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Case Report and Review of the Literature

A Diagnostic Dilemma of Pancreatic Adenocarcinoma: The Duct Cut-off Sign

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ABSTRACT

Pancreatic cancer carries one of the worst prognoses in the United States. It is the fourth leading cause of cancer-related death in the United States and second after colorectal cancer in digestive system cancer-related death. Early detection is the key to improving its prognosis. Surgical resection is the only curative treatment, but even after margin-negative resection, the 5-year survival rate is still 30%. The following case presents a fascinating diagnosis of pancreatic cancer. Despite an initial diagnosis of pancreatitis, negative cytology, tumor markers, and imaging suggestive of intraductal papillary mucinous neoplasm (IPMN), this patient underwent surgical resection that later revealed pancreatic adenocarcinoma of the tail. This article highlights certain imaging modalities and characteristics that are essential in the diagnosis of pancreatic adenocarcinoma, in an effort to guide management of similar cases, with hope it leads to better outcomes.

Introduction

Pancreatic cancer has a mortality rate as high as 98% [1-3]. 75% of pancreatic adenocarcinomas occur at the head and neck, 15-20% occur in the body of the pancreas, and 5-10% arise in the tail [4, 5]. Pancreatic tail cancer has a worse prognosis because symptoms are usually vague and nonspecific. This makes the detection of this cancer difficult and later in its course, contributing to its grim prognosis [6]. Thus, early detection is the key to improving its prognosis because it allows the tumor to be resected in its early stage. A solid pancreatic mass is very rarely an incidental finding on imaging because there is usually another reason why imaging is being performed e.g., pancreatitis; in those cases, IPMNs were most commonly found [7, 8]. Tumors in the body and tail usually present later with adjacent organ involvement, making them borderline resectable or unresectable [9, 10]. The workup and diagnosis of pancreatic cancer includes laboratory testing and imaging. Imaging will be the central discussion in this case because it was equivocal and pertinent laboratory and tumor markers were negative.

Case Presentation

A 62-year-old male presented to the hospital with epigastric abdominal pain and vomiting for one day. He had a history of obesity, hypertension, peptic ulcer disease, benign brain tumors, and seizures. The patient was admitted due to alcohol dependence but had been drinking only occasionally for the past 10 years. He denied tobacco and illicit drug use. He presented with a leukocytosis of 25.1K/UL and lipase at 3,671 U/L. Alkaline phosphatase, total and direct bilirubin, AST, ALT, CA 19-9, and CEA levels were all normal. An abdominal ultrasound showed a mildly dilated 6 mm common bile duct. Computed tomography (CT) of the abdomen showed peripancreatic inflammatory changes which was consistent with acute pancreatitis (Figure 1). Magnetic resonance imaging/magnetic resonance cholangiopancreatography revealed possible pancreatic IPMN's: one in the uncinate process (1.9 × 1 cm) and one in the tail of the pancreas (3 × 2.4 cm) (Figures 2 & 3). Endoscopic ultrasound (EUS) with fine needle aspiration (FNA) revealed a 1.5 cm × 0.8 cm cyst in the uncinate process, likely a side-

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branch IPMN, and a 3 × 2.4 cm ill-defined mass in the body and tail. No lymph nodes were enlarged. The FNA was negative for malignant cells.

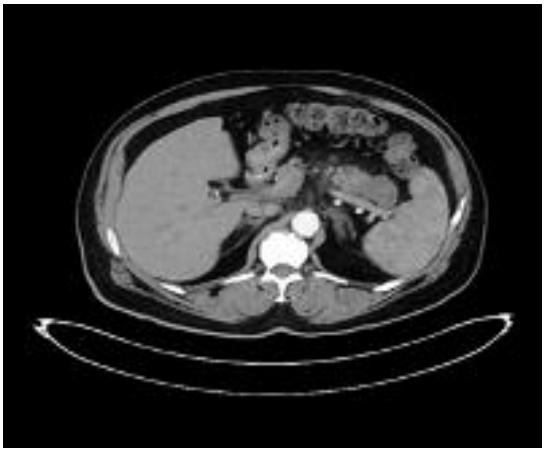

Figure 1: CT showing pancreatic inflammation along with area of hypovascularity at pancreatic tail.

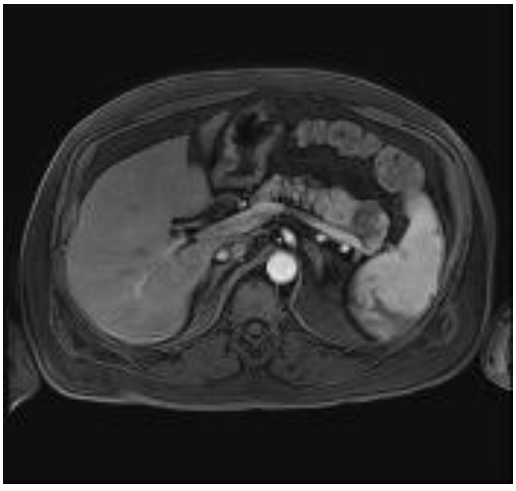

Figure 2: MRI revealing an area of hypovascularity in the pancreatic tail.

