Characterization and Differential Diagnosis of Cystic Pancreatic Lesions: An Emphasis on Endoscopic Ultrasound-Guided Fine-Needle Aspiration

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Received 15 July 2012; Revision submitted 15 July 2012; Accepted 18 July 2012

Abstract

Cystic pancreatic lesions (CPLs) are detected with increasing frequency. Endoscopic ultrasound (EUS) may provide detailed imaging of the CPLs. Additional diagnostic information may be obtained with EUS-guided fine-needle aspiration of the cyst contents and the subsequent cyst fluid analysis and cytology. This article is part of an expert video encyclopedia.

Keywords

Cystic pancreatic lesion; Endoscopic ultrasound; Fine-needle aspiration; Video.

Video Related to this Article

Video available to view or download at doi:10.1016/S2212-0971(13)70236-X

Techniques

- Endoscopic ultrasound (EUS).
- Fine-needle aspiration (FNA).

Materials

- Echoendoscope: Linear echoendoscope; Pentax, Montvale, NJ, USA.
- Accessories: EchoTip® Ultra High Definition Ultrasound Access Needle; Cook Medical Inc., Bloomington, IN, USA.

Background and Endoscopic Procedure

Cystic pancreatic lesions (CPLs) are being detected with increasing frequency. Up to 60% of CPLs are reported to be pancreatic cystic neoplasms (PCNs). The four major types of PCNs are intraductal papillary mucinous neoplasm (IPMN), mucinous cystic neoplasm (MCN), serous cystic neoplasm (SCN), and solid-pseudopapillary neoplasm (SPN). There are some cross-sectional imaging features that are characteristic for certain PCNs. For main-duct IPMNs, the main pancreatic duct is cystically dilated. In branch-duct IPMNs, the cystically dilated branch ducts communicate with the main pancreatic duct. Peripheral calcification on computed tomography is nearly specific for MCN. Honeycombed or microcystic lesion with a central scar with calcification is diagnostic of SCN.

On EUS, the findings that suggest IPMN include dilation of the main pancreatic duct or branch duct(s) with or without mural nodules and intraluminal debris or mucus. MCNs appear as thin-walled, septated, fluid-filled cavities. SCNs typically appear as multiple well-demarcated microcystic lesions with septations. SPNs may appear to be solid, mixed solid and cystic, or cystic on EUS. Some SPNs may have calcifications.

EUS-guided FNA (EUS–FNA) is a versatile tool in the evaluation of CPLs. It may provide the specimen for cyst fluid analysis and cytology. Cyst fluid carcinoembryonic antigen concentration is the most accurate marker of mucinous CPLs (i.e., IPMN and MCN). Cytology is reported to be the best test to diagnose malignant cysts.

Key Learning Points/Tips and Tricks

- The movement of the needle is easier when the echoendoscope is straight.
- Scan the needle pathway using color Doppler mode to identify and avoid vascular structures.
- Always keep the needle in the visual plane during EUS–FNA.
- Aspirate all fluid, make one needle pass, and use antibiotics in order to minimize the risk of cyst infection.

Complication and Risk Factors

The complication rate of EUS–FNA of CPLs is low. In one large-scale report, the overall complication rate was 2.2% (13 of 603 patients), with no obvious identifiable risk factors. The reported complications were pancreatitis (n = 6), abdominal pain (n = 4), retroperitoneal bleeding (n = 1), infection (n = 1), and bradycardia (n = 1). This article is part of an expert video encyclopedia. Click here for the full Table of Contents.
Cystic pancreatic lesions are being detected with increasing frequency. Most of these lesions are pancreatic cystic neoplasms. Intraductal papillary mucinous neoplasm, mucinous cystic neoplasm, serous cystic neoplasm, and solid-pseudopapillary neoplasm account for the majority of pancreatic cystic neoplasms.

In main-duct IPMNs, the main pancreatic duct is cystically dilated, as can be seen in the CT and MRCP. On EUS, the main pancreatic duct is dilated with or without mural nodules and intraluminal debris or mucus.

