Histopathologic Features and Clinical Significance of Localized Peritoneal Invasion by Pancreatic Ductal Carcinoma

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Background:
Pancreatic ductal carcinoma is a highly malignant neoplasm with a propensity for aggressive locoregional invasion and metastatic spread. The pancreas is partially invested by the peritoneum, which when breached may increase the risk for intra-abdominal dissemination and recurrence. The histopathologic features of peritoneal invasion by pancreatic ductal carcinoma and their clinical significance have not been evaluated to date.

Design:
83 surgical pathology cases (81 resections and 2 wedge biopsies) of pancreatic ductal carcinoma and variants involving the body and/or tail with extra pancreatic extension were analyzed using routine and elastic stains and immunostains including pan-keratin and calretinin. The extent of tumor invasion of the peritoneum was divided into 3 groups: 1) no peritoneal involvement, 2) tumor invasion through the elastic lamina and into the submesothelial stromal tissue, and 3) tumor penetration of the peritoneal surface. The clinical history and data from institutional cancer registries were reviewed to determine the times and patterns of disease recurrence.

Results:
Tumor penetration of the peritoneum involves a stepwise invasion of the peritoneal elastic lamina, submesothelial stromal tissue, and peritoneal surface. Invasion of the submesothelial stroma is often associated with thinning, fragmentation, and retraction of the elastic lamina from the peritoneal surface and expansion of the submesothelial connective tissue. Of the 63 cases, 33 tumors did not involve the peritoneum, 20 invaded the elastic lamina, and 30 perforated the peritoneal surface. Tumor invasion of the peritoneum (peritoneal surface and/or submesothelial stroma) was associated with an increased risk for recurrence (odds ratio 6.75, 95% CI=1.84 to 24.80), and all were associated with intra-abdominal recurrence and spread including malignant ascites.

Conclusions:
Invasion of the peritoneum is accompanied by architectural alteration that includes fragmentation and retraction of the elastic lamina and expansion of the submesothelial connective tissue. Localized peritoneal invasion by pancreatic carcinoma is associated with a significantly increased risk for tumor recurrence, particularly within the abdominal cavity, which may account for a mechanism for treatment failure in the surgical management of pancreatic carcinoma.