

POSTER PRESENTATION

Open Access

Inversion time calculations have varying impact on short, intermediate and long MOLLI T1 values: implications for studies using T1-mapping sequences

Stefan K Piechnik^{1*}, Vanessa M Ferreira¹, Andreas Greiser², Bruce S Spottiswoode², Matthew D Robson¹, Stefan Neubauer¹

From 18th Annual SCMR Scientific Sessions
Nice, France. 4-7 February 2015

Background

T1-mapping has great diagnostic potential based on tight normal ranges and excellent sensitivity to disease. Numerically, T1 calculation hinges on the inversion time (TI) from the inversion preparation to the centre of k-space for each T1-weighted image. In the original ShMOLLI sequence (Piechnik *JCMR* 2010, 12:69) based on "Work In Progress" WIP561 MOLLI, the TI calculation was offset from centre of k-space by two SSFP echo spacings, and included ~10ms duration of the adiabatic inversion pulse itself. The impact on T1 values resulting from rectifying this since WIP448B and WIP780 warrants investigation to assure an accurate clinical interpretation of previously published normal ranges of MOLLI T1 values.

Methods

We compared pre- and post-contrast T1 values in multiple organs using original ShMOLLI (WIP561) and ShMOLLI (WIP448C) prototype sequences at 1.5T (Siemens Avanto MR system; software version syngo MR B17A) in 15 patients (7 males, 58±16 years-old, HR 64±11ms). A single mid-ventricular short-axis view per subject was used to acquire a pair of T1-maps using both versions; post-contrast T1-maps were acquired in threes (e.g. ShMOLLI WIP 561, 448, 561), averaging the 1st and 3rd measurements before comparing with the 2nd to compensate for the time trend post gadolinium administration. Matched regions of interests were prescribed manually in left

ventricular (LV) myocardium, LV and RV blood pool, spleen, liver parenchyma and visceral fat for comparison of the T1 values.

Results

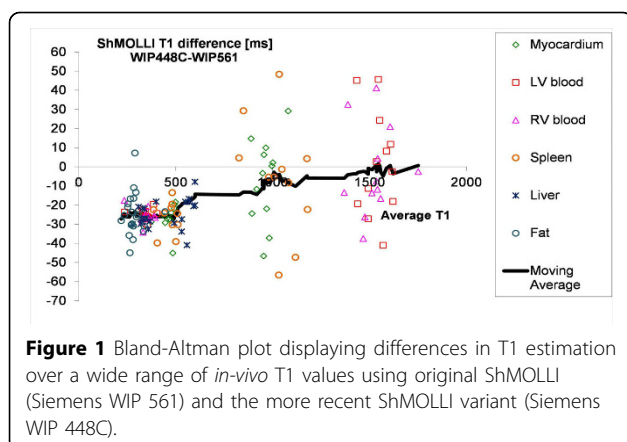
131 paired T1 measurements were obtained for comparisons of native and post-contrast T1 values in different tissues (Figure 1). The novel ShMOLLI variant (WIP448C) produced lower T1 estimates compared to original ShMOLLI (WIP561). This is especially pronounced for the short T1 range, both in the pre-contrast environment (e.g. native liver and visceral fat T1) and all post-contrast T1 estimates ($\Delta T1 = -25 \pm 8$ ms). The impact was less pronounced for the intermediate T1 range (i.e. native LV myocardium and spleen; -5 ± 26 ms) and nil for long T1 (LV and RV blood; -0.5 ± 25 ms). Specifically, native myocardial T1 showed trend level significance towards lower values (-7 ± 21 ms, $p = 0.094$) measured using novel ShMOLLI WIP448C.

Conclusions

There are quantitative differences in ShMOLLI-T1 estimation between WIP 561 and 448C versions due to inversion time calculations, which likely extends to other MOLLI variants. The effect is most pronounced on short T1 ranges (e.g. post-contrast T1) and may require correction of ~25ms to obtain equivalent values between WIP packages. The effect on intermediate and long T1 ranges (e.g. native myocardial and blood T1) is much less pronounced, but requires further investigation to establish corrections to previously established norms and thresholds for detecting disease. We suggest that

¹Oxford University, Oxford, UK

Full list of author information is available at the end of the article



studies employing T1-mapping sequences clearly publish the WIP number and software version to enable comparison of results to any published literature.

Funding

The research was supported by the National Institute for Health Research (NIHR) Oxford Biomedical Research Centre based at The Oxford University Hospitals Trust at the University of Oxford.

Authors' details

¹Oxford University, Oxford, UK. ²Siemens Healthcare, Erlangen, Germany.

Published: 3 February 2015

doi:10.1186/1532-429X-17-S1-P23

Cite this article as: Piechnik *et al.*: Inversion time calculations have varying impact on short, intermediate and long MOLLI T1 values: implications for studies using T1-mapping sequences. *Journal of Cardiovascular Magnetic Resonance* 2015 **17**(Suppl 1):P23.

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

 **BioMed Central**