

ASGE guideline: complications of EUS

This is one of a series of statements discussing the utilization of GI endoscopy in common clinical situations. The Standards of Practice Committee of the American Society for Gastrointestinal Endoscopy prepared this text. In preparing this guideline, a MEDLINE literature search was performed, and additional references were obtained from the bibliographies of the identified articles and from recommendations of expert consultants. When little or no data exist from well-designed prospective trials, emphasis is given to results from large series and reports from recognized experts.

Guidelines for appropriate utilization of endoscopy are based on a critical review of the available data and expert consensus. Further controlled clinical studies are needed to clarify aspects of this statement, and revision may be necessary as new data appear. Clinical consideration may justify a course of action at variance to these recommendations.

INTRODUCTION

EUS and EUS-guided FNA (EUS-FNA) have emerged as accurate and safe methods for diagnosing and staging GI and non-GI malignancies. In addition, EUS-FNA has been used to aspirate fluid from cystic lesions, pseudocysts, and fluid collections for both diagnostic and therapeutic purposes. EUS-FNA distinguishes itself from other forms of endoscopy by traversing the GI lumen to enter sterile spaces, organs, and lymph nodes, often in close proximity to large vascular structures. EUS uses dedicated echoendoscopes that have unique optical and mechanical properties beyond the addition of a US transducer. As such, the incidence and types of complications associated with the performance of EUS differ from those seen with other endoscopes.

This guideline will focus on the complications specifically associated with EUS and EUS-FNA. Complications associated with sedation and standard endoscopic techniques can be found in the ASGE guidelines entitled

“Complications of Upper GI Endoscopy” and “Complications of Colonoscopy.”¹⁻³

MECHANICAL AND OPTICAL PROPERTIES OF ECHOENDOSCOPES

Echoendoscopes are commonly available in two varieties: radial-scanning and curvilinear-array (CLA) devices. Radial-scanning devices contain either a rotating mechanical US transducer or a wraparound-nonrotating electronic US transducer that generates an US image perpendicular to the long axis of the endoscope. CLA (sometimes referred to as linear array) echoendoscopes produce an US image in a single plane parallel to the long axis of the endoscope via an electronic US transducer. EUS-FNA is typically only performed with CLAs, because this allows real-time visualization of the needle during FNA. In addition, a variety of US miniproboscopes that pass through the working channel of standard videoendoscopes are available.

All currently available echoendoscopes place the US transducer at the most distal end of the device. Both radial and CLA echoendoscope transducers are nonflexible, thus, making the tip of the echoendoscopes more rigid than their standard endoscope counterparts, and echoendoscopes typically have a longer nonflexible segment just proximal to the US transducer, giving the echoendoscope a distal, rigid segment of up to 4 cm in length.

Most echoendoscopes currently available are oblique-viewing instruments. The point of view obtained of the GI tract is akin to that obtained with a duodenoscope, and, thus, intubation and advancement of the instruments (especially in the esophagus) are semiblind maneuvers.

Overall, these mechanical and optical differences in echoendoscopes make manipulation of the echoendoscopes more difficult and can contribute to the incidence of complications.

PERFORATION

Upper-GI endoscopy with a standard upper endoscope carries a risk of perforation of 0.03%.¹ The frequency of perforation at colonoscopy has been studied in a variety of settings and appears to be between 0.12% and 0.32%.^{2,4,5} One abstract reported two esophageal perforations with radial EUS instruments in 3006 patients (0.07%).⁶ A survey

of 86 physicians regarding cervical esophageal perforation encountered reported 16 perforations among 43,852 (0.03%) with one death (0.002% mortality).⁷ The majority (94%) of these perforations occurred in patients older than 65, and 44% occurred in patients with a history of difficult intubation during a prior upper endoscopic procedure. Fifteen of 16 perforations (94%) occurred with a radial-scanning echoendoscope. Twelve of 16 perforations were caused by trainees or staff physicians with less than 1 year of experience with upper EUS. Two of the 15 surviving patients required surgical interventions.

Esophageal cancer and esophageal strictures have both been independently linked to an increased incidence of esophageal perforation.^{1,8,9} A malignant esophageal stricture restricts passage of the echoendoscope during approximately a third of EUS for esophageal cancer staging and limits the endosonographer's ability to completely evaluate tumor depth and lymph nodes of the celiac axis, thus decreasing accuracy for T and N staging.^{10,11} Dilation of the stricture carries with it a 0% to 24% risk of perforation.^{12-14,16,17} Sequential bougienage to no more than 16 mm has been reported in 120 patients without perforation.^{16,17}

A thinner, tapered tip, wire-guided, nonoptical echoendoscope (MH-908; Olympus America Corp., Melville, NY) has been shown in 30 patients to significantly increase the frequency of complete staging of otherwise obstructing malignancies without causing perforations.¹⁵ Prospective studies of the role of dilation in patients with obstructing esophageal cancer undergoing EUS examinations by experienced operators have not found an association between perforation and dilation.^{16,17} Through-the-scope US probes represent another alternative in patients with a stricture.¹⁸⁻²⁰

In summary, limited data suggest that EUS is associated with a similar rate of perforations compared with standard endoscopy. Lack of operator experience, older patient age, and a difficult esophageal intubation may be risk factors for esophageal perforation. Duodenal perforations have been reported to occur during EUS examinations, but their overall incidence has not been studied.²¹ No significant data on the incidence of perforations during EUS in the large intestine are available.

