



DIGITAL ACCESS TO SCHOLARSHIP AT HARVARD

Assessment of intra- and inter-ventricular cardiac dyssynchrony in patients with repaired Tetralogy of Fallot: a cardiac magnetic resonance study

The Harvard community has made this article openly available. [Please share](#) how this access benefits you. Your story matters.

Citation	Jing, Linyuan, Christopher M Haggerty, Jonathan D Suever, Ashwin Prakash, Frank Cecchin, Oskar Skrinjar, Tal Geva, Andrew J Powell, and Brandon K Fornwalt. 2014. "Assessment of intra- and inter-ventricular cardiac dyssynchrony in patients with repaired Tetralogy of Fallot: a cardiac magnetic resonance study." <i>Journal of Cardiovascular Magnetic Resonance</i> 16 (Suppl 1): P120. doi:10.1186/1532-429X-16-S1-P120. http://dx.doi.org/10.1186/1532-429X-16-S1-P120 .
Published Version	doi:10.1186/1532-429X-16-S1-P120
Accessed	February 16, 2015 11:47:56 AM EST
Citable Link	http://nrs.harvard.edu/urn-3:HUL.InstRepos:12406802
Terms of Use	This article was downloaded from Harvard University's DASH repository, and is made available under the terms and conditions applicable to Other Posted Material, as set forth at http://nrs.harvard.edu/urn-3:HUL.InstRepos:dash.current.terms-of-use#LAA

(Article begins on next page)

POSTER PRESENTATION

Open Access

Assessment of intra- and inter-ventricular cardiac dyssynchrony in patients with repaired Tetralogy of Fallot: a cardiac magnetic resonance study

Linyuan Jing^{1*}, Christopher M Haggerty¹, Jonathan D Suever¹, Ashwin Prakash^{2,3}, Frank Cecchin^{2,3}, Oskar Skrinjar⁴, Tal Geva^{2,3}, Andrew J Powell^{2,3}, Brandon K Fornwalt¹

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

Background

Patients with repaired tetralogy of Fallot (TOF) frequently have right bundle branch block. However, the contribution of cardiac dyssynchrony to dysfunction remains controversial. To better understand this phenomenon and ultimately study therapies, we developed a method to quantify left (LV), right (RV) and inter-ventricular cardiac dyssynchrony using standard cine CMR.

Methods

30 patients with repaired TOF (age 28 ± 16 , 46% female) and 17 healthy controls (age 29 ± 7 , 12% female) underwent cine CMR. Patients were imaged twice to assess inter-test reproducibility. Circumferential strain vs time curves were generated with a custom feature tracking algorithm for 12 LV and 12 RV segments in 4-7 slices encompassing the ventricles. For each segment, the temporal offset (TO) of the strain curve relative to a global reference curve derived from the controls was calculated and expressed as a percent of the cardiac cycle. The intra-ventricular dyssynchrony index (DI) for each ventricle was computed as the standard deviation (SD) of the TOs (more dyssynchrony increases the SD). The inter-ventricular DI was calculated as the difference in median RV and median LV TOs. Regional dyssynchrony was quantified in 3 LV (septum, infero-lateral and antero-lateral wall) and 3 RV (septum, sinus, outflow tract) regions using median TOs.

Results

Compared to controls, patients with repaired TOF had a greater LV, RV and inter-ventricular DI (Figure 1). The greater inter-ventricular delay in the patients was primarily due to a global delay in RV contraction with the RV contracting $4.9 \pm 3.5\%$ later than the LV in patients vs $1.4 \pm 3.2\%$ earlier in controls (Figure 1). Median TOs were similar in the three LV regions between patients and controls, but all three RV regions were significantly delayed in patients compared to the controls. Contraction patterns in the RV were also distinct: in controls, the earliest contraction was seen in the outflow tract; in patients, contraction occurred first in the septum and last in the outflow tract (Figure 2). Inter-test reproducibility for the three DIs was good with all coefficients of variation $<20\%$. QRS duration was prolonged in the patients compared to the controls (150 ± 27 ms vs 85 ± 8 ms, $p < 0.001$). However, QRS duration was not correlated with any of the DIs.

