

Preliminary evaluation of MR diffusion-weighted imaging in diagnosing pancreatic carcinoma

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Purpose

To evaluate the efficacy and limitation of diffusion weighted imaging (DWI) in diagnosing pancreatic carcinoma, as well as the apparent diffusion coefficient (ADC) value of pancreatic carcinoma and normal pancreas.

Materials and methods

Twelve pancreatic carcinoma patients and 12 healthy volunteers underwent MRI scan. GE excite II 1.5T superconductive MR system, combined with 8 channel body array coil and ASSET parallel acquisition technique were employed. Single shot echo planar imaging (EPI) sequence was applied in DWI, $b=0$, 800s/mm^2 , three directions, TR/TE 3000/61.2ms, matrix 128×128 , 4NEX, slice thickness 5mm, intersection gap 1mm, FOV 34-40cm. The acquisition time was 48 seconds in 2-3 breath-hold. Pre-contrast scan included axial T_1 WI (breath hold fast spoiled gradient echo, FSPGR) with fat suppression, T_2 WI (single shot fast spin echo, SSFSE) sequence. The slice thickness, intersection gap and FOV of DWI, T_1 WI and T_2 WI were coherent. The signal intensity ratio (SIR) of tumor / peri-tumor pancreas, contrast-to-noise ratio (CNR) of tumor of different sequences were measured. The ADC values of tumor, peri-tumor pancreas and normal pancreas were compared and ROC curve of ADC value of tumor for diagnosing pancreatic carcinoma was obtained.

Result

In DWI images, the carcinomas were hyperintensity. The diameters of region of interest (ROI) measurable were between 10~20mm (not including 20mm, 10 cases), >20mm (including 20mm, 14 cases). The SIR and CNR of tumors in DWI image were higher than that in T_1 WI and T_2 WI, the difference was significant ($p<0.05$). The ADC values of tumor, peri-tumor pancreas and normal pancreas were $1.27\pm 0.31\times 10^{-3}\text{mm}^2/\text{s}$, $1.65\pm 0.31\times 10^{-3}\text{mm}^2/\text{s}$, $1.46\pm 0.24\times 10^{-3}\text{mm}^2/\text{s}$, respectively. The difference between ADC values of tumor and peri-tumor pancreas were significant, the former was higher than the later. There was no significant difference between the ADC values of peri-tumor and normal pancreas. The area under ROC curve was 0.756. When ADC value of $1.30\times 10^{-3}\text{mm}^2/\text{s}$ was chosen, the sensitivity and specificity of diagnosis were 75% and 62.5%, respectively.

Conclusion

DWI and ADC value of pancreas are useful to diagnose pancreatic carcinoma. The main factors which influence DWI and ADC value measurement of pancreas are the relatively small volume of pancreas and the signal heterogeneity due to atrophy and fatty infiltration of the pancreas.

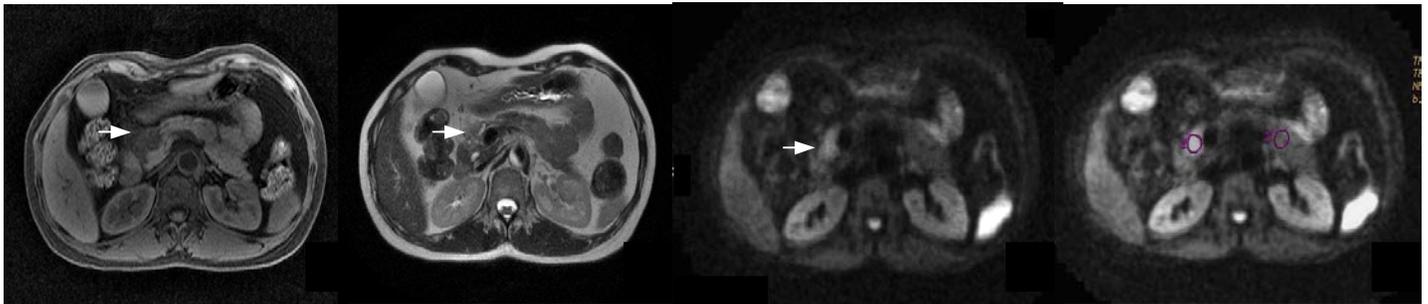


Figure1

a

b

c

d

Figure1 :A 56-year-old female patient with pathologically proved pancreatic neck carcinoma.

Figure a T_1 WI with fat suppression, the tumor was hypointensity (arrow).

Figure b T_2 WI, the tumor was inhomogeneous hyperintensity (arrow).

Figure c DWI, the tumor was hyperintensity (arrow) and more distinct than in T_1 WI and T_2 WI.

Figure d the ROI was placed both at pancreatic neck and tail to measure signal intensities and ADC values.