Endoscopic Ultrasound in the Diagnosis and Staging of Pancreatic Cancer

Two decades have elapsed since publication of the first papers describing the examination of the pancreas via the stomach and the duodenum using an ultrasound probe fixed to an endoscope tip. Initial attempts to image the pancreas in this fashion proved difficult and frustrating, but they were promising enough that instrument makers and gastrointestinal endoscopists persisted in developing increasingly effective devices.

Called "a marriage of inconvenience" in a 1987 editorial in the Lancet,[1] endoscopic ultrasonography is now available in most academic medical centers and in many large community hospitals. The 13th International Symposium on Endoscopic Ultrasonography, to be held October 4-6, 2002, in New York City, will devote a major forum to issues involving the imaging of pancreatic neoplasms.

Endoscopic Ultrasound and the Pancreas
Endoscopic ultrasound has proved to be a good marriage after all. It is an accurate method for locoregional staging of gastrointestinal neoplasms and for evaluation of extrinsic mass lesions close to the gastrointestinal tract. The entire pancreas, including the uncinate process, head, body, and tail, can usually be scanned through the stomach and the duodenum. Because the transducer is close to the pancreas, interference from the abdominal wall and bowel gas is eliminated. Higher-frequency ultrasound with shorter penetration can be used, producing images with greater clarity and detail. The development of endoscopic ultrasound-guided fine-needle aspiration (FNA) of the pancreas has provided a new means by which to obtain cytologic material and tumor markers and to improve diagnostic yield and accuracy.

Drs. Levy and Wiersema have written a superb review of the current experience and evidence supporting the use of endoscopic ultrasound in the diagnosis and staging of pancreatic cancer. They present extensive data indicating that the technique is very accurate for the detection of pancreatic masses, identifying more than 90% of them. The negative predictive value is in the same range, so that a negative endoscopic ultrasound examination of the pancreas is very helpful when body imaging with computed tomography (CT) or magnetic resonance imaging (MRI) is equivocal. The authors also provide recent evidence that endoscopic ultrasound remains helpful in detecting or ruling out pancreatic masses even with the improvements in helical CT scanners and MRI technology.

Guiding Management Decisions
A persistent problem for endoscopic ultrasound imaging is the difficulty in differentiating a neoplastic mass in the pancreas from focal pancreatitis. The difficulty is compounded because chronic pancreatitis increases the risk of developing carcinoma of the pancreas, and because pancreatic cancers often create a surrounding inflammatory and desmoplastic reaction. Fine-needle aspiration using endoscopic ultrasound guidance has been a major advance in helping to solve this dilemma. While a negative cytology does not rule out the possibility of a malignancy, a positive cytology is highly specific and can help guide a patient to surgical or combined-modality therapies. Endoscopic ultrasound and ultrasound-guided FNA have proved to be similarly useful in management decisions regarding cystic lesions in the pancreas, which are often detected as incidental findings on abdominal CT scans. Intraductal mucinous pancreatic tumors can also be diagnosed using endoscopic ultrasound FNA. Again, the sensitivity for malignancy is only in the 50% to 60% range for
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a definite cytologic diagnosis, but specificity is close to 100%. Measurement of amylase, tumor markers, and mucin, combined with endoscopic ultrasound imaging and cytology, can be helpful adjuncts in determining the management of cystic and intraductal lesions. In patients with clinical syndromes suggesting neuroendocrine tumors such as insulinomas or gastrinomas, the first-line work-up is usually a helical CT scan of the pancreas and a somatostatin-receptor scan. The ability of endoscopic ultrasound to image neuroendocrine pancreatic tumors even smaller than 10 mm can be very helpful in localizing tumors when scans are negative or equivocal. Endoscopic ultrasound FNA can provide cytologic diagnosis if necessary.

**Pancreatic Cancer Staging**

Once a diagnosis of pancreatic cancer is made, staging the lesion and determining whether it is resectable are key elements for management. Until recently, endoscopic ultrasound was more accurate for locoregional staging of pancreatic cancer than CT and MRI. Endoscopic accuracy for portal vein invasion was reported to approach 90%. Recent studies have sometimes, but not always, confirmed this degree of accuracy.[3-5]

Endoscopic ultrasound accuracy for determining portal vein invasion is limited in very large tumors because of penetration problems using high-frequency ultrasound. Furthermore, in recent years, dual-phase helical CT and state-of-the-art MRI have been shown to equal endoscopic ultrasound accuracy for locoregional staging, while also providing evidence for distant metastases. Other reports continue to show an advantage for endoscopic ultrasound in assessing vascular invasion, particularly in cases where CT and MRI are inconclusive.[5,6]

Primary cancers, such as renal cell cancer or lymphoma, can sometimes metastasize to the pancreas. These metastases may have an identical appearance to primary pancreatic carcinoma on CT scans. Endoscopic ultrasound-guided FNA, using cytologic analyses, can be definitive in differentiating metastases from primary pancreatic cancer.[7]

**Current Applications**

As documented in the article by Levy and Wiersema, the current role of endoscopic ultrasound appears to be in detecting small pancreatic tumors that are not imaged or not well defined on the latest CT or MRI scans. Needle biopsy, particularly of smaller pancreatic lesions, is often technically impossible when guided by CT scan. Endoscopic ultrasound-guided FNA can be used in such cases to achieve cytologic and marker evidence to help differentiate benign from malignant lesions. In selected cases, endoscopic ultrasound can add to the staging accuracy of CT and MRI, and endoscopic ultrasound-guided FNA can be used to confirm lymph node metastases.

Endoscopic ultrasound provides excellent access to the celiac axis and, for pain control in advanced pancreatic cancer, endoscopic ultrasound-guided celiac axis blockade and celiac neurolysis are well-established techniques. Endoscopic ultrasound-guided injections of antitumor agents directly into pancreatic cancers are experimental but have evident promise.

The application of endoscopic ultrasound to the diagnosis and management of pancreatic cancer is potentially of great value to the oncologist as new treatment strategies for this highly lethal disease continue to evolve.

**References:**


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