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Review Article

Critical evaluation of pancreatic masses

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Abstract

Evaluation of a patient with a pancreatic mass on a CT or MRI requires consideration of the gender and age of the patient, presenting symptoms, quality of the imaging study performed and relevant medical history. CT is generally preferred over MRI for suspected pancreatic cancer but MRI is best considered for evaluation of ductal anatomy and possible cystic neoplasms. EUS should be considered when further characterization of morphology or tissue sampling is required.

Key words

Pancreatic masses, Pancreatic cystic neoplasms, Pancreatic solid masses, MDCT, MRI, Endoultrasound

Introduction

Routine use of cross-sectional imaging such as a CT scan or MRI for symptoms ranging from vague abdominal pain to jaundice and weight loss may identify pancreatic masses that require further characterization. Following these imaging studies, gastroenterologists, radiologists and surgeons are usually asked diagnose and determine the malignant potential of these lesions. When evaluating patients with these lesions, it is critical to keep several factors in mind when evaluating these patients.

Factors to consider

First, the presenting symptoms of the patient which prompted the initial imaging study must be critically appraised to properly formulate a differential diagnosis for these lesions. For example, a pancreatic lesion found only when evaluating nonspecific abdominal pain is more likely (but not always) a benign solid or cystic lesion rather than malignancy. Symptoms such as new onset diabetes, jaundice and weight loss usually herald malignancy.

A second factor to consider is the quality of the imaging study performed which identified the suspicious pancreatic lesion. Patients who undergo a CT scan in an emergency room for abdominal pain suggestive of renal colic or right upper quadrant pain are likely to have a thick-slice (> 5 mm) noncontrast study or alternatively a CT performed in which image acquisition following IV contrast injection is limited to the portal venous phase. It is increasingly realized that precise evaluation of pancreatic masses with CT scan requires thin slice (1 mm or less) image acquisition during the arterial phase following IV contrast injection. Current state-of-the-art CT scan utilizes multislice (multidetector row) CT and permits image acquisition in multiple contrast phases (i.e., arterial, parenchymal and venous phases). These changes permit high-quality CT image reformations in all three planes and improve characterization of pancreatic masses.[1] Similarly, current T2-weighted magnetic resonance imaging (MRI) and MRI-cholangiopancreaticography (MRCP) obtains thin-sliced sections through the biliary and pancreatic ducts which improves determination of a pancreatic mass and any possible communication of a pancreatic mass to the main pancreatic duct.[2,3] Secretin-enhanced MRCP further improves the visualization of pancreatic ducts and tumor-to-duct communication when cystic lesions are considered.[4] When the quality or technique from the initial CT or MRI is not sufficient, then repeat imaging should be considered.

Thirdly, the gender and age of the patient will help to narrow the differential diagnosis of pancreatic masses. Pancreatic malignancies occur predominately in patients over the age of 50. Therefore if symptoms such as new onset diabetes, jaundice and weight loss occur in someone this age, then malignancy needs foremost to be excluded. It is important to note that large

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or rapidly expanding benign lesions such as cystic neoplasm, pseudocyst or focal pancreatitis (i.e., pseudotumor) may also cause symptoms indistinguishable from cancer.

Finally, pertinent medical history to identify risk factors for pancreatic cancer (i.e., smoking, diabetes, obesity and chronic pancreatitis), cystic neoplasms (i.e., Von Hippel Landau syndrome) or a pseudotumor/pseudocyst (i.e., previously diagnosed acute or chronic pancreatitis) should be considered in each patient.

Initial workup

When an initial imaging study is clearly inadequate or indeterminate, it is advisable to perform a dual phase thin-slice MDCT which includes image acquisition during both the portal phase and arterial phase. This will allow better characterization of the number, size, location and density of the mass or masses under consideration. MDCT is recommended over MRI for suspected pancreatic cancer due to widespread availability, clinician experience and expertise with image interpretation for this indication and finally overall lower costs. MRI and MRCP are best considered for evaluation of ductal anatomy and possible cystic neoplasms.

Suspected pancreatic cystic lesions

Pseudocysts are not classified as pancreatic cystic lesions (PCLs) since these are nonepithelial inflammatory fluid collections associated with acute or chronic pancreatitis. Pseudocysts are the most common type of pancreatic cysts identified in symptomatic patients and management of these lesions is beyond the scope of this discussion. In patients with incidentally found lesions, however, the vast majority are benign cystic neoplasms. These neoplasms include cysts with exceedingly low malignant potential such as serous cystic neoplasms (SCNs) or alternatively mucinous cysts with a higher malignant potential such as an intraductal papillary mucinous neoplasms (IPMNs) or mucinous cystic neoplasms (MCN). Rarely, a clinician may encounter a solid pseudopapillary tumor (SPT), cystic neuroendocrine tumor, or other rare types of PCLs.