On resected specimen, notice the dilated main pancreatic duct, and notice the tumor at the head of the pancreas.

In branch-duct IPMNs, the branch duct is cystically dilated. MRCP may show the communication between the branch-duct IPMN and the main pancreatic duct. On EUS, the branch duct is cystically dilated. Occasionally the communication between the cystic lesion and the main pancreatic duct may be demonstrated.

On resected specimen, the branch duct is cystically dilated. The lesions form multi-cystic, grape-like structures.

Microscopically, IPMNs show intraductal proliferation of columnar mucin-producing cells. The epithelium can be flat or papillary.

In some cases of IPMNs, duodenoscopy may reveal a patulous duodenal papilla and mucin extrusion through the orifice.

Mucinous cystic neoplasms are predominantly macrocystic. Septations may be present, which may be more conspicuous on MRI.

Peripheral calcification on CT is nearly specific for mucinous cystic neoplasm.

On EUS, mucinous cystic neoplasm may be uniocular, or septated.

The resected specimen may be uniocular or septated. The internal surface of the specimen shown is glistening with mucin. Mural nodules are also seen.

Histologically, mucinous cystic neoplasms are characterized by ovarian-type stroma, composed of densely packed spindle cells with sparse cytoplasm and uniform, elongated nuclei. The presence of ovarian-type stroma is a requirement for diagnosis.

EUS-FNA or IPMN or mucinous cystic neoplasm may reveal thick, mucinous cyst fluid.

The fluid is usually high in CEA concentration, and cytology may reveal mucinous glandular cells, as seen in the inset photomicrograph.

Serous cystic neoplasms are usually polycystic. The central nidus often calcifies, as seen on the pre-contrast CT.

EUS shows the characteristic microcystic nature of a serous cystic neoplasm.

EUS-FNA of serous cystic neoplasm may reveal thin and nonmucinous cyst fluid.

The fluid is usually low in CEA concentration, and cytology may reveal cuboidal cells with small round nuclei and clear cytoplasm.

This is a characteristic gross appearance of serous cystic neoplasm. The lesion is composed of numerous tiny cysts. The cysts are arranged around a central, fibrous scar. The central scar may be calcified, as in this case.

Histologically, serous cystic neoplasms are lined by a single layer of cuboidal epithelial cells.

A solid-pseudopapillary neoplasm is seen on CT, which is a heterogeneous, partially solid and partially cystic mass.

Calcifications may be seen occasionally, as seen on this CT of another patient.

On EUS, solid-pseudopapillary neoplasm may be solid, mixed solid and cystic, or cystic. Here we see a cystic lesion with septation.

The cyst fluid of a solid-pseudopapillary neoplasm is usually low in CEA concentration, and cytology may be highly cellular with monotonous sheets of densely packed cells.

Solid-pseudopapillary neoplasms are usually large, round, and solitary. Cut section of solid-pseudopapillary neoplasm reveals solid areas that are lobulated and light brown to yellow in color. There may also be zones of hemorrhage and necrosis. The cystic spaces may be filled with necrotic debris.

The solid portions of solid-pseudopapillary neoplasm are composed of poorly cohesive monomorphic cells. These cells are admixed with hyalinized or myxoid stromal bands. Pseudopapillae are formed when the poorly cohesive neoplastic cells drop away.

Here are some tips and tricks for EUS-FNA of cystic pancreatic lesions.

The movement of the needle is easier when the echoendoscope is straight. Always try to maintain the echoendoscope as straight as possible.

Scan the needle pathway using color Doppler mode to identify and avoid vascular structures.

Always keep the needle in the visual plane during EUS-FNA.

Aspirate all fluid, make one needle pass, and use antibiotics in order to minimize the risk of cyst infection.

In summary, cystic pancreatic lesions are being detected with increasing frequency.

Pancreatic cystic neoplasms account for the majority of these lesions.
EUS may provide detailed imaging of cystic pancreatic lesions. Analysis of cyst fluid may aid the differential diagnosis of these lesions.

References