomical, microstructural and functional remodelling in heart failure. Data from pre-clinical and clinical studies will be presented to demonstrate this approach. In the clinic, patient-specific mathematical models of this kind have the potential to more specifically stratify the different forms of heart pathology, and thus to help inform and monitor patient therapy.