

ORAL PRESENTATION

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Comparison of strain measurement from multimodality tissue tracking with strain-encoding MRI and harmonic ophase MRI in Pulmonary Hypertension

Yoshiaki Ohyama^{1*}, Bharath Ambale Venkatesh¹, Elzbieta H Chamera¹, Monda Shehata², David Bluemke³, Joao A Lima¹

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

Background

Right ventricular (RV) function is the most important determinant of survival in patients with pulmonary hypertension (PH). Strain-encoding (SENC) MRI has been reported to be useful for the quantitative analysis of RV function. Harmonic phase (HARP) method analyzes myocardial deformation from tagging data and has been used for quantification of left ventricular (LV) function in large multi-center trials. Pixel-based multimodality tissue tracking (MTT) is a new noninvasive method for quantification of cardiac deformation from cine image. The aim of this study is to validate bi-ventricular strain measurement by MTT compared to SENC and HARP MRI in PH patients.

Methods

In 45 subjects (30 PH patients and 15 normal subjects), RV and LV peak global longitudinal strains (E_{ll}) were measured from long axis 4 chamber view using MTT. LV peak global circumferential strains (E_{cc}) by MTT were measured from short axis. For validation, RV and LV E_{ll} by MTT were compared to measures by SENC-MRI from short axis, and LV E_{cc} by MTT were compared to measures by short axis tagged MRI analysis (HARP).

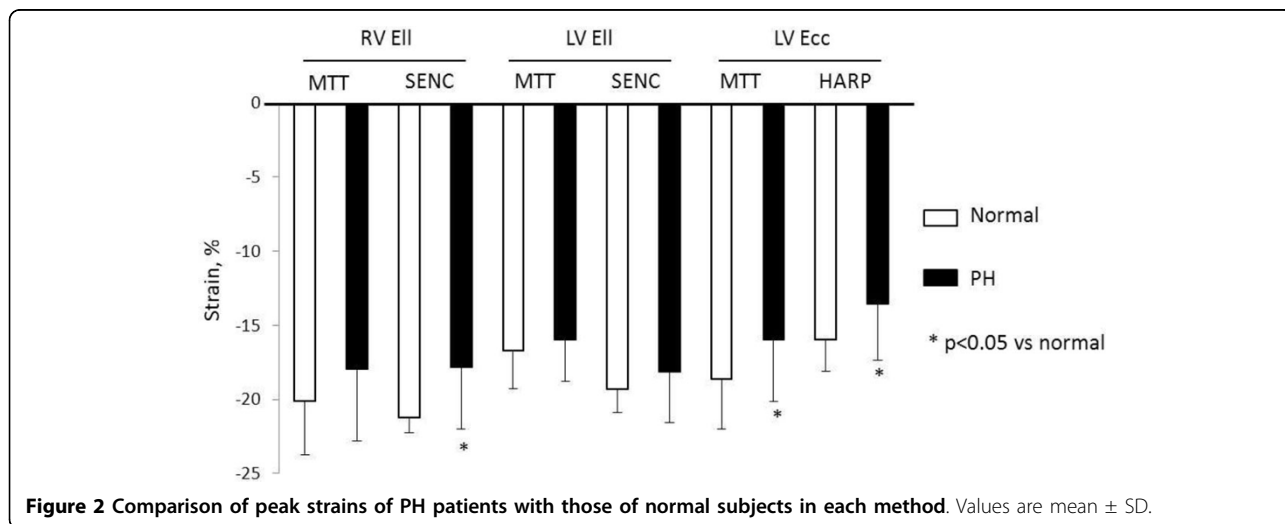
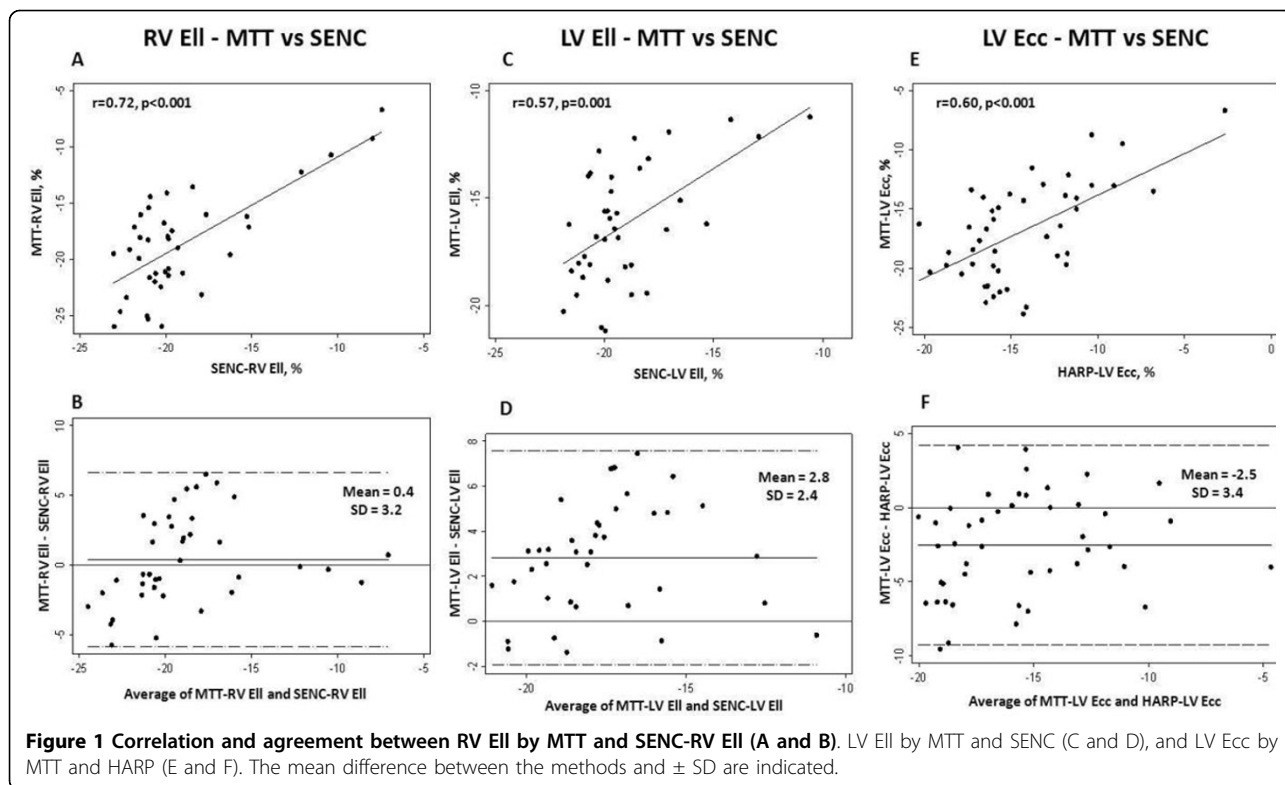
Results