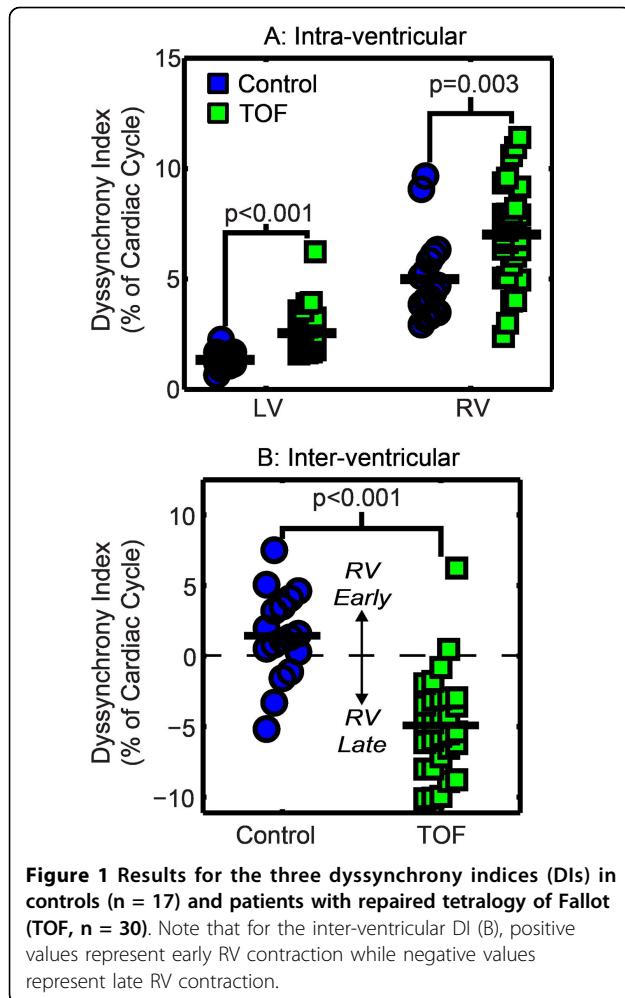
Conclusions

Patients with repaired TOF suffer from left, right and inter-ventricular cardiac dyssynchrony which can all be quantified from standard cine CMR with good inter-test reproducibility. Future studies need to determine whether these patients may benefit from resynchronization therapy.

Funding

This work was supported by a National Institutes of Health (NIH) Director's Early Independence Award (1DP5OD012132-01), and NIH grant number KL2 RR033171 from the National Center for Research Resources and the National Center for Advancing

¹Department of Pediatrics, Physiology, Biomedical Engineering and Medicine, University of Kentucky, Lexington, Kentucky, USA
Full list of author information is available at the end of the article



Translational Sciences. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH.

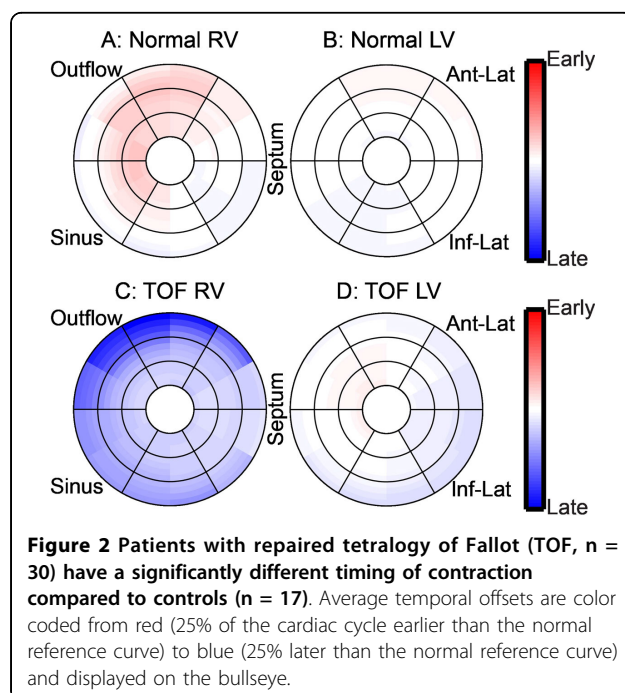
Authors' details

¹Department of Pediatrics, Physiology, Biomedical Engineering and Medicine, University of Kentucky, Lexington, Kentucky, USA. ²Department of Cardiology, Boston Children's Hospital, Boston, Massachusetts, USA. ³Department of Pediatrics, Harvard Medical School, Boston, Massachusetts, USA. ⁴Scientific Imaging and Visualization LLC, Atlanta, Georgia, USA.

Published: 16 January 2014

doi:10.1186/1532-429X-16-S1-P120

Cite this article as: Jing *et al.*: Assessment of intra- and inter-ventricular cardiac dyssynchrony in patients with repaired Tetralogy of Fallot: a cardiac magnetic resonance study. *Journal of Cardiovascular Magnetic Resonance* 2014 **16**(Suppl 1):P120.



Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Submit your manuscript at www.biomedcentral.com/submit

