

ORAL PRESENTATION

Open Access

'Splenic switch-off' to detect adenosine understress; a novel method to improve test sensitivity

Charlotte Manisty^{1*}, David P Ripley⁴, Gaby Captur³, Charles Peebles², Timothy C Wong⁵, Erik B Schelbert⁵, Anna S Herrey⁶, John P Greenwood⁴, James Moon³

From 17th Annual SCMR Scientific Sessions
New Orleans, LA, USA. 16-19 January 2014

Background

The sensitivity of adenosine perfusion CMR is reduced by false negative scans, with up to 50% resulting from inadequate pharmacological stress. Without a robust physiological marker for adequate myocardial hyperaemia, this false negative rate is difficult to address. We observed that splenic perfusion is markedly attenuated with adenosine - compared both to rest and to myocardial perfusion. In this collaborative multi-center study, we investigate

the pharmacology of 'splenic switch-off', and evaluate its potential clinical utility as a marker of inadequate stress in adenosine perfusion imaging.

Methods

We assessed splenic perfusion in 4 cohorts acquired in 4 separate CMR units using 3 different pharmacological stressors. This study included: • Verification cohort of 50 adenosine perfusion scans (London, UK); to determine

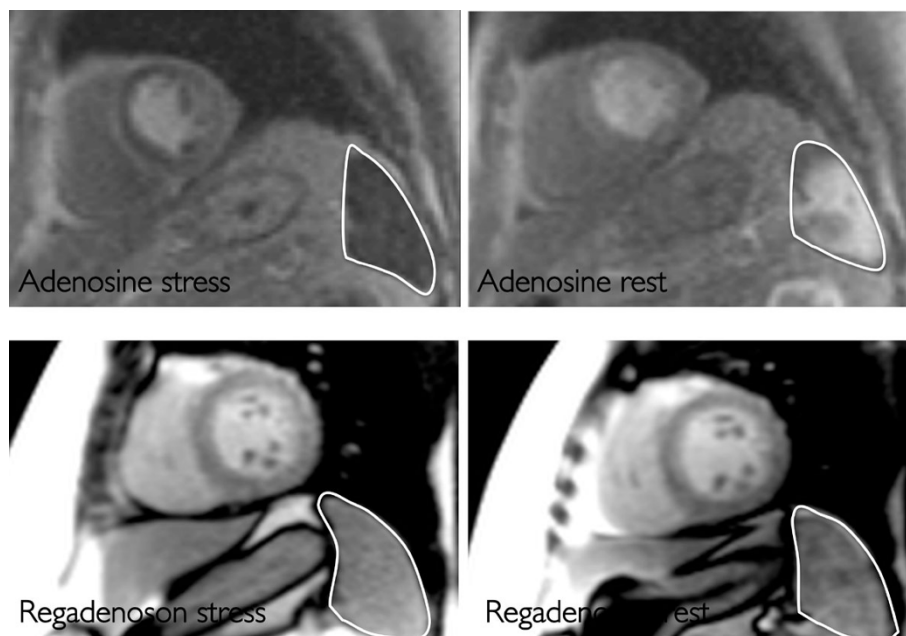
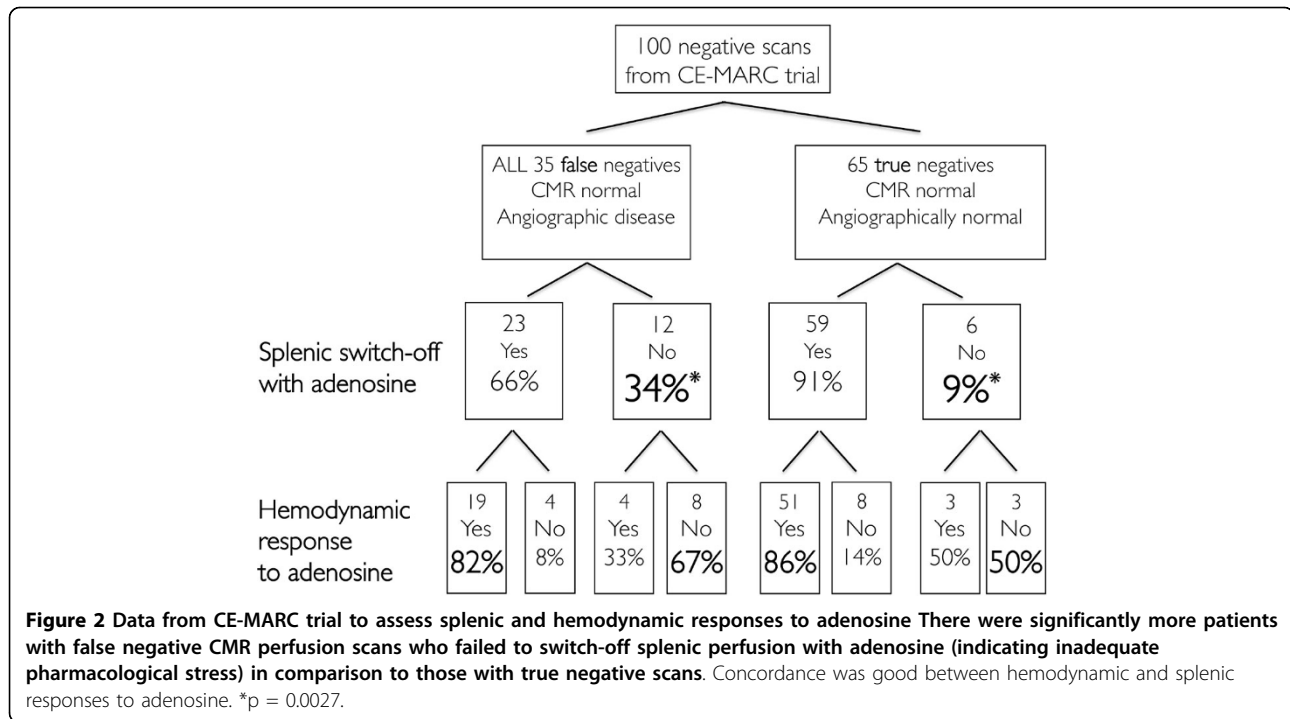


