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Citation

Hulten, Edward, Ravi V Shah, Siddique Abbasi, Tomas Neilan, Jiazuo Feng, John Groarke, Alfonso H Waller, Ron Blankstein, Raymond Y Kwong, and Michael Jerosch-Herold. 2014. "Myocardial strain imaging with radial acquisitions (SIRA) reduces tag fading compared to Cartesian sampling." *Journal of Cardiovascular Magnetic Resonance* 16 (Suppl 1): P35. doi:10.1186/1532-429X-16-S1-P35. <http://dx.doi.org/10.1186/1532-429X-16-S1-P35>.

Published Version

doi:10.1186/1532-429X-16-S1-P35

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POSTER PRESENTATION

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Myocardial strain imaging with radial acquisitions (SIRA) reduces tag fading compared to Cartesian sampling

Edward Hulten^{1,3*}, Ravi V Shah^{1,2}, Siddique Abbasi¹, Tomas Neilan^{1,2}, Jiazuo Feng¹, John Groarke¹, Alfonso H Waller¹, Ron Blankstein¹, Raymond Y Kwong¹, Michael Jerosch-Herold¹

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

Background

Myocardial tagging is considered a gold-standard technique to derive myocardial strain using cardiac magnetic resonance (CMR) in large epidemiologic studies. Nevertheless technical limitations related to tag line fading (via T1 relaxation) limit generalizability and reproducibility of this technique. Our purpose was to test myocardial tagging with radial k-space acquisition against routinely utilized Cartesian k-space sampling techniques, in order to potentially minimize tag-line fading over the cardiac cycle.

Methods

We compared a new tagging sequence with radial acquisitions for cardiac MRI to a routinely-utilized clinical tagging sequence with Cartesian sampling. Both sequences were added pre-contrast to routine clinical scans of 14 patients. The per phase change in grayscale contrast due to T1 relaxation ("tag fading") of tagged myocardium was modeled using a non-linear fit with maximum likelihood estimation to an exponential decay curve and compared between groups. Peak Eulerian circumferential strain (Ecc) was compared using HARP software.

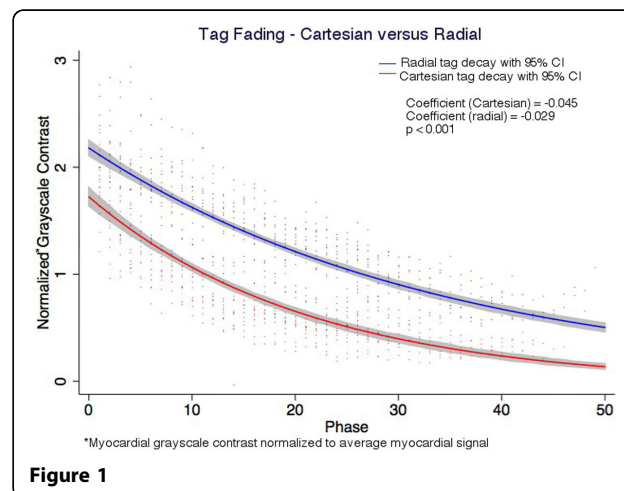
Results

14 patients (mean age 54 ± 16 years and 36% were men) and mean left ventricular ejection fraction $53 \pm 16\%$ (LVEF) were included. Tag fading differed significantly between radial and Cartesian sampling; the exponential decay coefficient was -0.045 ± 0.011 for the Cartesian and significantly higher than the decay coefficient value of 0.029 ± 0.007 for radial read-outs ($p < 0.001$). Due to

less tag fading myocardial strain could be evaluated for more segments acquired with radial, compared to Cartesian read-outs ($p < 0.001$). The intra-observer reliability for Ecc was higher for radial ($r = 0.99$, $p < 0.001$) than Cartesian ($r = 0.86$, $p < 0.001$) images ($p = 0.002$ for comparison). The bias was 0.9% and limits of agreement -4.1 to 6.0% with concordance = 0.86 ($p < 0.001$) for Ecc-radial versus Ecc-Cartesian. Both tagging methods correlated with LVEF, $r = -0.86$ ($p < 0.001$) for Ecc-radial versus $r = -0.83$ ($p < 0.001$) for Ecc-Cartesian.

Conclusions

Radial k-space acquisition with very low flip-angle excitations leads to better reliability for myocardial strain relative to standard, widely employed Cartesian readouts, while maintaining good signal-to-noise. Radial k-space



¹Noninvasive Cardiovascular Imaging, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts, USA
Full list of author information is available at the end of the article

acquisition is a promising new approach for evaluating myocardial strains using MRI.

Funding

None.

Authors' details

¹Noninvasive Cardiovascular Imaging, Brigham and Women's Hospital and Harvard Medical School, Boston, Massachusetts, USA. ²Division of Cardiology, Massachusetts General Hospital and Harvard Medical School, Boston, Massachusetts, USA. ³Cardiology, Walter Reed National Military Medical Center, Bethesda, Maryland, USA.

Published: 16 January 2014

doi:10.1186/1532-429X-16-S1-P35

Cite this article as: Hulten *et al.*: Myocardial strain imaging with radial acquisitions (SIRA) reduces tag fading compared to Cartesian sampling. *Journal of Cardiovascular Magnetic Resonance* 2014 **16**(Suppl 1):P35.

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