Comparison of DTI-SSFSE and DTI-SSEPI sequence for white matter tractography of dog spine

F. Sun[1], X. Wang[2], G. Cao[3], K. Tan[2]

[1]GE Medical System China, Beijing, China, People's Republic of, [2]Beijing University First hospital, Beijing, China, People's Republic of, [3]GE Medical System China, Hong Kong, China, People's Republic of

Introduction

3D brain tractography using EPI based diffusion tensor image (DTI-SSEPI) has been developed rapidly in recent years. However, there has been much less reports on spinal tractography although it is not rare to see traumatic spinal injury., The lack of popularity of spinal tractography is mainly due to the difficulty in applying EPI based DTI in this very inhomogeneous region. To overcome the susceptibility problem of DTI-SSEPI, we developed SSFSE based diffusion tensor sequence (DTI-SSFSE) to study spinal tractography.

Materials and Methods

The experiments were conducted on a 1.5T GE Signa TwinSpeed scanner. The DTI-SSFSE and DTI-SSEPI images were acquired from five anesthetic healthy dogs using a   quadrature extremity coil. DT-SSFSE sequence was developed based the same principle as described reference (1). The scan parameters were TE/TR=67/13000ms (for DTI_SSFSE) , TE/TR=73/8000ms (DTI-SSEPI). Both DTI sequences were scanned with 13 non-collinear diffusion directions, b=500, 4NEX, and 128x128 acquisition matrix, 4mm slice thickness without gap,

Tractography processing was performed using DTV[2](developed by Dr. Masutani at Univ. of Tokyo; http://www.ut-radiology.umin.jp/people/masutani/dTV.htm) and Volume One (http://www.volume-one.org/). All comparison used the same "seed" position and same tracking condition (stop if length<80 and FA<0.2).

Result

An example of typical tractography result was shown in Figure 1. Neuro fiber bundle generated from DTI-SSFSE data was consistently alone the spinal cord in the spinal canal,   while the fiber bundle generated from DTI-SSEPI was often disrupted due to the inconsistency of EPI data.

Discussion and Conclusion

Due to the white matter tractography technique is sensitive to spatial continuity, in the place where EPI data is severely distorted, such as spinal cord or optic nerve, FSE based DTI sequence should be a feasible alternative solution.

Reference

1. D. C. Alsop. Magn. Reson in Med 1997; 38:527-533;
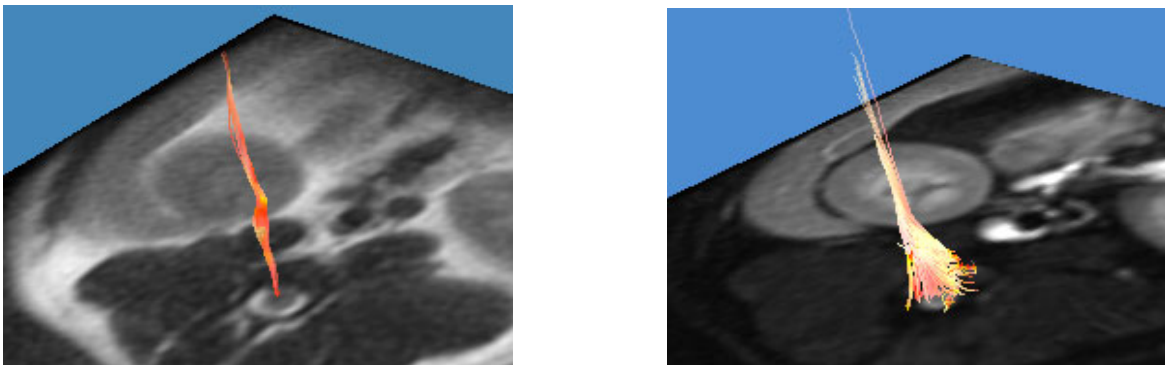2. H. Yamadal, et al. ISMRM 2003 abstract, P2167;

Figure 1. White matter tractography image, generated from DT-SSFSE data (left) and DT-SSEPI data (right).