Diffusion-weighted MR imaging of mucinous pancreatic tumors: Doughnut sign on ADC map

Y. Watanabe[1], M. Nagayama[1], A. Okumura[1], Y. Amoh[1], T. Ishimori[1], T. Nakanishi[1], K. Nakatani[1], R. Yoshida[1], S. Yata[1], S. Ichihashi[1], M. Yoshimura[1], M. Yuki[1], K. Oda[1], and Y. Dodo[1]

[1]Department of Radiology, Kurashiki Central Hospital, Kurashiki, Okayama, Japan

Purpose: To investigate whether ADC map of diffusion-weighted MR imaging would be useful in the diagnosis of mucinous cystic tumor of the pancreas.

Introduction: MR imaging of the pancreas has been useful to detect cystic lesions such as mucinous pancreatic neoplasm, serous cystadenoma, retension cysts and pseudocysts. It is important to accurately diagnose mucinous neoplasm and differentiate them from other benign cystic lesions, because mucinous neoplasm has a malignant potential. The morphology has been a mainstay for the characterization of cystic lesions of the pancreas. However, it has not been always conclusive. Therefore, we postulate that ADC map based on diffusion-weighted images could characterize content of cystic lesions as mucinous or serous fluid and increase the confidence to diagnose mucinous neoplasm.

Materials and methods: This study included 39 cystic lesions (>=15mm) of the pancreas in 39 consecutive patients. MR imaging was performed using abdominal synergy coil on 1.5T MR units (Philips Gyroscan Intera & Achieva). Diffusion-weighted images were obtained with a single-shot spin-echo echo planar sequence (b value 0 and 600-800 s/mm^2) and respiratory triggering. ADC map was reconstructed by calculating ADC from b-0 and b-600 images. Fluid contents of the cystic lesions were assessed using ADC map about the uniformity: uniform or doughnut type, and ADC value.

Results: The final diagnosis of the 39 cystic lesions were 25 mucinous neoplasm (21 mucinous cysic tumors, 4 duct-ectatc mucinous seoplasm), 6 serous cystadenomas, 8 retension cysts. The doughnut sign was found in 67 % (14/21) of mucinous cystic tumors. ADC value of mucinous cystic tumors with doughnut sign was 3.7 + 0.5 mm^2/sec for the outer zone and 3.2 + 0.5 mm^2/sec for the inner core ($p<0.01$ paired-t-test). None of duct-ectatic mucinous neoplasm, serous cystadenoma or retension cysts showed doughnut sign. ADC values were 3.1+0.2 mm^2/sec for serous cystadenoma and 3.8+0.6 mm^2/sec for retension cysts.

Conclusion: The doughnut sign on ADC map could be useful to diagnose mucinous cystic tumors of the pancreas.

Fig. 1 Mucinous cystadenoma of the pancreas: doughnut sign on ADC map.

a) FS-T2 b) DW b-800 c) ADC map

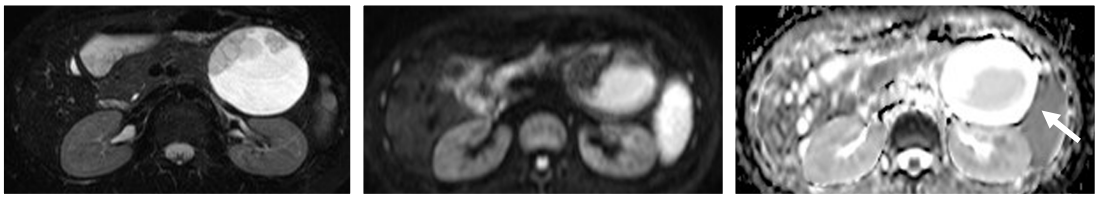

Fig. 2 Serous cystadenoma of the pancreas: uniform type on ADC map.

a) FS-T2 b) DW b-800 c) ADC map.