Chapter 1
General Considerations of EUS and EUS-FNA

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Endoscopic ultrasonography (EUS) uses the technology of endoscopy to introduce high-frequency ultrasound probes into the upper or lower part of the gastrointestinal (GI) tract to visualize its wall and adjacent structures. EUS identifies and evaluates lesions occurring in the wall of the GI tract, in periluminal (mediastinal, abdominal, and pelvic) lymph nodes, pancreas, the left side of the liver, the spleen, left kidney, left adrenal gland, and at times masses in the most medial parts of lung. EUS is a highly accurate clinical test for the detection, staging, and optimal management of esophageal, gastric, colorectal, pancreatic, and biliary tumors as well as the evaluation of thick gastric folds and benign pancreatic disease.

In the last two decades, EUS-guided fine-needle aspiration (FNA) has empowered EUS as a tool that provides a cytologic diagnosis, being definitive and therapy-guiding for primary tumors such as pancreatic adenocarcinoma and for cancer staging, i.e., in the lung, pancreas, stomach, and esophagus. EUS-FNA changes the therapeutic strategy in up to 15 and 30% of patients with clinical suspicion of upper GI tract and pancreatic malignancy, respectively. The information provided by EUS-FNA prevents

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unnecessary surgery in 30% of patients who have a primary malignancy. In addition, EUS-FNA is minimally invasive, relatively inexpensive, and associated with low risk of complications. Thus, EUS-FNA has become a diagnostic strategy of choice for masses in such sites. Furthermore, EUS and EUS-FNA may prove to be valuable diagnostic modalities that change clinical management in selected critically ill patients in the intensive care unit; transient intraprocedural complications were reported in 9% of interventions (6 of 63), predominantly related to brief oxygen desaturation. EUS and EUS-FNA have been proved useful in children as young as 5 years old with pancreas and mediastinal masses and when tissue was needed; the procedure is performed under general anesthesia and endotracheal intubation.

EUS-FNA provides an excellent sampling of lymph nodes, pancreatic tumors, and hepatic or left adrenal gland metastases. The overall sensitivity of EUS-FNA varies from 76 to 91%, the specificity from 84 to 100%, and the accuracy from 78 to 94%. Statistical analysis of 5667 EUS-FNAs of various targets showed a specificity of 92.8% (false positive rate 7.2%, 27/377 cases with cytohistological correlation) due to epithelial cell contamination, EUS sampling error, and cytology misdiagnosis; scenarios included lymph node sampling in the setting of Barrett's esophagus with dysplasia or early cancer, pancreas mass in chronic or autoimmune pancreatitis, reactive gastropathy, and nodal sampling for rectal cancer staging; EUS-FNA samples may be contaminated with cellular elements carried over during transmural needle passage resulting in diagnostic difficulties. Recent analysis shows a pooled sensitivity of 85% in the EUS-FNA of solid pancreatic masses. Cystic pancreatic lesions have a diagnostic rate of 66% with the use of EchoBrush. Less favorable results are seen for EUS-FNA of cystic lesions of the pancreas (54% sensitivity and 93% specificity) and GI wall masses. Still, the overall accuracy of EUS-FNA in patients with mural masses, who had previously failed endoscopic standard forceps biopsy procedures, is 81%. The nondiagnostic rate of EUS-FNA of pancreas is wide, ranging from 2 to 48%; factors will be further discussed in Chap. 2.

The overall risk of complications from EUS-FNA is low (1.6%), slightly higher than that for standard EUS alone; however, it appears acceptable. Perforation and aspiration pneumonia are rare. Acute extraluminal hemorrhage at the site of the aspiration occurs in 1.3% of patients; however, this is typically self-limited. Complications that may occur after the procedure include (but are not limited to) pancreatitis and infection. Aspiration of cystic pancreatic lesions conveys a 14% risk of infection, bleeding, or pancreatitis. Life-threatening mediastinitis has been reported after EUS-FNA of a mediastinal bronchogenic cyst. Therefore, antibiotic prophylaxis for patients with cysts and necrotic lesions after EUS-FNA is currently recommended by the American Society for Gastrointestinal Endoscopy (ASGE). However, prophylactic administration of antibiotics to prevent endocarditis is currently not recommended.

The incidence of needle-track tumor seeding in malignancies evaluated by EUS-FNA is difficult to assess, because surgical excision often removes the needle pathway or the tumor responds to chemotherapy. Peritoneal implants have been reported in 1 of 46 patients (2.2%) and 7 of 43 patients (16%) when EUS-FNA or percutaneous-guided FNA was used, respectively, for the initial diagnosis of nonmetastatic pancreatic carcinoma.

New applications for EUS are also emerging, including interventional EUS. The basic principle is to advance a needle under EUS guidance into a target in the vicinity of the gut to inject an agent, drain fluid, or form a fistula. EUS-guided celiac plexus block is one of the procedures to prevent or control the intractable pain in patients with pancreas cancer. Local delivery of chemotherapy is another application in constant development. The most successful procedure is cyst or pseudocyst drainage under EUS guidance, which has become the standard of care. Drainage of pelvic abscesses of various sizes has been successfully done with no complications. EUS-guided transgastric or transduodenal cholangiopancreatography has been reported useful and with few complications in patients with obstructive jaundice when standard endoscopic retrograde cholangiopancreatography (ERCP) was unsuccessful. Therapeutic pancreas cyst alcohol ablation is being investigated and is an

area of constant evolution that needs further evaluation. Placement of EUS-guided gold fiducial markers to be used as point of reference for image-guided radiation therapy in unresectable pancreatic adenocarcinoma has been done with promising results. Finally, radioactive seeds have been placed under EUS guidance and results are under evaluation to assess benefits.

Further Reading

Bardales RH, Stelow EB, et al. Review of endoscopic ultrasound-guided fine-needle aspiration cytology. Diagn Cytopathol. 2006;34(2):140–75.

Berzosa M, Davies SF, et al. Diagnostic bedside EUS in the intensive care unit: a single-center experience. Gastrointest Endosc. 2013;77(2):200–8.

Das A, Chak A. Endoscopic ultrasonography. Endoscopy. 2004;36(1):17–22.

Hawes RH. The evolution of endoscopic ultrasound: improved imaging, higher accuracy for fine needle aspiration and the reality of endoscopic ultrasound-guided interventions. Curr Opin Gastroenterol. 2010;26(5):436–44.

Hewitt MJ, McPhail MJ, et al. EUS-guided FNA for diagnosis of solid pancreatic neoplasms: a meta-analysis. Gastrointest Endosc. 2012;75(2):319–31.

Gleeson FC, Kipp BR, et al. False positive endoscopic ultrasound fine needle aspiration cytology: incidence and risk factors. Gut. 2010;59(5):586–593.

Jhala NC, Jhala DN, et al. Endoscopic ultrasound-guided fine-needle aspiration. A cytopathologist's perspective. Am J Clin Pathol. 2003;120(3):351–67.

Lozano MD, Subtil JC, et al. EchoBrush may be superior to standard EUS-guided FNA in the evaluation of cystic lesions of the pancreas: preliminary experience. Cancer Cytopathol. 2011;119(3):209–14.

Thornton GD, McPhail MJ, et al. Endoscopic ultrasound guided fine needle aspiration for the diagnosis of pancreatic cystic neoplasms: a meta-analysis. Pancreatology. 2013;13(1):48–57.