Journal of Cardiovascular Magnetic Resonance

Poster presentation

Accelerated whole-heart 3D CSPAMM reveals impact of beta-blocker therapy on myocardial architecture

Boris Schmitt

Address: German Heart Institute Berlin, Berlin, Germany
from 13th Annual SCMR Scientific Sessions
Phoenix, AZ, USA. 21-24 January 2010

Published: 21 January 2010

Journal of Cardiovascular Magnetic Resonance 2010, **12**(Suppl 1):P122 doi:10.1186/1532-429X-12-S1-P122

This abstract is available from: http://jcmr-online.com/content/12/S1/P122

Introduction

Myocardial tagging using accelerated whole-heart 3D CSPAMM is a tool to study myocardial wall motion parameters like strain, shortening and rotation.

Wall motion is altered in many heart diseases leading to heart failure.

One main column in therapy is beta-blockers while its physical mechanisms are not entirely understood yet.

Differences in beta-blocker sensitivity of longitudinal and transverse myocardial fibres seem to be of relevance.

We postulate a positive effect of early blocking of the contraction of the transverse myocardial fibres at low beta-blocker dosages which leads to increased longitudinal contractility with consecutively enhanced myocardial function.

Purpose

MRI 3D-tagging is used to investigate the structural basic principle in myocardial architecture accounting for the effect of beta-blocker therapy in myocardial insufficiency.

Methods

We included 10 healthy adults and administered an infusion of the beta-blocker Esmolol at increasing dosages starting from 5 or 50 μg/kg/min to 150 μg/kg/min.

Using a 3 T Philips Archieva® R2.5.3 MRI and the Gyrotools® 3D-tagging software we performed a whole-heart tagging scan with grid line interspace of 7 mm at each dosage.

In addition short axis CINE scans were performed to capture changes in systolic and diastolic ventricular volumes and stroke volumes respectively.

Stroke volumes were verified by executing phase-contrast MRI flow measurements in the ascending aorta.

During the MRI investigation ECG and blood pressure were continuously monitored.

After 3D shift correction the tagging scans were evaluated using TagTrack 1.5.2®.

In short axis views midventricular contours were drawn and processed throughout all heart phases, results exported as numeric values for circumferential and radial shortening [%] and rotation [degrees] and displayed as curves over time [heart phases].

Results

In six volunteers a shift of shortening curves towards earlier heart phases (left-shift) and a decrease in the area-under-the-curve (work) was noted. In three volunteers no significant change in phase but decrease in amplitude and work was observed. One proband showed a significant right-shift (negative inotropy) from the start. This proband was investigated a second time starting at a very low dose of 5 μg/kg/min resulting in a left-shift up to 25 μg/kg/min and a reproducible right-shift from 50 to 150 μg/kg/min. Vital parameters remained stable at all dosages in all volunteers.

Conclusion

Beta-blockers at low doses evoke an accelerated contraction profile leading to less myocardial work load with prolonged rest at diastole. At higher doses they induce negative inotropy. Individual beta-blocker-sensitivity can be detected by MRI 3D-tagging.