

Research Project

Non-invasive ultrasound molecular imaging of myocarditis and autoimmune myocardial inflammation

Third-party funded project

Project title Non-invasive ultrasound molecular imaging of myocarditis and autoimmune myocardial inflammation

Principal Investigator(s) Kaufmann, Beat ;

Co-Investigator(s) Kuster Pfister, Gabriela ;

Project Members Ellertsdottir, Elin ; Xu, Lifan ;

Organisation / Research unit

Departement Biomedizin / Cardiovascular Molecular Imaging (Kaufmann)

Department

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Myocarditis is an inflammatory disease of the myocardium caused by a variety of infectious and non-infectious diseases. In western countries, it is most often of viral origin. After an initial virus-induced cytotoxicity, T-cell-mediated autoimmunity plays an important role. Myocarditis can present with highly variable symptoms but can also be asymptomatic. However, even asymptomatic patients carry a risk for sudden death. In addition, viral myocarditis may later develop into dilated cardiomyopathy, which in young patients is a frequent cause for heart failure. Autopsy studies show histologic evidence of myocarditis in 1% and suggest that the disease is underdiagnosed. Routine cardiac tests for diagnosis lack sensitivity and/or specificity. Even endomyocardial biopsy, which is considered the gold standard for diagnosis suffers from low sensitivity. Noninvasive imaging has been used to detect wall motion abnormalities (echocardiography) or evidence of tissue damage (magnetic resonance, nuclear imaging). However, wall motion abnormalities may not be present, and tissue damage may occur not only due to inflammation, but also due to ischemia. Thus, there is a need for non-invasive imaging methods for the diagnosis and detailed characterization of myocarditis. Contrast enhanced ultrasound (CEU) molecular imaging has been used to target leukocytes and markers of endothelial inflammation in myocardial microvessels. **We therefore propose to study the value of CEU molecular imaging for the diagnosis, sequential assessment and evaluation of prognosis of myocarditis. Specifically, we will test whether (1) CEU molecular imaging can detect myocardial inflammation in experimental autoimmune myocarditis independent of left ventricular function, (2) whether CEU molecular imaging can be used for serial assessment of inflammatory cell recruitment during all phases of autoimmune myocarditis, and (3) whether CEU molecular imaging of tissue inflammation is predictive of late functional impairment.** Myocarditis is a frequent differential diagnosis especially in young patients with an important disease burden. The diagnostic tools currently available are imperfect, and there is a need for novel, noninvasive diagnostic imaging methods. The proposed studies will assess whether CEU molecular imaging can be developed into a feasible tool for detecting myocarditis and whether it can assess its prognosis.

Keywords Myocarditis, Molecular Imaging, Ultrasound, Contrast

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