CT scan and MRI/MRCP are helpful to provide further information about PCL morphology. In general, CT is superior to MRI for detection of mural calcification and intracystic septations [Figure 1a]. MRI, on the other hand, is superior to CT for evaluation of the number of cysts and their communication with the main pancreatic duct [Figure 1b]. When available, EUS has increasingly been used to provide morphologic details of PCLs [Figure 1c]. The combination of EUS with fine-needle aspiration cytology and cyst fluid analysis for tumor markers (i.e., carcinoembryonic antigen, CEA) or other recently available diagnostic studies has further increased its diagnostic accuracy for differentiation of mucinous from nonmucinous PCLs.

Only a minority of imaging studies demonstrating newly diagnosed pancreatic cysts are performed in patients with pancreaticobiliary pain, weight loss, jaundice, acute pancreatitis, steatorrhea symptoms and conditions (i.e., pancreaticobiliary pain, weight loss, jaundice, acute pancreatitis, steatorrhea) referable to the cyst. Nevertheless, current management guidelines largely depend on data from symptomatic patients. Most experts recommend surgery for the following cystic tumors: 1) main duct IPMNs with a duct diameter >6 mm; 2) all MCNs [Figures 1d and 1e]; 3) branched duct IPMNs (BD-IPMNs) exceeding 3 cm (controversial); 4) cysts with an associated mass or mural nodules (growths off the cyst wall) or; 5) symptoms clearly referable to the cyst.[5] These guidelines also recommend surgery for BD-IPMNs exceeding 3 cm; however, there is growing controversy about using size alone as a guideline for an operation.[6] These guidelines also do not address management of incidentally found cysts but do recommend surveillance of cysts <3 cm in size without nodules. Recently, endoscopic cyst ablation has been proposed as an alternative treatment in patients with PCLs who refuse or are not candidates for surgical resection.[7-9]

Suspected solid pancreatic lesions

CT scan has a more prominent role than MRI for evaluation of solid pancreatic masses primarily due to lower cost, widespread availability and comparable accuracy for imaging these lesions. MRCP is also less frequently used for evaluation of solid masses since their assessment does not require detailed pancreatic ductal pictures that is required for PCLs. Similar to pancreatic cysts, benign solid pancreatic lesions are more likely to be identified either incidentally or during workup of nonspecific abdominal pain. When a high-quality CT or MRI shows a suspected resectable solid benign or malignant pancreatic mass, no further workup is necessary and surgical resection can be considered if appropriate.[10]

Additional evaluation of a solid pancreatic mass with EUS should be considered in two circumstances. First, if tissue

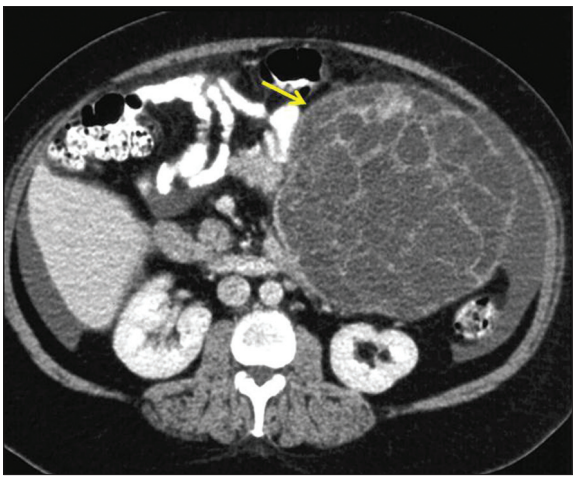

Figure 1a: A 31-year-old female with MCN. Despite a large size lesion (arrow) arising from the tail, it was benign without atypical cells. Note large locules and mild ascites. Multiple cystic spaces with variable thickness septations are apparent (arrow) and generally considered a risk of malignancy. Peripheral calcifications (arrowheads) within the septa are noted in up to 15% of patients

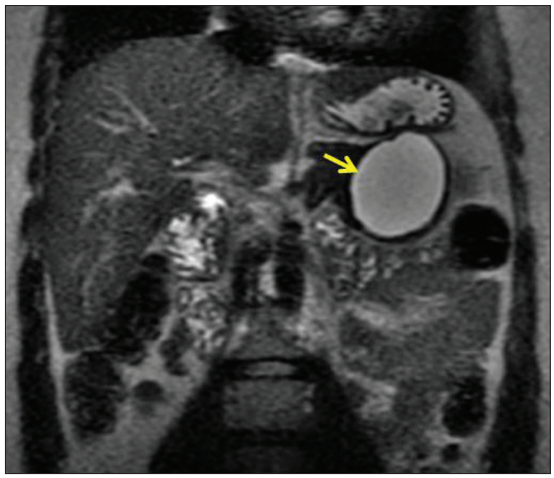

Figure 1b: A 51-year-old female with MCN. T2-weighted MRI shows typical location and paucilocular appearance (arrow). No malignancy on surgical pathology

