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1. The Subject and Aims of Research

Research aims at the improvement and applications of Magnetic Resonance Imaging. My topic includes acquisition of pulmonary perfusion imaging, brain imaging such as perfusion imaging, diffusion tensor imaging and MR spectroscopy. The ongoing projects includes EPI artifact correction, functional MRI, mathematical model of pulmonary perfusion, and acquisition of ultra-fast magnetic resonance spectroscopy.

2. Related Recent Research Topics

a. Artifact correction of echo planar imaging: EPI (echo planar imaging) is one of most widely used MR fast imaging. EPI technique allows acquiring one image in single excitation; however it suffers from two major sources of artifacts: N/2 or Nyquist ghosts from the inconsistency of odd and even lines, and geometric distortion due to the limited bandwidth of phase-encoding. We aim to remove these artifacts without increasing scan time. We expect to obtain ghost-free, less distortion and improved SNR EPI images, which will be useful for functional MRI data acquisition.

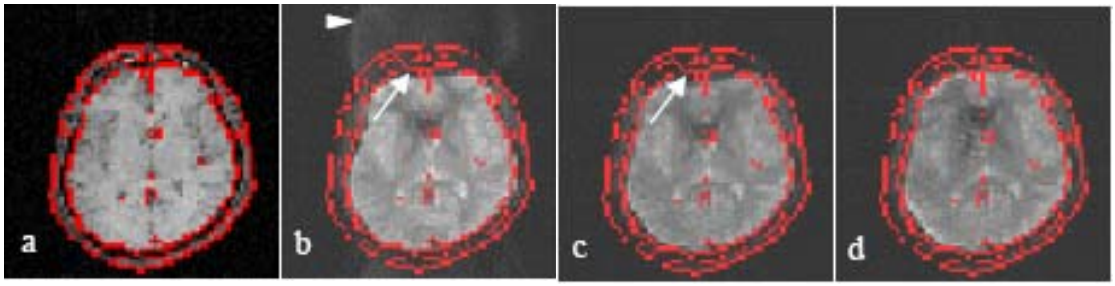


Figure 1 Corresponding anatomical image (a), original EPI image (b), and EPI images after artifact correction (c&d)

b. Measurement of pulmonary perfusion: The gasexchange efficiency of human depends on local matching of regional pulmonary perfusion distribution and ventilation. There are two major aspects to measure perfusion using MR technique. One is using dynamic contrast-enhanced MR images to assess perfusion parameters qualitatively or quantitatively. We want to apply this technique on patients with complex blood supply such as patients with congenital heart diseases and establish a mathematical model explain perfusion with multiple arterial input. On the other hand, perfusion images can be acquired using arterial spin labeling without contrast agent. This technique has been proved feasible in brain, but it needs further investigation to verify its validity in lung.

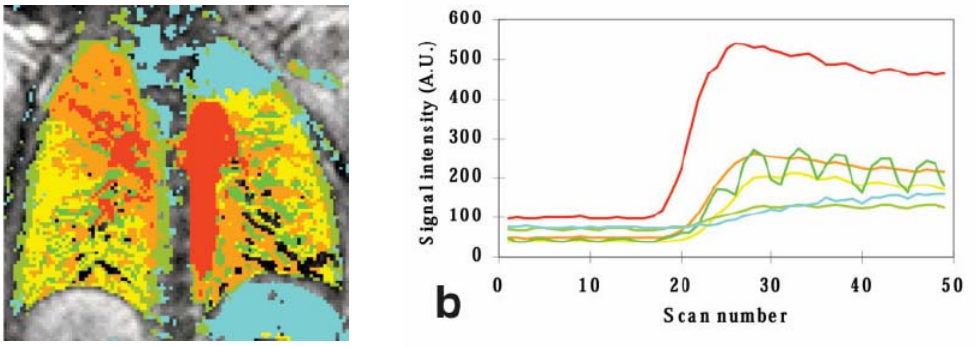
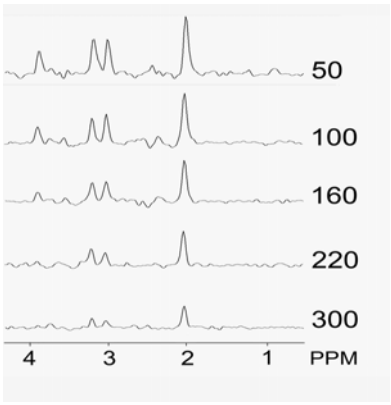


Figure 2 Signal intensity analyses for dynamic contrast-enhanced MRI

c. Fast MR spectroscopy: Proton spectroscopy can be used to measure brain metabolite concentration distribution, which is helpful for understanding brain activity or brain damage. However, traditional MRS needs long scan time to obtain the whole K-space; it takes typically 30mins for single slice. We will use a fast technique called PEPSI to acquire MRS, which can reduce scan time to less than a minute. We can utilize its fast property to obtain parameters that are difficult to measure for traditional methods, such as T1 and T2 value of metabolites. Figure on the right shows spectrums acquired at different TEs.



3. Selected Publications and Projects

Publications:Yi-Ru Lin, Ming-Ting Wu, Teng-Yi Huang, Shang-Yueh Tsai, Hsiao-Wen Chung, Vu M. Mai, Cheng-Yu Chen, Huay-Ben Pan, "Comparison of arterial spin labeling and first-pass dynamic contrast-enhanced MR imaging in the assessment of pulmonary perfusion in human: The inflow spin-tracer saturation effect", *Magn Reson Med*. 2004 Nov 23; 52(6):1291-1301

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Ming-Long Wu, Cheng-Wen Ko, Ting-Yi Chen, Ming-Ting Wu, Hsiao-Wen Chung, Teng-Yi Huang, Yi-Ru Lin, "MR ventriculocisternography by using 3D balanced steady-state free precession imaging: technical note", *American Journal of Neuroradiology*. 2005 May; 26(5):1170-1173.

Kai-Hsiang Chuang, Ming-Ting Wu, Yi-Ru Lin, Kai-Sheng Hsieh, Ming-Long Wu, Shang-Yueh Tsai, Cheng-Wen Ko, Hsiao-Wen Chung, "Application of Model-Free Analysis in the MR Assessment of Pulmonary Perfusion Dynamics", *Magnetic Resonance in Medicine*. 2005 Aug; 54(2): 299-308

Yi-Ru Lin, Geoffery S. Young, Nan-kuei Chen, William P. Dillon**,** Stephen Wong, "Creutzfeldt-jakob disease involvement of rolandic cortex: a quantitative apparent diffusion coefficient evaluation", *American Journal of Neuroradiology*, 2006 Sep;27(8):1755-9

Shang-Yueh Tsai, Ming-Ting Wu, Yi-Ru Lin, Kai-sheng Hsieh, Teng-Yi Huang, Hsiao-Wen Chung, JY Pan, Huay-Ben Pan, CF Yang, "Temporal correlation-based dynamic contrast-enhanced MR imaging improves assessment of complex pulmonary circulation in congenital heart disease.", *Magnetic Resonance in Medicine*.. 2006 Sep;56(3):517-26