STIR Turbo SE Imaging vs. Diffusion-Weighted Imaging: Diagnostic Capability for Quantitatively Assessed N-Stage in Non-Small Cell Lung Cancer Patients

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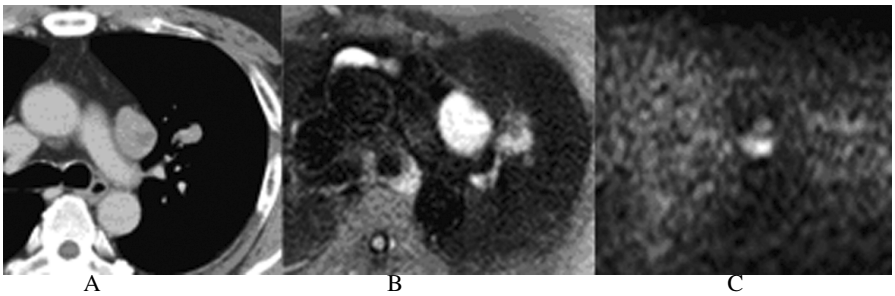
INTRODUCTION: Assessment of N-stage is very important for management in non-small cell lung cancer (NSCLC) patients. Recently, short inversion time inversion recovery (STIR) turbo spin-echo (SE) imaging is suggested as useful for N-stage assessment in NSCLC patients (1, 2). This technique has potential to play as the substitution of FDG-PET or PET/CT (2). On the other hand, diffusion-weighted image (DWI) has been suggested as useful for distinguishing malignant tumor from benign tumor, determination of nodal and distant metastases in oncology patients (3). However, no direct comparison of capability for N-stage assessment has been made between STIR turbo SE imaging and DWI in NSCLC patients. The purpose of this study was to directly compare diagnostic capability of lymph node metastases between STIR turbo SE imaging and DWI in NSCLC patients.

MATERIALS AND METHODS: 55 consecutive NSCLC patients (31 men, 24 women; mean age 68 years), who were candidate for surgical therapy, prospectively underwent STIR turbo SE imaging and DWI for quantitative assessment of lymph node metastases. After surgical resection, final diagnosis of N-stage in each subject was determined by pathological examination. All MR examinations were performed by using two 1.5 T superconducting magnet (Gyroscan Intera and Achieva, Phillips Medical Systems, Best, The Netherlands) using a four-channel sensitivity encoding (SENSE) body coil. STIR turbo SE images were obtained with a 0.9% saline phantom. A centrically-reordered multishot blackblood STIR turbo SE sequence with SENSE (TR = 2–3 msec, TEeff = 8 msec, TI = 150 msec, ETL = 8, NEX = 2, 256 x 192 matrix, 512 x 384 reconstruction matrix, field of view = 320 mm, reduction factor = 4) and a sequentially reordered half-Fourier single-shot STIR spin-echo echo-planar imaging sequence (TR = 5759ms, TE = 70ms, TI = 180ms; echo train length = 141; *b* values, 0 and 1000 sec/ mm^2; 256 x 128 matrix; 512 x 256 reconstruction matrix; number of signals acquired, 4) were adapted for MR examination in each patient. For quantitative assessment of lymph node metastases, region of interests (ROI) was placed over each lymph node on each sequence and saline phantom on STIR image. On STIR images, signal intensity of each lymph node was normalized as lymph node saline ratio (LSR). On DWI, apparent diffusion coefficient (ADC) of each lymph node was calculated. Then, feasible threshold values of both sequence for distinguishing metastatic lymph node and non metastatic lymph node were determined by using ROC-based positive tests. To compare diagnostic capability between STIR turbo SE imaging and DWI, sensitivities, specificities and accuracies on a per site basis and a per patient basis were compared by means of McNemar's test. A p value less than 0.05 was considered to indicate significant difference for all analyses.

RESULTS: Representative case is shown in Figure 1. Results of ROC-based positive test on both methods were shown in Figure 2. The feasible threshold value of LSR and ADC were determined as 0.6 and 0.002. When feasible threshold values were adapted, specificity and accuracy of LSR (specificity: 73 [214/293] %, accuracy: 74 [224/304] %) were significantly higher than those of ADC (specificity: 37 [109/293] %, $p<0.05$; accuracy: 38 [119/304] %, $p<0.05$) on a per site basis. On the other hand, there were no significant differences of all diagnostic values between STIR turbo SE imaging and DWI on a per patient basis.

CONCLUSION: Quantitatively assessed STIR turbo SE imaging can more specifically and accurately distinguish metastatic lymph nodes from non-metastatic lymph nodes than quantitatively assessed diffusion-weighted imaging. However, on quantitative N-stage assessment, diffusion-weighted imaging can play as substitution to STIR turbo SE imaging in NSCLC patients.



A B C

Figure 1; 43 years old male with squamous cell carcinoma at upper lobe of left lung.

A: Contrast-enhanced CT shows subaortic lymphadenopathy. This node is B: STIR turbo SE image shows subaortic lymphadenopathy as high signal intensity. LSR is 0.82, and this case is true positive on STIR turbo SE imaging. C:DWI (b=1000) shows subarotic lymph node as high signal intensity. ADC is 0.0008, and this case is false-negative case on DWI.

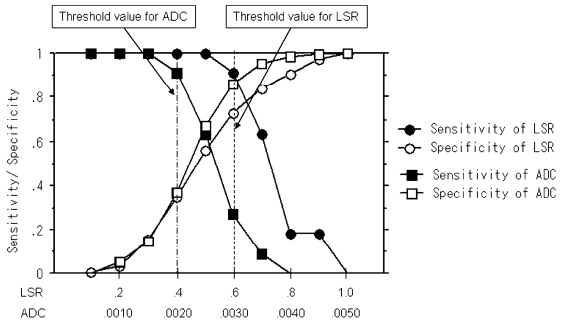


Figure 2; Results of ROC-based positive test.

The feasible threshold value of LSR is determined as 0.6, and that of ADC is determined as 0.002.

References:

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