

# Endoscopic Ultrasonography of the Pancreas: New Advances

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Endoscopic ultrasonography (EUS) has been used in the diagnosis of wall-infiltrative lesions, cancers, and submucosal tumors of the gastrointestinal tract. EUS is no longer merely an imaging technique and consequently its applications can therefore be divided into diagnostic and therapeutic categories for pancreatic diseases as well for gastrointestinal diseases. Diagnostic EUS includes conventional EUS, color Doppler EUS, contrast-enhanced EUS, intraductal ultrasonography, and EUS-guided fine needle aspiration (FNA). Therapeutic EUS is used for drainage of pancreatic pseudocysts by puncturing as well as injecting substances having a therapeutic potential, such as alcohol for celiac plexus neurolysis, or in the future, anticancer drug or gene - therapy - related substances.

## Acute Pancreatitis

The role of EUS in acute pancreatitis has been investigated for the detection of choledocholithiasis in patients with biliary pancreatitis [1, 2]. EUS can reliably identify cholelithiasis and is more sensitive than transabdominal ultrasonography in detecting choledocholithiasis in patients with biliary pancreatitis. EUS can also distinguish edematous and necrotizing pancreatitis, identify peripancreatic fluid collection and predict the severity of pancreatitis to some extent.

Indications for surgery in cases of infected pancreatic necrosis is now generally accepted

and the presence of infection can be confirmed in patients with sterile or infected pancreatic necrosis using ultrasonography-guided FNA [3]. Because of a potential risk for secondary infection, FNA should be done after the patient has clinical signs of sepsis or infected pancreatic necrosis is suspected. EUS may be used in the early management of patients with acute pancreatitis to select those who would benefit from endoscopic stone extraction and endoscopic or surgical drainage.

## Chronic Pancreatitis

The diagnostic role of EUS in chronic pancreatitis has been evaluated in the diagnosis of early or minimal chronic pancreatitis [4-6] and in the differential diagnosis of focal pancreatitis and small pancreatic cancer [6]. The diagnostic criteria of EUS for early or minimal chronic pancreatitis have not as yet been accepted because of the lack of an acceptable gold standard. However, a correlation can be confirmed between EUS and the secretin test and between EUS and endoscopic retrograde cholangiopancreatography (ERCP) in normal patients and patients with advanced chronic pancreatitis but not in patients with mild or moderate chronic pancreatitis. The validity of EUS in the diagnosis of early or minimal chronic pancreatitis requires a long-term follow-up of patients with early or minimal chronic pancreatitis.

Differentiation between benign and malignant ductal stenosis or focal mass is still difficult to establish using EUS alone. EUS with FNA [7-9] or ERCP with intraductal ultrasonography (IDUS) [10] is the next step in differentiating small resectable pancreatic cancers from focal chronic pancreatitis.

Therapeutic trials using EUS in chronic pancreatitis have been done for pain control and drainage of pseudocysts. EUS-FNA is applicable transgastrically to the celiac plexus block for managing chronic pain by the injection of alcohol [11-13]. Although evaluation of the effect on chronic pain without the use of placebo control group may not be scientifically sound, we can expect a fairly safe and effective means of managing chronic intractable pain in chronic pancreatitis and pancreatic cancer.

EUS is the test of choice for detecting cystic changes in chronic pancreatitis. EUS can also localize and characterize pseudocysts in detail and identify the best candidates for drainage of the pseudocysts. Color Doppler EUS can detect blood vessels interposed between the cyst and the gastrointestinal wall thus indicating the necessity of a safer route for drainage. Small thin-walled cysts which do not contain debris or blood and are not in communication with the pancreatic duct are ideal for EUS-guided aspiration drainage.

## **Pancreatic Cancer**

For tumor localization, lymph node involvement and vascular invasion, EUS is recognized to be more accurate than other imaging techniques such as transabdominal ultrasonography, computed tomography (CT) and ERCP. An accurate preoperative staging of pancreatic cancer is essential in planning the best treatment for each patient, especially in the selection for surgery of those who can best benefit from the operation. ERCP can reveal obstruction or stenosis of the main pancreatic duct but cannot evaluate tumor size, vascular invasion or lymph node metastasis in and around the pancreas in

patients with pancreatic cancer. EUS combined with IDUS for small pancreatic cancers, color Doppler and contrast-enhanced EUS [14] for vascular invasion, and EUS combined with FNA for pancreatic mass and lymph node involvement are all-important in the accurate preoperative assessment of the lesions involving either masses or cysts inside and outside of the pancreas. If a patient is referred to us for a pancreatic mass detected on conventional ultrasonography or CT, a differential diagnosis of the mass can be made by a single EUS procedure in which the mass lesion is staged and biopsied. When the mass is smaller than 2 cm in size, we must differentiate between a small resectable pancreatic cancer and focal pancreatitis and IDUS can be of help in such a differential diagnosis. When the mass appears to be advanced pancreatic cancer, palliative pain control can be considered with a EUS-guided celiac nerve block.

## **Conclusion**

EUS requires considerable expertise and is still not widely available. Its role in the diagnosis and treatment continues to evolve and to be evaluated. Instruments and techniques will be improved and become less invasive, easier to operate, and more informative in the near future.

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**Key words** Pancreatic Cyst; Pancreatitis; Pancreatitis, Acute Necrotizing; Pancreatic Neoplasms

**Abbreviations** CT: computed tomography; ERCP: endoscopic retrograde cholangiopancreatography; EUS: endoscopic ultrasonography; FNA: fine needle aspiration; IDUS: intraductal ultrasonography

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