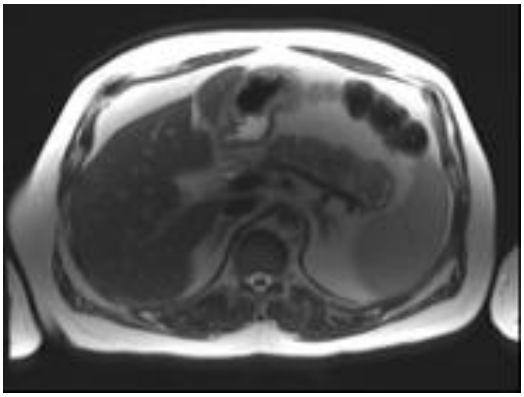

Figure 3: MRI showing abrupt cut-off of the pancreatic duct as seen on CT.

Given the patient's history of ulcers, brain tumors and now a pancreatic mass, a workup for gastrinoma and MEN-1 syndrome was performed. Parathyroid hormone was normal while serum gastrin was equivocal. The patient underwent repeat imaging with CT pancreatic protocol as well as a repeat EGD/EUS. Once again imaging was equivocal. Given the high-risk features on imaging despite a negative cytopathology, a distal pancreatectomy was planned. A 3-hour laparoscopic distal pancreatectomy and splenectomy was successfully performed. A splenectomy was performed because the mass was inseparable from the splenic vessels. Final pathology was a 3.5 × 3.5 × 2.5 cm invasive ductal adenocarcinoma of the pancreas with negative margins and 8 lymph nodes negative for malignancy (stage IB, Figure 4 shows a gross image of the tumor). The patient did well postoperatively and during outpatient follow up. He was referred to Oncology for further management. He received one cycle of adjuvant FOLFIRINOX chemotherapy.

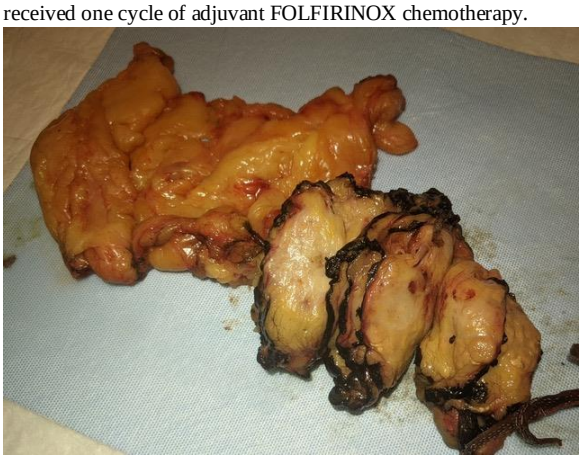

Figure 4: Gross image of the tumor on the right with a piece of omentum on the left.

Discussion

The difficulty with diagnosing this patient was the diagnostic dilemma between the changes observed on imaging in the case of pancreatitis, versus the changes in the early stages of pancreatic adenocarcinoma. Avoiding diagnostic error between pancreatic cancer and pancreatitis is extremely important given the high mortality rate associated with pancreatic cancer and the morbidity involved with unnecessary surgical intervention. In our case, surgery improved this patient's prognosis with an early resection, however there are still many patients that will not have that opportunity due to the lack of widespread screening for pancreatic tail cancer.

Multi-detector CT with the availability of thinner slices, multi-planar reformat, and 3D images help produce a detailed assessment of the tumor and tumor-vessel relationship [9]. Advanced MRI and EUS are often used for tumor detection and staging [10]. Our focus is on imaging characteristics which aid in the early detection of suspicious pancreatic tail lesions. The "duct cut-off sign" seems to be the best diagnostic value for this type of case (Figures 2 & 3). This sign is not to be confused with the "double-duct sign," which is a simultaneous stenosis of the common bile duct and pancreatic duct, usually suggestive of pancreatic cancer. In a case where a patient is initially diagnosed with pancreatitis and the pancreatic duct seems to disappear on imaging, there is a high probability it is more likely due to cancer than post-pancreatitis inflammation; this was true for our case (Figure 3). Johnston *et al.* have shown that abrupt cut-off of the pancreatic duct was associated with an increased likelihood of detecting malignancy [10]. All patients who demonstrate this sign should undergo expedited workup with dedicated MRI and EUS.

Pancreatic adenocarcinoma enhances poorly on imaging, thus creating a dilemma in differentiating a malignant lesion versus post-pancreatitis necrosis or even a poorly perfused area post-pancreatitis. We recommend that in the setting of a new diagnosis of acute pancreatitis in a patient with poorly perfused areas suggesting hypovascular lesions, it would be beneficial to follow up with imaging in a more restricted time frame — around 6-8 weeks to ensure that the area of hypoperfusion is not due to a misdiagnosed adenocarcinoma. The duct cut-off sign becomes especially important, particularly in this case where there were no tumor markers or adenopathy present, but a clear hypovascular area of focus post-pancreatitis [9].

Conclusion

The history, physical exam, and workup are paramount to the survival of patients with pancreatic adenocarcinoma. When there is a strong clinical suspicion, repeat imaging within a short interval is crucial for the patient's benefit. Since a hypovascular area on imaging could be necrosis or adenocarcinoma, follow up imaging should be done within 6-8 weeks in most settings of pancreatitis with a hypovascular area of focus, to ensure a diagnosis of adenocarcinoma is not delayed or missed. This will increase the chance of curative resection and eventual survivability of this malignancy.

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Author Contributions

JP and OO wrote and edited the manuscript. MG, GK, MI, and LA revised and edited the manuscript. All authors read and approved the final manuscript.

Competing Interests

None.

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