Scientific Session

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Animal experiments at wholebody clinical MRI system

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Small animals or tissue specimens are often used to study/validate specific disease model and imaging technique, at high field, such as 7 T or 9.4 T, MRI system preferably. The advantages using high-field small-bore MRI system include, (a) high gradient strength, say 200 mT/m and (b) increased signal-to-noise ratio (SNR), which are required for imaging of small organs in high-resolution. However, small-bore MRI system is not widely available, as is the wholebody MRI system. In these days, 3 tesla clinical MRI systems start being equipped with stronger gradient, for instance 40 mT/m for routine imaging and 80 mT/m for diffusion imaging. As the SNR of water-proton MRI is roughly proportional to the field strength, it is doable to use the wholebody 3D MRI system for imaging studies of small animal and tissues, particularly using small RF coil with high-filling factor. Not only the large animal (rabbit, lamb, dog, and pig) can be imaged, also there are several benefits using the clinical 3T MRI system even for small animal, such as convenience for handling animal and availability of various stable imaging techniques.

In this presentation, my experiences with animal experiments at 3T MRI system, including requirements, will be introduced, particularly for drug-delivery and specimen experiments. Imaged in Fig. 1 and Fig. 2 are typical examples of an in-vivo mouse MRI for drug-delivery and ex-vivo human cervical spinal cord, respectively. These images were acquired at 3T MRI system using homemade Transmit/Receive (T/R) RF coil with homemade T/R switch.

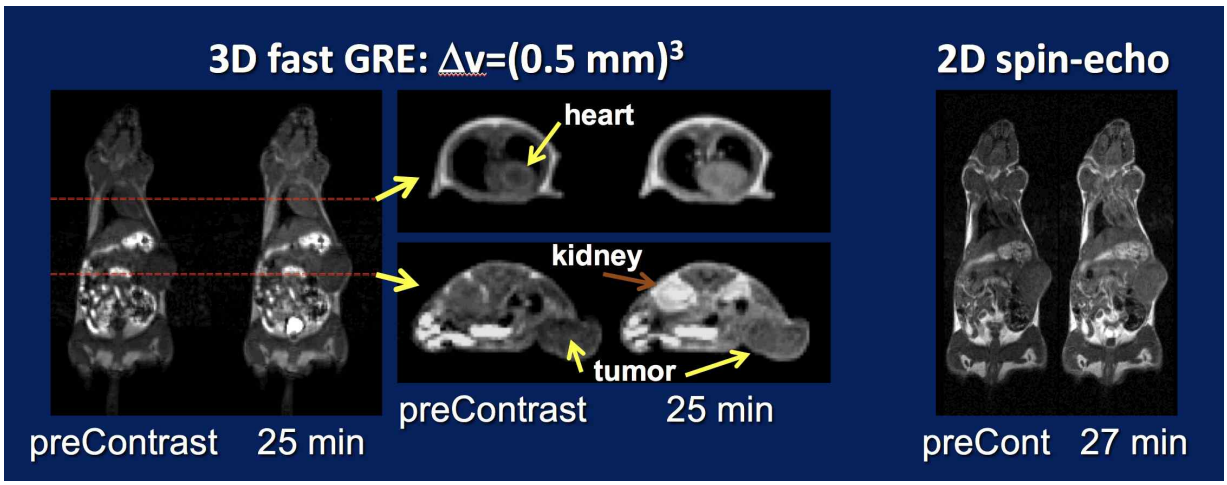

Fig. 1. Mouse imaging for pharmacokinetics of a polymerized contrast-agent, using a homemade quadrature T/R RF coil with 2” ID and 4” length.

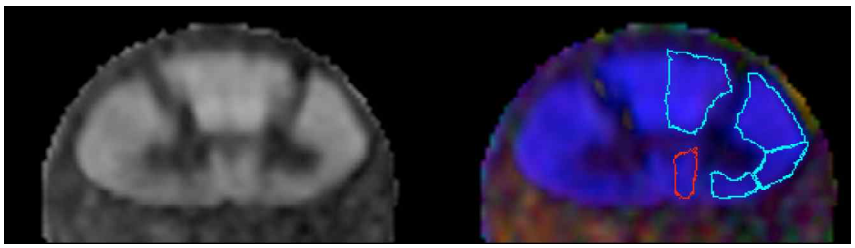

Fig. 2. High-Resolution (0.4x0.4x0.4 mm^3 acquisition resolution, interpolated to 0.2x0.2x0.2 mm^3) FA and FA-weighetd fibermap of ahun ex-vivo human cervical spinal cord specimen at C3 level. These images were calculated using DW images of b=0 and 1000 s/mm^2 with 21 non-colinear directions, which were acquisred using a homamade birdcage quadrature T/R RF

coil with 1” ID and 2” length.

Keywords : Small animal MRI/MRS, Ex-vivo specimen MRI, RF coil