MTT quantified RV E_{ll} correlated closely to those of SENC, with good limits of agreement (-18.7 ± 4.5 vs -19.1 ± 4.8 , $p = 0.463$ for all, $r = 0.72$, $p < 0.001$). LV E_{ll} quantified by MTT showed moderate correlation with SENC (-16.2 ± 2.8 vs -19.0 ± 2.4 , $p < 0.001$ for all, $r = 0.57$, $p = 0.001$), and LV E_{cc} by MTT also showed moderate correlation with HARP (-16.9 ± 4.1 vs -14.3 ± 3.5 , $p < 0.001$ for all, $r = 0.60$, $p < 0.001$) (Figure 1). PH patients demonstrated reduced RV E_{ll} compared to normal subjects (18.0 ± 4.8 vs -20.1 ± 3.6 , $p = 0.16$ in MTT, -17.8 ± 4.2 vs -21.2 ± 1.0 , $p = 0.004$ in SENC). LV E_{cc} was also reduced in PH patients compared to normal (-16.0 ± 4.2 vs -18.6 ± 3.4 , $p = 0.04$ in MTT, -13.5 ± 3.8 vs -16.0 ± 2.1 , $p = 0.03$ in HARP) (Figure 2). Strain measurement by MTT showed high reproducibility in both PH patients and healthy subjects.

Conclusions

We demonstrate that MTT is a reproducible tool for quantification of cardiac deformation using cine images in PH patients. Hence, it could serve as a new rapid and comprehensive technique for clinical assessment of regional cardiac function.

¹Johns Hopkins University, Baltimore, Maryland, USA
Full list of author information is available at the end of the article



Funding

Grant sponsor: National Institutes of Health; Grant number: NIH1P50HL084946.

doi:10.1186/1532-429X-16-S1-O38

Cite this article as: Ohyama et al.: Comparison of strain measurement from multimodality tissue tracking with strain-encoding MRI and harmonic ophase MRI in Pulmonary Hypertension. *Journal of Cardiovascular Magnetic Resonance* 2014 **16**(Suppl 1):O38.

Authors' details

¹Johns Hopkins University, Baltimore, Maryland, USA. ²Mercy Catholic Medical Center, Philadelphia, Pennsylvania, USA. ³National Institute of Health, Bethesda, District of Columbia, USA.

Published: 16 January 2014