

Cardiac protocol including anatomic proton MRI at 3T and 31P metabolic imaging at 7T

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Introduction

Phosphorus (31P) MRSI monitors cardiac energetics in vivo. Previous studies have shown that the PCr/ATP ratio predicts mortality, however widespread use has been hampered by low sensitivity and spatial resolution. We set out to solve these limitations by applying our dipole array coil for 31P MRSI at 7T. We aim to correlate the 7T 31P metabolic and cardiac energetics information with 3T volume and ejection fraction analysis on the same patients. We show here the performance of such an array and the set up of a 3T protocol, ahead of a future study in heart failure patients.

Methods

The full study protocol consisting of 7T 31P-MRSI and a 3T scan is detailed in Figure 1. For this study, we have been using our novel transmit/receive dipole array. A total of 8 volunteers consented to an in vivo 7T MRI scan and 5 to a 3T MRI. Experimental B1+ maps were acquired on a phantom. A 50mL tube was also placed in the center of this shaft to enable for a single point B1+ value at heart depth.

Results

The B1+ maps show good uniformity around the position of the heart. Spectra from the dipole array coil are of excellent quality.

The corrected PCr/ γ ATP ratio is consistent and lies in the expected range. 3T data analysis shows that the LVEF of the healthy volunteers are within the normal range.

Conclusion

Dipole array coils present a promising new approach for human cardiac 31P-MRSI at 7T and may increase the power of clinical trials measuring energetics.

Field

Systems and applications

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