

Combined Diffusion Weighted and Dynamic Subtraction MRI for Prostate Transition Zone Cancer Diagnosis : Correlation with Histopathology

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PURPOSE

Approximately 30% of prostate cancers occur within the transition zone. MRI is generally considered inadequate for use in the evaluation of transition zone cancers (TZ ca.), because of the heterogeneous T2 signal intensity in the normal TZ. The purpose of this study was to retrospectively evaluate whether the combination of these techniques (T2-weighted MRI: T2-WI, Dynamic Contrast Enhanced MRI: DCE-MRI, Diffusion Weighted-MRI: DW-MRI) would provide better diagnostic sensitivity than each technique alone in the diagnosis of TZ ca..

MATERIAL AND METHOD

PATIENTS: 26 TZ ca. in 23 patients with at least one tumor (tumor size > 10mm) located predominantly in the transition zone (>50% of the tumor located within the TZ). The patients ranged from 52 to 76 years old (median, 65 years). 16 peripheral zone (PZ) cancer in 12 patients with only PZ cancer but without TZ ca. were selected by step-section pathologic maps. The patients ranged from 60 to 81 years old (mean, 68 years). All patients underwent conventional MRI (T2-WI, DCE-MRI, DW-MRI) and radical prostatectomy. For all patients, the period from MRI to radical prostatectomy surgery ranged from 1 to 7 weeks (median interval, 4 weeks).

MRI TECHNIQUES: MRI were obtained by 1.5T superconducting system (Signa CV/i ver. 9.1 GE Medical System Milwaukee, WI) with phased array coil. Imaging sequences were T2-weighted image with fat saturation (FST2-WI), DW-MRI (single shot echo planner image, b=0 and b=1000 sec/mm², ADC map findings) and DCE-MRI {fast SPGR, contrast medium (0.5 mmol/kg,) injected total time 5 sec., image acquisition 30, 50, 70sec.}.

MRI EVALUATION: The sensitivity, specificity, accuracy, and positive predictive value (PPV) were evaluated in three groups: **A:** T2-WI with FS, **B:** T2-WI with FS + DWI, **C:** T2-WI with FS + DWI + DSMRI. Image diagnosis in each sequence was evaluated five phases about cancer presence conviction degrees (1 : definitely absent, 3 : possibly present, 5 : definitely present). When the total score was more than 6 in **B** group, the diagnosis was cancer present. And when the total score was more than 8 in **C** group, the diagnosis was cancer present.

RESULT

The sensitivity, specificity, accuracy, and PPV in group **A** were 61.5%, 68.8%, 64.3%, 76.2%. These in group **B** were 80.8%, 87.5%, 83.3%, 91.3%. These in group **C** were 69.0%, 100%, 81.0%, 100%. Diagnostic ability improved when DW-MRI was added to FST2-WI. The specificity and PPV were especially improved when DW-MRI and DCE-MRI were added to FST2-MRI. There was significant difference between group **A** and **C** by McNemar test. (P < 0.05)

DISCUSSION

In our study, sensitivity, specificity, accuracy and PPV improved when DW-MRI was added to FST2-WI. However, there were two cases in which the diagnosis of group **B** was false negative but that of group **C** was true positive. The specificity and PPV were especially improved when DCE-MRI was added to FST2-WI and DW-MRI (group **B**). It is difficult to differentiate TZ ca. from benign prostate hyperplasia nodules on T2-WI and enhanced MRI. Thus it may be valuable to know that the use of DCE-MRI and DW-MRI helped to improve diagnostic ability in TZ ca. on MRI. When TZ ca. did not demonstrate clearly on DW-MRI, the ADC map showed low value on the cancer lesion. The ADC map was useful when cancer lesion was easily differentiated from BPH nodules. It was useful to combine the DW-MRI and ADC map for TZ ca. diagnosis.

CONCLUSION

It was helpful to add DW-MRI to FST2-WI in diagnosis of prostate TZ ca.. The addition of DCE-MRI may be an option to improve the specificity and PPV of diagnosing the TZ ca. with FST2-WI and DW-MRI.