Diffusion-weighted imaging in autoimmune pancreatitis: Which variable is most useful for differentiation from pancreatic cancer?

Yasunari Fujinaga[1], Masaaki Takahashi[1], Akira Fujita[1], Sachie Fujita[1], Shin Yanagisawa[1], Hideaki Hamano[2], Shigeyuki Kawa[3], and Masumi Kadoya[1]

[1]Department of Radiology, Shinshu University, School of Medicine, Matsumoto, Nagano, Japan, [2]Department of Gastroenterology, Shinshu University Hospital, Matsumoto, Nagano, Japan, [3]Center for Health, Safety, and Environmental Management, Shinshu University, Matsumoto, Nagano, Japan

BACKGROUND: Some authors have reported usefulness of apparent diffusion coefficient (ADC) value to differentiate autoimmune pancreatitis (AIP) from pancreatic cancer (PC) [1-3]. On the other hand, Uto et al. reported that signal intensity (SI) of the lesion-to-spinal cord ratio was useful for differentiating between benign and malignant lung nodules [4]. On diffusion-weighted imaging (DWI), the variables except for ADC value have not been analyzed to differentiate AIP from PC.

PURPOSE: The aim of this study was to analyze which variable was useful to differentiate AIP from PC on DWI.

MATERIALS AND METHODS: We retrospectively reviewed database in our hospital and selected 42 AIP patients (28 male and 14 female; mean age 64.9 years old) and 50 PC patients (25 male and 25 female; mean age 68.3 years old) who underwent 3-T MRI including DWI. AIP was diagnosed based on the criteria of International Consensus Diagnostic Criteria (ICDC). All PC patients underwent surgical resection and were diagnosed with invasive ductal adenocarcinoma pathologically. Two readers independently measured ADC value and SI of both the lesion and the spleen by region of interest (ROI) method using commercial software package. The mean values were used for analysis. AIP and PC patients were divided into three subgroups based on the setting of the b-value as follows: group A, b-values were 0 and 1000 (s/mm^2); group B, 50 and 800; group C, 50 and 1000. In the same b-value groups, ADC value, ADC ratio ($ADC_{lesion}/ADC_{spleen}$), SI of the lesion and SI ratio (SI_{lesion}/SI_{spleen}) was compared between AIP and PC using Mann-Whitney U test. In addition, diagnostic performance was compared using receiver operating characteristic (ROC) analysis. Accuracy was compared using Fisher's extract test. A P value of < 0.05 was regarded as significantly difference.

Table 1 Median of each variable

Variable	Group A (0, 1000)		Group B (50, 800)		Group C (50, 1000)	
	AIP	PC	AIP	PC	AIP	PC
	n = 3	n = 13	n = 9	n = 8	n = 30	n = 29
ADC ($\times 10^{-3}$mm^2/s)	1.202	1.284	0.951**	1.264**	1.014****	1.276****
ADC ratio	1.350	1.524	1.271	1.500	1.309**	1.663**
SI	75.40	60.99	47.96	69.35	51.18	61.13
SI ratio	0.850	0.612	0.629	0.921	0.721	0.613

Numbers in parentheses refer to b values (s/mm^2). **, significantly different between AIP and PC ($P < 0.01$); ****, significantly different between AIP and PC ($P < 0.0001$)

Table 2 Area under the curve of each variable

Variable	Group A (0, 1000)	Group B (50, 800)	Group C (50, 1000)
ADC	0.6923	0.9028	0.8069
ADC ratio	0.8205	0.7500	0.7467
SI	0.5641	0.6528	0.5448
SI ratio	0.7949	0.6667	0.5184

ADC values (s/mm^2) was written in parentheses

Fig. 1 ROC curve in group C (b values = 50 and 1000 s/mm^2)

RESULTS: The median of each variable was shown in table 1. The median ADC value of AIP was significantly lower than that of PC in group B and C. The median ADC ratio of AIP was significantly lower than that of PC in group C. The medians of two variables were significantly different between AIP and PC in group C. ROC curve in group C was shown in Fig. 1. Area under curve (AUC) of each variable calculated from ROC analysis was shown in table 2. AUC of ADC was highest in all groups of b values. When ADC values were used for differentiation with the cut-off values on the basis of Youden index, sensitivity (%)/specificity (%) /accuracy (%)/cut-off ADC value ($\times 10^{-3}$mm^2/s) were 66.7/76.9/75.0/1.228 in group A, 77.8/100/88.2/1.111 in group B, and 83.9/85.7/84.7/1.162 in group C. There was no significant difference of accuracy between each group.
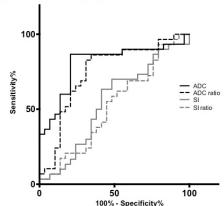
CONCLUSION: ADC value was the most useful variable to differentiate AIP from PC on DWI.

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