Assessment of regional myocardial perfusion during low-dose dobutamine infusion — differences between hypokinetic, akinetic and infarcted myocardial sectors

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INTRODUCTION
Revascularization of ischemic myocardium results in augmentation of myocardial function only when the treated segment is viable. Purpose of this study was to assess myocardial viability with combination of three MR imaging modalities: cine, perfusion and late contrast enhancement. The results were compared to FDG-PET and myocardial postoperative recovery assessed with MRI 6 months after intervention.

PATIENTS
Ten patients suffering from 3 three vessel coronary artery disease diagnosed with coronary angiogram and regional dyskinesia in cineangiogram were included. Mean age was 62, 4 were women.

STUDY PROTOCOL
All patients underwent MRI and PET imaging within two weeks, after which they were treated with coronary bypass surgery. Six months later MRI was repeated.

IMAGING METHODS
MRI was performed with 1.5T Siemens Vision imager's body array coil as receiver. Left ventricular function and regional wall motion was first assessed from five 8mm thick short axis cine slices obtained during breath hold. During dobutamine 5ug/kg/min infusion three short axis slices were imaged first with cine sequence and then during 0.05 mmol/kg Gd-DTPA injection with a IR-prepared turboflash sequence (TI 400 ms). Five minutes after injection the turboflash images were repeated to observe late enhancement of myocardial infarction. Static ¹⁸F fluorodeoxyglucose PET imaging was performed after oral administration of oclymox to reduce plasma free fatty acids.

IMAGE ANALYSIS
Each left ventricular short axis section was divided to 8 segments for further analysis. Wall thickening was quantitated from cine images and rest and stress results were compared. Segments with less than 2mm thickening at rest were considered chronically ischemic. They were annotated dobu+ segments if the low dose infusion increased thickening by 2mm, and dobu- if there was less response. Each segment was also analyzed for first pass enhancement (see Figure) using time-SI-curves. Finally the presence of post contrast enhancement of myocardium either transmurally or subendocardially was noted at each segment. MR segment was deemed unviable if there was transmural enhancement or if the segment with < 7mm diastolic thickness did not improve during dobutamine infusion ≥ 2mm. Corresponding short axis sections and segments of PET images were analyzed. Uptake of FDG ≥50% was considered to represent viable myocardium.

RESULTS and CONCLUSION
On MR cine images 178 of 240 segments had normal wall thickening at rest. We found an agreement of viability between MRI and PET in 50 chronically ischemic segments, as there was disagreement in 13 segments. Interestingly, there was a significantly differential enhancement slope in myocardial segments with infarction, dobu-, dobu+ and normal wall motion (0.25, 0.63, 1.52, and 1.75 %fatSI/s, correspondingly). We showed that no increase in wall thickening can occur due to dobutamine stimulation in regions where perfusion is severely degraded due to coronary artery disease. Therefore we conclude that perfusion imaging is useful in detection of viable myocardium and severity of myocardial ischemia.

REFERENCE
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