VISUALIZATION OF PELVIC SPLANCHNIC NERVE USING READOUT-SEGMENTED ECHO-PLANAR DIFFUSION-WEIGHTED IMAGING AT 3T: PRELIMINARY EXPERIENCE IN HEALTHY MALE VOLUNTEERS.

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Introduction

Pelvic splanchnic nerve is an important surgical landmark in pelvic nerve-preserving surgery and accurate visualization of the nerve will be helpful for preoperative planning. Though diffusion-weighted imaging (DWI) is one of the most common techniques in visualizing peripheral nerves, it is challenging to depict the pelvic splanchnic nerve on conventional DWI technique because of the thinness of the targeted nerve and image distortion from susceptibility artifact caused by neighboring rectal gas. As an alternative technique to conventional DWI with increased resolution and reduced distortion, readout-segmented echo-planar imaging (RS-EPI) is of current interest [1]. The aim of this study was to evaluate the potential ability of readout-segmented echo-planar diffusion-weighted imaging (RS-EPI DWI) for visualizing the pelvic splanchnic nerve in normal male volunteers.

Materials and Methods

Eleven healthy male volunteers with an age range from 25 to 48 years were examined in this study with 3T MR scanner (MAGNETOM, Trio, A Tim system, Siemens Healthcare, Erlangen, Germany). RS-EPI DWI were performed using the following parameters: field of view (FOV), 320 x 320 mm; acquisition matrix, 288 × 288; acceleration factor, 2; slice thickness, 2.5 mm; number of slices, 56; slice gap, 10 %; repetition time (TR), 10300 msec; echo time (TE), 69 msec (minimum); echo spacing, 0.34 msec; *b* value, 250 sec/mm2; diffusion directions, three-direction trace; number of shots (or readout-segments), 7; number of excites (NEX), 2; acquisition time, 7 minutes 45 seconds. Postprocessing technique included reformatting of oblique coronal thin-slab maximum intensity projection (MIP) images from axial source images on a workstation, and both axial source images and oblique coronal thin-slab MIP images were used for qualitative analyses. We evaluated both sides of the nerve on each subject and the visibility of the pelvic splanchnic nerve was scored with a 4-point grading scale: poor (the nerve is invisible or near-invisible); fair (the nerve is partially visible); good (the nerve is almost entirely visible); excellent (the entire nerve is visible).

Results and Discussion

The result of qualitative grading was as follows: excellent, 2 of 22 sides (9%); good, 9 sides (41%); fair, 8 sides (36%); poor, 3 sides (14%). Successful visualization (including “excellent” and “good”) was achieved at the rate of 50%. In patients with pelvic malignancies, RS-EPI DWI may enable to assess the anatomical relationship between lesion and pelvic splanchnic nerve by virtue of its high-resolution and low-distortion images. The major cause of “fair” or “poor” visualization was suspected to be image distortion or motion artifact in readout-direction due to bowel gas, bowel peristalsis or patient movement. Increased number of shots (or readout-segments) or administration of intramuscular butylscopolamine may improve the image quality.

Conclusion

This preliminary study demonstrated the potential ability of RS-EPI DWI for visualizing the pelvic splanchnic nerve with high-resolution and low-distortion images. Further optimization will improve the visualization rate.

References

[1] David A. Porter et al. MRM 62:468–475 (2009)

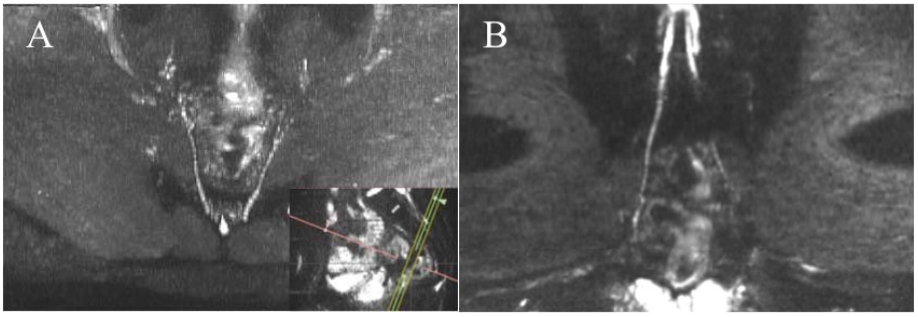

Figure 1.
Oblique coronal thin-slab MIP image (A) and curved planar reformatted image (B) in a 25-year-old healthy male volunteer. Right pelvic splanchnic nerve was clearly visualized from S3 nerve root to pararectal region.

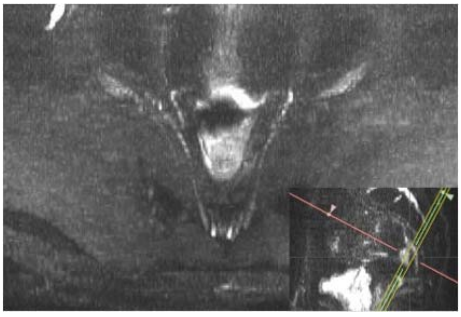

Figure 2.
Oblique coronal thin-slab MIP image in a 30-year-old healthy male volunteer.