

# Preliminary results of metabolic MRI technology and PET in patient with liver metastases

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**Introduction:** Metabolic MRI can reveal simultaneous detection of multiple metabolites involved in cell proliferation and energy metabolism without the need for radio-isotopes, however, this is so far not available throughout the human body.

**Methods:** We designed a metabolic body MRI system using a double-tuned RF bore transmitter for uniform excitation of  $^2\text{H}$  and  $^{31}\text{P}$  spins, an 8-channel  $^1\text{H}$  dipole transceiver, and 8 dual-tuned receiver loops for  $^2\text{H}$  and  $^{31}\text{P}$  at 7T. After careful assessment of the system and safety performance, a patient with liver metastases was enrolled to investigate altered metabolism compared to healthy controls and compared to FDG-PET/CT. The patient drank a deuterium-labeled glucose solution (20 grams of deuterated glucose in 100ml water) 40 min prior to the  $^1\text{H}$ - $^2\text{H}$ - $^{31}\text{P}$  MRI exam of 60 minutes.

**Results:** We were able to see full metabolic maps throughout the liver (and a large part of the body) for both  $^2\text{H}$  as well as  $^{31}\text{P}$  MR signals. While almost no deuterated lactate was observed in the healthy part of the liver, we see clear evidence of deuterated lactate signals in the metastases that match the elevated SUV area of the PET. Compared to a healthy liver, a substantial elevation of phosphomonoesters (PME) was observed in the metastases.

**Conclusion:** The first in man study of  $^2\text{H}$  and  $^{31}\text{P}$  metabolic MRI from a patient was shown. While only from one patient, PME and deuterated lactate levels were clearly elevated in the metastases compared to a healthy liver.

## Field

Systems and applications

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