Figure 1 Splenic perfusion at stress and rest with adenosine (upper panels) and regadenoson (lower panels), showing splenic switch-off with adenosine only.

¹Heart Hospital Imaging Centre and Imperial College, London, UK
Full list of author information is available at the end of the article



if splenic perfusion is consistently switched-off with adenosine. • 2 comparison cohorts using alternative pharmacological stressors (25 dobutamine scans; Southampton, UK and 25 regadenoson scans; Pittsburgh, USA); to assess whether generic stress (or only adenosine) causes splenic switch-off. • Clinical utility cohort of 100 adenosine scans (35 false and 65 true negative) from the CE-MARC trial (Leeds, UK); to assess whether failure of splenic switch-off could be a useful clinical indicator of inadequate stress.

Results

The spleen was visible in 98.5% of scans and grading of splenic perfusion was concordant between 2 blinded observers, $\kappa = 0.84$. Splenic switch-off occurred in 92% of adenosine studies acquired in London, but did not occur either with dobutamine or regadenoson perfusion studies, Figure 1. Measuring perfusion semi-quantitatively using signal intensity, splenic perfusion with adenosine stress was significantly lower than at rest (8.1 ± 9 versus 33.3 ± 19 arbitrary units, $p < 0.0001$), in contrast to with regadenoson where it increased significantly (123.7 ± 56.7 versus 144.6 ± 59.2 au, $p = 0.003$). With dobutamine (where only stress images were acquired), splenic perfusion was greater than myocardial (54.1 ± 1 versus 67.6 ± 25.2 au, $p = 0.0005$), again in contrast to adenosine. Within the CE-MARC cohort, patients with false negative CMR scans had a 36% rate of failed splenic switch-off. By contrast, the true negative group had a 9% rate ($p = 0.0027$ for difference), Figure 2. Splenic response to adenosine was concordant with haemodynamic response in 81% of subjects.

Conclusions

Splenic switch-off with adenosine is a new observation, and although a drug-specific effect, can be assessed in nearly all scans. Rescanning individuals with failure of splenic switch-off would reduce false negative scans by a third, but it may be that up to 1 in 11 of all adenosine perfusion patients are understressed. Further work is needed on this important sign.

Funding

CM is an NIHR Clinical Lecturer.

Authors' details

¹Heart Hospital Imaging Centre and Imperial College, London, UK. ²University Hospital, Southampton, Southampton, UK. ³Heart Hospital Imaging Centre and University College, London, UK. ⁴Multidisciplinary Cardiovascular Research Centre (MCRC) & Leeds Institute of Genetics, Health and Therapeutics, University of Leeds, Leeds, UK. ⁵UPMC Cardiovascular Magnetic Resonance Center, Heart and Vascular Institute, University of Pittsburgh, Pittsburgh, Pennsylvania, USA. ⁶Heart Hospital Imaging Centre and Royal Free Hospital, London, UK.

Published: 16 January 2014

doi:10.1186/1532-429X-16-S1-O1

Cite this article as: Manisty et al.: 'Splenic switch-off' to detect adenosine understress; a novel method to improve test sensitivity. *Journal of Cardiovascular Magnetic Resonance* 2014 **16**(Suppl 1):O1.