PANCREATIC ADENOCARCINOMA ENHANCEMENT CORRELATES WITH HISTOLOGICAL DIFFERENTIATION

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Introduction
Pancreatic adenocarcinoma is the tenth most common malignancy but the fourth most common cause of death from cancer, in either men or women, and represents the most common form of pancreatic malignancy. The ability to better characterize differentiating biological features of tumor on imaging (1) may be useful to better appreciate the appearance of earlier disease, for prognosis (2), and for guiding development of optimized and new primary and adjuvant therapies. We have previously noted that pancreatic adenocarcinomas achieve different levels of enhancement on arterial phase gadolinium-chelate enhanced (Gd) T1 weighted 3D gradient echo (GRE) imaging. A histological basis for this differential enhancement has not yet been elucidated. We performed this study to determine if there is a correlation between the degree of pancreatic adenocarcinoma arterial phase enhancement and histological grading of tumor differentiation.

Methods
39 patients with both a surgical pathology diagnosis of pancreatic adenocarcinoma and a Gd-enhanced pancreatic MRI within 14 days prior to surgery were enrolled. MRI examinations were performed with a current-generation 1.5T MRI scanner. A torso phased-array surface coil was used for signal reception. Routine imaging included breath-hold axial fat saturated T1W 3D GRE after contrast injection (.05 mmol/kg of Gd-BOPTA, MultiHance, Bracco). Arterial phase images were acquired with a real-time-bolus-tracking method triggered 8 seconds after the arrival of contrast medium in the celiac arterial axis. Tumors were categorized independently by 2 reviewers as either poorly (similar to paraspinal muscle), moderately (similar to liver), or well enhancing (similar to highest signal intensity regions of enhancement in the spleen) on the arterial images. Histopathology based results graded the adenocarcinoma cases as well (WD), moderate (MD), or poorly differentiated (PD). Pathology and MRI grades were converted to a five point scale where 1 = PD, 1.5 = PD-MD, 2 = MD, 2.5 = MD-WD, and 3 = WD. MRI conversion was based on the hypothesis that poorly enhancing tumor corresponded to PD, moderately enhancing to MD, and well enhancing to WD.

Results
In 39 surgical specimens histological evaluation found poorly differentiated (n=12), poorly-to-moderately differentiated (n=2), moderately differentiated (n=22) and well-differentiated (n=3) pancreatic adenocarcinomas. Average tumor size was 24mm with a range of 10 to 55mm. There was agreement between the MRI based grading and histopathology in 30 of the 39 cases (Fig 1-3). In 2 patients, MRI under-graded tumor differentiation (grade 1.5 on perfusion vs. 2 on histology) averaging a difference of 0.5 grade points, and in 7 patients MRI over-graded the tumor differentiation by an average of 1.1 grade points. Cohen's kappa value measuring the agreement between the histopathology grade and the MRI grade was 0.64 with a 95% confidence interval of 0.46-0.83 indicating substantial agreement.

Discussion
We conclude that contrast enhancement of pancreatic adenocarcinoma, a measure of tissue vascularity, correlates with tumor differentiation. More aggressive undifferentiated tumors have diminished vascularity. Given that the majority of pancreatic adenocarcinomas are incurable at the time of presentation, it is hoped that, in the future, improved understanding of tumor biology on imaging may serve as an additional prognostic determinant and may help to guide development of future therapies.

References