Reviewer's report

Title: Reduced flow in the left ventricle after anterior acute myocardial infarction: a case control study using 4D flow MRI

Version: 0 Date: 02 Sep 2019

Reviewer: Pim van Ooij

Reviewer's report:

In this study entitled "Reduced flow in the left ventricular apex after anterior acute myocardial infarction: a case control study using 4D flow MRI", Corrado et al. use cardiac MRI to investigate the hemodynamics in the left ventricle in patients with acute myocardial infarction (AMI) compared to healthy controls. Furthermore, they investigated how altered hemodynamics related to cardiac function parameters and myocardial strain. They employed bSSFP for left ventricular (LV) function (end-diastolic volume, end-systolic volume, stroke volume and ejection fraction) and strain (longitudinal, circumferential and radial) measurements, 4D flow MRI to derive the hemodynamic parameters peak systolic and peak diastolic kinetic energy and through-plane velocity magnitude, and late gadolinium enhancement MRI (LGE) for the measurement of infarct size. The main finding is that AMI patients had lower through-plane velocities in the LV apex and mid regions for systole, and in apex for diastole. Interestingly, the average kinetic energy normalized by stroke volume is more than two times higher (although not statistically significant) in patients compared to controls. This is due to a significantly lower stroke volume in the patients than the controls. The authors found that the peak systolic flow significantly correlated with heart rate, stroke volume, ejection fraction and circumferential strain, but only for the basal region (and with ejection fraction for the mid region).

Despite the limitations (different field strengths, especially important when considering KE in cases of more noise at 1.5T than 3T; limited statistical significance due to low number of subject, although trends may be appreciated as well), I find this study of interest. A regional analysis of LV hemodynamics in patients with AMI may provide additional information compared to considering the LV in its totality. The manuscript is clear, concise and well-written. I do have one question concerning the use of KEi_SV and a comment on the focus on the apex, while the results concerning the base are worth mentioning more prominently as well.
- Is KEi_SV a good measure to investigate altered hemodynamics in patients with AMI compared to healthy controls? If the SV is decreased in patients, it follows almost automatically that KEi_SV is increased, possibly even when the total LV KE is decreased in patients compared to controls, as is to be expected from the lower velocities. In my opinion in reference 10 it is not clearly described why normalization to SV is needed ("In sub-analysis, we also normalized the KE parameters to the stroke volume to develop insight into KE spent per unit of stroke volume."). Could the authors describe more explicitly why they chose to normalize KE to SV? Is it true that KE without normalization was decreased in patients with AMI as one would expect based on the flow results? Or are the results hampered by the effect of noise blow-up when reporting KE (as it is derived from velocity squared) in the patient data as the authors mention in the Discussion?

- In table 4 the flow parameters in the basal region predominantly correlate with functional parameters and circumferential strain. Considering that the average peak systolic flow is about two times lower in patients compared to controls (although not statistically significant), it is interesting to note that basal peak systolic flow in patients related to lower heart rate and circumferential strain. The title focusing on the apex alone neglects the interesting findings in the LV base.

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Yes

**Are the conclusions drawn adequately supported by the data shown?**
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