Combination of high-b-value diffusion-weighted MRI and MR cholangiopancreatography as the optimal non-invasive modality for diagnosis of pancreatic adenocarcinoma

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INTRODUCTION

Although contrast-enhanced dynamic multi-detector-CT (MDCT) have evolved as the mainstay for pancreatic cancer detection and staging (1), non-invasive modalities without using contrast agent and radiation exposure are desired for screening in a risk group of pancreatic cancer, in particular. Recent study suggests high-b-value diffusion-weighted MRI (DWI) allows the detection of pancreatic adenocarcinoma with a high sensitivity and specificity (2). However, DWI has some limitations, that small pancreatic cancer (<18mm) can not be detected on this images, for example (2). Some cases of mass-forming chronic pancreatitis can not be differentiated from pancreatic cancer with a difference of apparent diffusion coefficient values between them. On the contrary, MR cholangiopancreatography (MRCP) is another non-invasive modality for detecting pancreatic cancer with very high sensitivity. MRCP also facilitates a differential diagnosis between pancreatic cancer and mass-forming chronic pancreatitis by characteristic pancreatic duct findings ("duct penetrating sign") on MRCP (3). The purpose of this study was to evaluate the utility of combination of DWI and MRCP for diagnosis of pancreatic adenocarcinoma.

MATERIALS AND METHODS

18 patients (8 men, 10 women; age range; 56-83 years, mean age; 65.5 years) with histopathologically proven pancreatic adenocarcinomas were included in this study. Diagnostic confirmation was made by surgical resection (n=13), and biopsy (n=5). 11 patients with chronic pancreatitis were also included as a control group. Three abdominal radiologists assessed the presence of the lesions by using a five-point confidence scale on DWI alone, MRCP alone, MDCT, dynamic MRI, and combination of DWI and MRCP (DWI+MRCP), respectively. Area under the receiver operating characteristic (ROC) curve (Az), sensitivity, specificity and accuracy on each modality were calculated. The interobserver agreement among reviewers for tumor detection was also calculated with linear-weighted kappa statistics.

RESULTS

All diagnostic factors, including Az, sensitivity, specificity, and accuracy with DWI+MRCP (0.995, 0.994, 0.990, 0.976, respectively) were higher than those with DWI alone (0.947, 0.796, 0.954, 0.897, respectively) and with MRCP alone (0.970, 0.833, 0.990, 0.929, respectively).There were no significant differences in the all factors among DWI+MRCP, MDCT(0.979, 0.870, 0.970, 0.994, respectively), and dynamic MRI(0.982, 0.796, 0.975, 0.925, respectively). All values of interobserver agreement among each reader were in the category of excellent (κ =0.79-0.81). The factors disturbed detection of lesions on DWI were considered small size (<10mm) or massive necrosis of the tumors. In all four cases with mass-forming chronic pancreatitis, accurately diagnosis was made on DWI+MRCP by using reference of "duct penetrating sign" (Fig 1).

CONCLUSION

Combination of DWI and MRCP was the optimal non-invasive modality for diagnosis of pancreatic adenocarcinoma without using contrast agent and radiation exposure.

REFERENCES:

1. Vargas R, Nino-Murcia M, Trueblood W, et al. AJR 182 (2):419-25, 2004.
2. Ichikawa T, Erturk SM, Sou H, et al. AJR 188: 409-414, 2007.
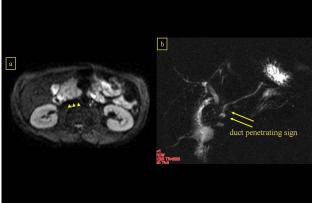3. Ichikawa T, Sou H, Araki T, et al. Radiology 221 (1):107-16, 2001

Fig1 57-year-old-man with mass-forming pancreatitis: DWI (a), MRCP (b)