

Usefulness of Diffusion-weighted MR image in Detecting Pancreas Cancer: Comparative Analyses with T1, T2-weighted MR images

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Purpose: The imaging of pancreatic cancer is still difficult using conventional image sequence such as T1-weighted image (T1-WI) or T2-weighted image (T2-WI). Recently, diffusion-weighted image (DWI) has been extensively used in the CNS system for tumor imaging as well as the acute stroke imaging. Furthermore, recent development of clinical MR scanner facilitates body application of DWI sequence. We hypothesized that DWI could be useful to depict the pancreatic cancer, which was not identified by conventional image technique such as T1-WI or T2-WI.

Materials and Method: Ten subjects (7 men and 3 women, mean: 65.8 years old) with pancreatic cancer were included in this study. Four cases were surgically confirmed as pancreatic cancer. The other 6 cases were confirmed clinically based on the image findings such as CT, PET, ERCP and serological tumor markers. All MR examinations were performed on 1.5 T MR scanner (Signa, GE). Imaging protocols consisted of T2-WI (repetition time (TR)/ echo time (TE): 2100/94 ms), T1-WI (TR/TE: 175/1.65 ms), and DWI (TR/TE: 5526/64 ms, NEX: 8, b factor: 500). Regions of interest (ROIs) were placed on both tumor region and normal appearing pancreatic parenchyma to calculate the image contrast. The image contrast was divided by signal intensity of sacrospinal muscle to produce a contrast-to-muscle ratio (C/M ratio). We compared the C/M ratio in each image sequence. All C/M ratios were expressed as the mean \pm SD. Differences among the T2-WI, T1-WI and DWI were evaluated by using a two-tailed analysis of variance with the Tukey-Kramer multiple-comparison test. A P value of <0.05 indicated a statistically significant difference.

Result: The mean C/M ratio for T2-WI, T1-WI, and DWI was 0.34 ± 0.27 , 0.20 ± 0.09 , and 0.80 ± 0.39 , respectively. The mean C/M ratio of the DWI was significantly greater than those of the T2-WI ($P < 0.01$) and T1-WI ($P < 0.001$). The mean C/M ratio between T2-WI and T1-WI was not statistically significant. These results are summarized in Figure 1. Figure 2 shows representative case of pancreatic cancer.

Discussion and Conclusion: In the current results, the mean C/M ratio of the DWI was significantly greater than those of the T2-WI and T1-WI. As shown in Figure 1 and 2, DWI has provided the excellent image contrast of tumor to normal appearing parenchyma. Although the low signal-to-noise ratio and spatial distortion due to susceptibility artifact are still drawbacks of DWI compared with the conventional T2-WI and T1-WI, our results support the hypothesis that DWI may be useful to depict the pancreatic cancer. In conclusion DWI may be considered as routine protocols for pancreas MR imaging. Further study should be needed especially for pathological correlation with DWI signal (ADC values) in pancreatic cancer.

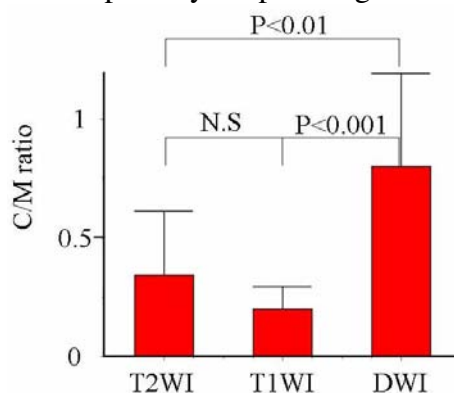


Figure 1. The mean C/M ratio of DWI was significantly greater than those of the T2-WI ($P < 0.01$) and T1-WI ($P < 0.001$). The mean C/M ratio between T2-WI and T1-WI was not statistically significant.

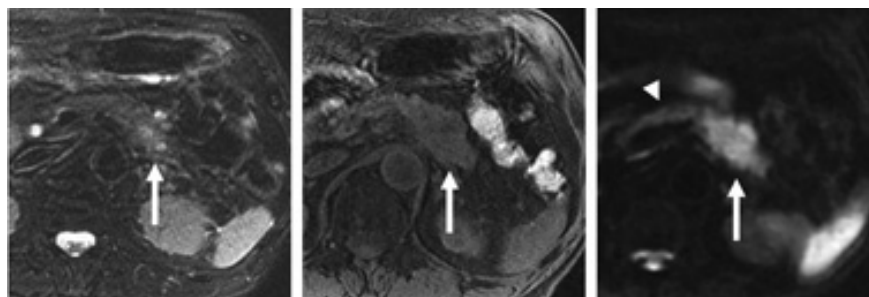


Figure 2. 77 M, Pancreas cancer case T2-WI (left), T1-WI (middle), DWI (left). The pancreatic cancer (white arrow) is better delineated on DWI than T2-WI and T1WI.