Poster presentation

A direct comparison of adenosine and regadenoson myocardial perfusion reserves measured by MRI

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Introduction
Effective pharmacological vasodilation is essential for assessing myocardial ischemia with MRI. Recently, regadenoson (Lexiscan™) was FDA approved and has been shown to produce comparable SPECT perfusion defects to those seen with adenosine, while causing fewer side effects.

Purpose
To directly compare myocardial perfusion reserve with adenosine and regadenoson using quantitative MRI techniques.

Methods
8 subjects (5 female, 3 male) without ischemia were imaged on a 3 T Siemens Trio system. Imaging was done first at rest, and then during adenosine infusion (140 ug/kg/min) and 34 ± 4 minutes later with regadenoson injection (0.4 mg/5 ml). A 5 cc/sec injection of Gd-BOPTA (Multihance™) was used, with doses of 0.02, 0.03 and 0.03 mmol/kg, respectively. The contrast was injected ~3 minutes after the start of the adenosine infusion, and ~90 seconds after the regadenoson injection. A saturation recovery radial turboFLASH sequence was used with 72 rays acquired after each saturation pulse. Scan parameters were TR = 2.6 msec, TE = 1.14 msec, flip = 14, slice thickness = 8 mm. Reconstruction was performed by iteratively minimizing a cost function as in [1] with total variation constraints in both space and time dimensions. Processing was performed in a manner similar to [2] to convert the arterial input functions into gadolinium concentration to remove the effects of saturation. Images were registered and segmented to give time curves from 6 tissue regions per slice. The curves were fit to a two compartment model and K^{trans} used as an index of perfusion.

Results
Fig. 1 shows the correlation of the perfusion reserves for the two vasodilators. The mean perfusion reserve was 2.34 ± 0.85 for adenosine, and 2.36 ± 1.1 for regadenoson ($p = ns$). All subjects tolerated both vasodilators well. 6 out of the 8 subjects felt that the regadenoson was easier to tolerate, Figure 1.

Conclusion
Regadenoson is a potential alternative to adenosine for use with cardiac MRI studies. Unlike adenosine, regadenoson does not require the use of an MRI-safe infusion pump and the study can be done with one intravenous line rather than two. In the eight subjects studied here, regadenoson and adenosine appear to produce comparable coronary vasodilation as measured by dynamic contrast MRI. Heart rates can remain somewhat elevated for longer after regadenoson vs. adenosine so clinical protocols with cine imaging should be designed to take this into account.
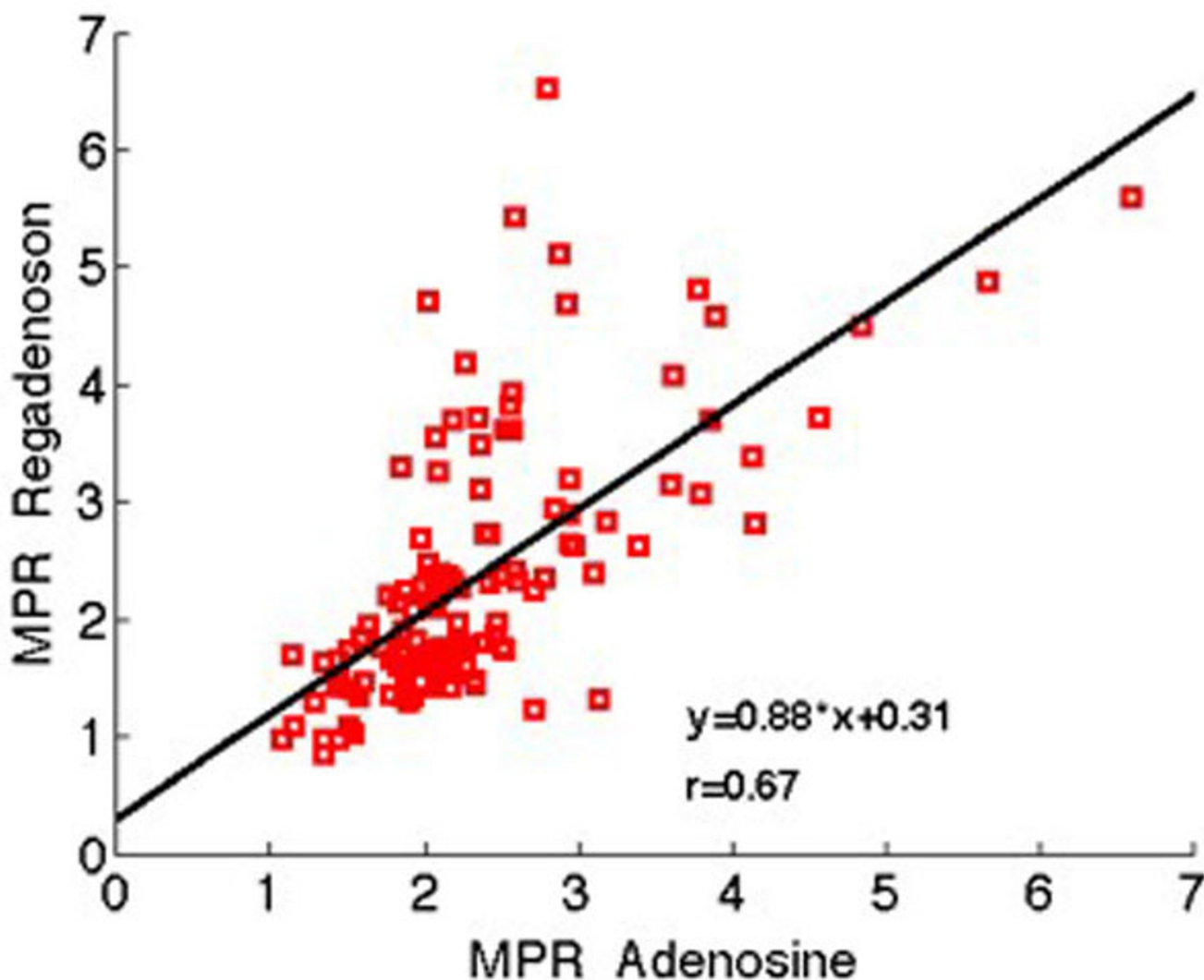
Acknowledgements

Figure 1
Relationship between adenosine and regadenoson myocardial perfusion reserve (MPR) values in 8 subjects, 6 regions per slice.

References
1.   *JMRI* 2009, **29:**466-73.
2.   *MRM* 2007, **57:**821-7.