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Impact of mechanically-induced fibrosis on atrial electromechanical function

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Atrial fibrillation is accompanied by remodelling processes on the structural, electrophysiological, and mechanical levels. Part of the observed alterations, in particular at the structural level, results from mechanical overload. In order to investigate the effects of mechanical forces on atrial tissue mechano-electric functions, we are establishing an *in vitro* model based on human and porcine atrial slices. Slices are electrically and mechanically stimulated in dedicated biomimetic chambers. Contractions are continuously monitored for up to 7 days. We hypothesise that mechanical overload can induce fibrosis, mimicking the condition of atrial tissue from patients having sustained atrial fibrillation, and thereby alter electromechanical function of the tissue. We aim to use this model for an in-depth characterisation of the effects of mechanical overload on the atrial tissue mechanical and electrophysiological properties of atrial tissue. In addition we have derived functional atrial and ventricular cardiomyocyte populations from human induced pluripotent stem cells, and characterized their electrical and mechanical functions. By compiling all data obtained into a computational model, we propose to establish a digital slice model in which parameters such as collagen distribution, stiffness of the tissue and extracellular matrix, as well as excitation could be changed indecently to assess effects on passive and active mechanics as well as on the electrophysiological properties of the atrial slices tissue over time.

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