MRI of Paraduodenal Pancreatitis: Clinical Performance in Distinction From Carcinoma

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Introduction

Paraduodenal pancreatitis (PDP) is a clinicopathologically distinct form of focal chronic pancreatitis (CP) thought to be related to obstruction of the pancreatic accessory duct. Differentiation between PDP and pancreatic duct adenocarcinoma (CA) is challenging and represents an important unmet clinical need. Distinction between PDP and CA is important in order to optimize therapeutic management and avoid unnecessary and potentially toxic treatments, including chemotherapy, in patients without tumor. MRI generates an array of soft tissue contrast that may provide characteristic differentiation between PDP and CA.

Purpose

To evaluate the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of contrast-enhanced MRI for the distinction of PDP from CA in patients with a histopathologically confirmed diagnosis.

Methods

Patients: This study was IRB-approved and HIPPA compliant. A retrospective search of our pathology database was undertaken for patients that had undergone a Whipple procedure over a three year period from July 2007 to July 2010, and cross-referenced with our electronic imaging database to identify patients with a contrast-enhanced MRI within 60 days of surgery. Two cohorts of patients were identified: one subgroup (17 patients, 14 male, 3 female, average age 46yo) with final histopathological diagnosis of PDP, and a second subgroup (30 patients, 14 male, 16 female, average age 53yo) with pathologic diagnosis of CA.

Imaging: Standardized MRI protocol was acquired including pre-contrast axial T2-weighted single shot +/- SPAIR fat-suppression, and multi-phase gadolinium contrast enhanced T1-weighted 3D gradient echo (3D GRE) in precontrast, arterial, venous and delayed phases, with arterial phase images acquired with a bolus-triggered technique we have described previously.

Image analysis: Two abdominal imaging fellows-in-training, each with 4 months experience in body MRI, served as study readers. Each reader was asked to record the presence or absence of three imaging features: a) focal thickening of the second portion of the duodenum, b) abnormal increased enhancement of the second portion of the duodenum on postcontrast 3DGRE and c) cystic focus in the expected region of the accessory pancreatic duct, or contained within the wall of the second portion of the duodenum (Figure 1). Strict criteria for the diagnosis of PDP included the presence of all three imaging features. Readers were instructed that any case that did not fulfill all three criteria was to be classified as CA.

Statistics- Sensitivity, specificity, PPV and NPV for the detection of PDP was calculated for each reader, with 95% confidence. A Fleiss' kappa test was performed to test for level of agreement between readers.

Results

Sensitivity, specificity, accuracy, PPV and NPV of MRI for diagnosis of PDP are presented in Table 1, with associated 95% confidence intervals (CI). Overall, each reader correctly categorized 15/17 (88.2%) of PDP when all three imaging criteria were met. Alternatively, 26/30 (86.7%) of pancreatic duct adenocarcinomas were correctly categorized as not consistent with PDP. Four patients with a histopathologic diagnosis of CA were incorrectly classified as PDP by each reader; however in only two patients did both readers misclassify a patient with CA as PDP. Agreement between the two readers, tested by Fleiss' kappa statistic, showed "substantial" agreement for the diagnosis of PDP and differentiation from pancreatic duct adenocarcinoma by contrast-enhanced MRI.

Conclusions

PDP may be distinguished from CA with contrast-enhanced MRI even with non-experienced readers, when strict diagnostic criteria are followed. Our results demonstrate that thickening and abnormal enhancement of the duodenum, in combination with a cystic focus in the region of the pancreatic accessory duct, may distinguish PDP from CA with a sensitivity of 88.2% and specificity of 86.7%. Of particular note, the NPV is 93% for excluding PDP. Our study contributes to optimized therapeutic management of patients with a pancreatic head mass, supporting a primary diagnostic role for MRI.

References

Adsay, N.V. and G. Zamboni, *Paraduodenal pancreatitis: a clinico-pathologically distinct entity unifying "cystic dystrophy of heterotopic pancreas", "para-duodenal wall cyst", and "groove pancreatitis".* Semin Diagn Pathol, 2004. **21**(4): p. 247-54.

Table 1. Statistics for MRI Detection of PDP (n=17) vs CA (n=30)

Characteristic	Reader 1*	Reader 2*
Sensitivity	88.2 (15/17) (95%CI 62.3-97.9)	88.2 (15/17) (95%CI 62.3-97.9)
Specificity	86.7 (26/30) (95% CI 68.4-95.6)	86.7 (26/30) (95% CI 68.4-95.6)
Positive Predictive Value	78.9 (15/19) (95% CI 53.9-93.0)	78.9 (15/19) (95% CI 53.9-93.0)
Negative Predictive Value	92.9 (26/28) (95% CI 75.0-98.8)	92.9 (26/28) (95% CI 75.0-98.8)
Accuracy	87.2 (41/47) (95% CI 73.6-94.7)	87.2 (41/47) (95% CI 73.6-94.7)

Note.– Values are percentages.
*Kappa value = 0.735

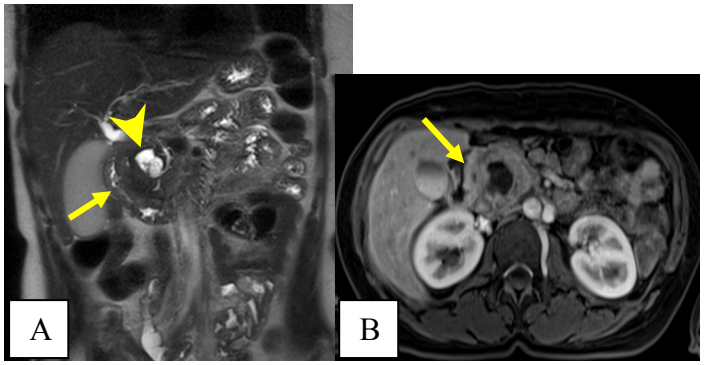

Fig 1. PDP showing duodenal wall thickening (A, arrow), enhancement (B, arrow) and cystic change in the paraduodenal pancreas (A, arrowhead)