POSTER PRESENTATION　　　　　　　　　　　　　　　　　**Open Access**

Myocardial feature tracking for viability assessment in ischemic cardiomyopathy

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Objective
To evaluate myocardial feature tracking (FT) as a potential novel quantitative analysis tool for the assessment of myocardial viability using LDDSMR.

Background
Low dose dobutamine stress magnetic resonance imaging (LDDSMR) is a widely accepted technique for assessment of hibernating myocardium in patients with ischemic cardiomyopathy (ICMP). It is particularly helpful in patients with intermediate transmurality of scar where prediction of functional recovery by late gadolinium enhancement imaging (LGE) alone is difficult. Analysis of LDDSMR is usually based on visual assessment and is therefore considerably operator dependant. Recently myocardial feature tracking (FT) has been introduced. It tracks tissue voxel motion of cine-MR images to assess circumferential and radial myocardial strain independent of additional sequences.

Methods
15 consecutive patients with ICMP referred for viability assessment were studied at 3 Tesla (Philips Achieva) at rest and during LDDSMR. ICMP was defined as: angiographically established coronary artery disease, LV-EF ≤45% and ≥2 segments with wall motion abnormalities at rest. Myocardial function was studied by steady state free precession (SSFP) cine imaging in 3 short axis slices covering 16 myocardial segments, excluding the apex.

The same segments were studied with dedicated FT software (Diogenes MRI, Tomtec, Germany) to assess subendocardial and subepicardial circumferential (Ecc) and radial (Err) strain.

Results
208 of 240 segments (87%) were analysed by two independent observers. 32 segments were excluded because of insufficient image quality or visualization of the outflow tract. Interobser-variability was: $Ecc_{subendocardial}$ r=0.84, $Ecc_{subepicardial}$ r=0.72 and Err r=0.7.

During LDDSMR (5 and 10 µg · kg^{-1}· min^{-1}) there was improvement in $Ecc_{subendocardial}$, $Ecc_{subepicardial}$ (p<0.001, by repeated measures analysis) and Err (p=0.001, please refer also to Table 1). Normokinetic segments without scar (n=67) improved in $Ecc_{subendocardial}$ (p<0.001) and $Ecc_{subepicardial}$ (p=0.008) while Err remained unchanged with stress. Hypokinetic segments without scar (n=75) improved in all three strain values ($Ecc_{subendocardial}$ p=0.012 ; $Ecc_{subepicardial}$ p=0.035 ; Err p=0.001). Hypokinetic segments with non-transmural scar (n=60) showed improved $Ecc_{subendocardial}$, $Ecc_{subepicardial}$ and Err up to 75% transmurality while transmurally scarred segments (n=6) remained unchanged with stress.

Conclusion
FT is a novel technique, which reliably detects quantitative wall motion derived from SSFP CINE imaging. It seems useful for quantitative analysis at rest and during low dose dobutamine stress for viability assessment in patients with ischemic cardiomyopathy.

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Table 1 Strain Values for different groups of transmurality at rest, 5 and 10 µg · kg-1· min-1 of dobutamine

Strain	Strain Rest, 5 and 10 µg · kg^{-1}· min^{-1} of dobutamine	p
All segments (WMS 0-5, LGE 0-100%, n=208)		
Ecc subendocardial	-11.8±8.9 ; -14.1±9.7 ; -16.2±11.2	**<0.001**
Ecc subepicardial	-7.1±5.2 ; -8.9 ±6.1 ; -10.4±7.8	**<0.001**
Err	13.4±12 ; 16.1±12.1 ; 17.2±14.3	**0.001**
Normal segments (WMS 5, LGE 0%, n=67)		
Ecc subendocardial	-16.2±11.1 ; -18.9±11.5 ; -22.3±13.3	**<0.001**
Ecc subepicardial	-8.6±6.2 ; -10.6±7.4 ; -13±10.3	**0.008**
Err	19.3±15 ; 20.7±13.2 ; 21.4±15.7	0.675
Hypokinetic segments without scar (WMS<5, LGE 0%, n=75)		
Ecc subendocardial	-10.5±6.9 ; -12.1±6.9 ; -14.1±9.2	**0.012**
Ecc subepicardial	-7±4.8 ; -8.2±5.5 ; -9.1±5.9	**0.035**
Err	11.7±8.3 ; 16±10.9 ; 16.5±12.8	**0.001**
Hypokinetic segments with non-transmural scar (WMS<5, LGE 1-25%, n=16)		
Ecc subendocardial	-10.7±7.9 ; -16±8.7 ; -16.6±10.8	**<0.001**
Ecc subepicardial	-7.6±5.3 ; -10.4±6.6 ; -12.2±7.5	**0.016**
Err	11.7±7.19 ; 20.1±16.8, 20.3±18.6	0.075
Hypokinetic segments with non-transmural scar (WMS<5, LGE 26-75%, n=44)		
Ecc subendocardial	-7.6±5.2 ; -10.3±7.4 ; -11.8±7.7	**<0.001**
Ecc subepicardial	-5.6±3.8 ; -7.4±4.3 ; -8.5 ± 4.9	**0.001**
Err	8.4±10.1 ; 8.7±5.6 ; 12.3±12	**0.017**
Hypokinetic segments with transmural scar (WMS<5, LGE 76-100%, n=6)		
Ecc subendocardial	-4.7±3 ; -2.9±2.5 ; -6.6±3.3	0.214
Ecc subepicardial	-2.9±2.9 ; -5.4±3.9 ; -4.5±4.2	0.131
Err	9.51±5 ; 5.4±6.2 ; 4.9±3.3	0.543