Poster presentation

Multiecho dixon fat and water separation method for diagnosing pericardial disease

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Introduction
Depiction of pericardial disease using Cardiac MR can be difficult, even in the presence of significant pericardial thickening. One essential requirement is the homogenous and consistent suppression of fat to facilitate the distinction of pericardial fat from parietal pericardium. The conventional chemical-shift selective fat-saturation approaches often result in non-uniform fat-suppression due to field variations at tissue interfaces. Alternative methods such as the use of inversion recovery reduce signal strength in the resultant images. Multi-echo Dixon approaches utilizing iterative decomposition have been shown to provide robust fat-water separation even in the presence of large field inhomogeneities and are likely to be particularly beneficial in this area of pericardial imaging.

Purpose
To compare an ECG-triggered multi-echo gradient echo sequence with iterative fat/water decomposition reconstruction (VARPRO [1]) with conventional non-gated fat saturated T1-weighted gradient echo with shared prepulses (SHARP) sequence.

Methods
Twenty one patients with clinical and/or echocardiographic suspicion of pericardial disease were evaluated with cardiac MR. All patients were evaluated with SHARP and VARPRO techniques. For quantitative analysis, pericardial thickness was measured for both approaches. Results were compared using paired t-test. Pericardial thickness of more than 4 mm was considered abnormal. Two readers qualitatively assessed all studies for the presence of thickened pericardium using a four-point scale (1: poor, 2: fair, 3: Good, 4: Excellent). Results were compared based on intra-class correlation (ICC) and non-parametric test (Wilcoxon).

Results
Nine patients were diagnosed with pericardial thickening suggestive of pericarditis (standard; 5.9 ± 1.7 mm, Water; 6.4 ± 1.7 mm, Fat; 5.7 ± 1.9 mm) with no significant difference in measurements between the two approaches ($P > 0.05$). Subjective analysis of pericardial thickening showed significantly higher scores for the VARPRO approach ($P < 0.05$; median 3, range 3-4) with excellent inter-reader agreement (ICC = 0.85), Figure 1.

Conclusion
The VARPRO method for fat/water separation performs better than the standard fat saturation protocol currently used at our institution. The water image from this method presents with a more uniform fat suppression. Conventional chemical fat saturation is particularly unreliable at the lung/heart interface where significant changes in magnetic susceptibility of the tissues result in a non-uniform static field with consequent under-performance of the fat suppression method.
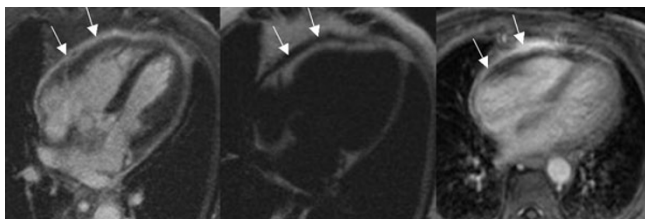
Figure 1

References

1.   Kellman P, *et al.*: **Multiecho Dixon Fat and Water Separation Method for Detecting Fibrofatty.** *Infiltration in the Myocardium Magnetic Resonance in Medicine* 2009, **61:**215-221.