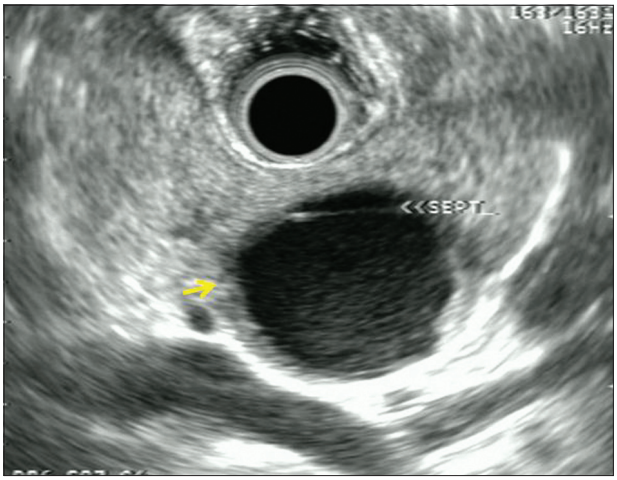

Figure 1c: EUS findings in a middle-age female patient with an MCN in the body of the pancreas. A cyst wall is present and few intracystic nodules arising from the wall (arrow) could represent a solid lesion or mucous (radial echoendoscope examination performed from the gastric body)

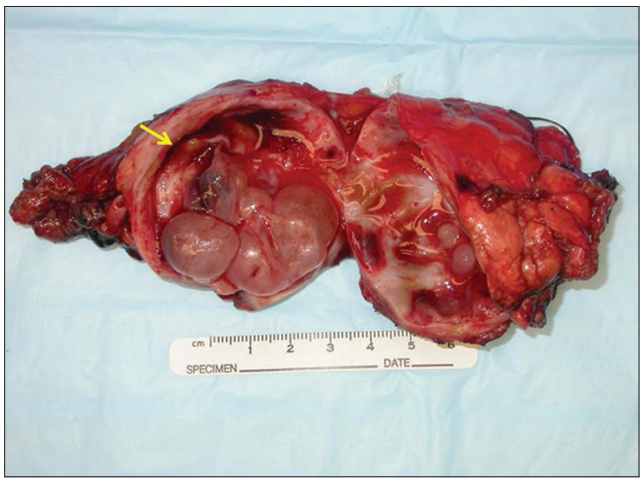

Figure 1d: Gross surgical specimen in a patient with MCN. Multiple cystic compartments filled with mucin (arrows) are noted. No malignancy was detected in this specimen

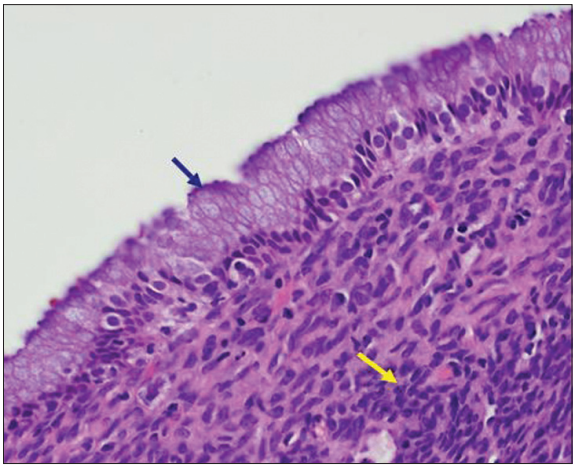

Figure 1e: Histology photomicrograph from a resected MCN lesion: columnar epithelium (blue arrow) with unique spindle cell stroma (yellow arrow) similar to ovarian stroma. This ovarian stroma-like appearance is the pathological hallmark of MCN (H&E, magnification 400).

diagnosis is required either before operative or medical management, then EUS is recommended. The overall sensitivity and specificity of EUS-FNA for the diagnosis of pancreatic tumors are 85% and 98%, respectively.[11] Some authors have even reported a sensitivity of EUS-FNA for pancreatic cancer exceeding 90% in patients following negative or nondiagnostic sampling from previous ERCP or percutaneous approach.[12,13] Despite excellent sensitivity, the NPV of EUS-FNA for pancreatic tumors is 55%.[11] Therefore, a negative or nondiagnostic biopsy does not completely exclude the possibility of malignancy.

A second indication for EUS is evaluation of a suspected pancreatic mass following negative or indeterminate imaging. EUS is superior to MDCT for detection of pancreatic masses.[10,14] This superiority of EUS for detection of pancreatic masses is most marked for those measuring less than 25 mm. Detection of small pancreatic masses is very useful for evaluation of functional neuroendocrine tumors (i.e., insulinomas) and neuroendocrine tumors in patients with multiple endocrine neoplasia type 1 (MEN 1). When EUS is performed for suspected pancreatic cancer by clinical history or cross sectional imaging, a negative EUS essentially rules out malignancy with a negative predictive value of 100%.[15]

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