EUS-FNA-INDUCED COMPLICATIONS

FNA is commonly performed to obtain tissue from masses or associated lymph nodes, as well as to aspirate the contents of cystic structures (i.e., pancreatic cysts) for analysis. In addition, the same needles used to perform FNA also can be used to inject substances, such as alcohol, corticosteroids, or anesthetic agents, to achieve celiac plexus blockade or neurolysis.

Most EUS-FNA needles are between 19 and 22 gauge in size. Recently, a trucut biopsy needle (Quick-Core; Wilson

Cook Medical, Inc., Winston-Salem, NC) has been designed to operate with an echoendoscope. This device obtains core biopsy specimens of tissue via a spring-loaded cutting sheath and a tissue tray to capture the larger specimen. Small series indicate that use of this needle by experienced operators does not carry an increased risk of complications, however, there has been one report of an infectious complication after trucut biopsy of a mediastinal mass.²²⁻²⁵

Infectious complications

Bacteremia is a rare occurrence after diagnostic endoscopy. Several early studies showed an incidence rate of approximately 0% to 8% (excluding patients with biliary obstruction at ERCP).²⁶⁻²⁸

The frequency of bacteremia as a complication of EUS and EUS-FNA has been prospectively studied in 3 separate trials, none of which included rectal EUS.²⁹⁻³¹ These studies, which collectively include over 250 patients, did not find a statistically significant increase in the rate of bacteremia when compared with that seen at upper endoscopy, and none of the patients who developed bacteremia manifested clinical signs or symptoms of illness. A single case of streptococcal sepsis has been reported among a series of 327 lesions undergoing EUS-FNA.³² This occurred in a patient undergoing FNA of a pancreatic serous cystadenoma despite prophylactic antibiotics, and the patient recovered with further antibiotic therapy. Other studies have noted febrile episodes after EUS-FNA at a rate of 0.4% to 1%.^{33,34} Mediastinal cysts appear to be at risk for infection during EUS-FNA as well, either from bacterial or fungal organisms and, if infected, can lead to mediastinitis with or without sepsis.^{25,35} There have been isolated reports of retroperitoneal abscesses after EUS-guided celiac plexus block.^{36,37} There have been no reports of perirectal abscesses after transrectal FNA.

Based on these data, it can be argued that the risk of bacteremia after EUS-FNA is low and is comparable with that of diagnostic endoscopy.³⁸ Based on these data, prophylactic antibiotics are not recommended for FNA of solid masses and lymph nodes. Some experts recommend prophylactic antibiotics as well as 48 hours of antibiotics after the procedure for EUS-FNA of the perirectal space.³⁹ EUS-FNA of cystic lesions appears to carry an increased risk of febrile episodes and possibly sepsis and, therefore, warrants prophylactic antibiotics, as well as a short post-procedure course.

Pancreatitis

The risk of iatrogenic pancreatitis as a result of EUS-FNA arises in patients undergoing FNA of pancreatic masses, cysts, or the pancreatic duct. All of these procedures involve direct passage of the needle through

pancreatic tissue. Reported rates of pancreatitis associated with pancreatic EUS-FNA, ranging from 0% to 2%.^{32,40-43}

One study evaluated pancreatitis specifically among 100 patients undergoing EUS-FNA (median 3.4 passes; range 2-9) and found a 2% rate of pancreatitis.⁴³ All patients had blood samples obtained before and 2 hours after the FNA was performed to assay amylase and lipase levels. Both patients developed acute interstitial pancreatitis and recovered with conservative therapy.

Hemorrhage

Hemorrhage as a complication of EUS-FNA has been described in only a limited fashion. One study reported two episodes of clinically significant bleeding after EUS-FNA of pancreatic lesions, one of which resulted in death.⁴¹ Mild intraluminal bleeding has been reported to occur in as many as 4% of cases.³³ One study specifically evaluated, over a 13-month period, extraluminal hemorrhage in patients undergoing EUS-FNA.⁴⁴ Three cases of extraluminal hemorrhage occurred among 227 patients, for an overall rate of 1.3%. These occurred during aspiration of a pancreatic islet cell mass, a peritumoral lymph node in a patient with esophageal cancer, and a pancreatic cyst. In all cases, the hemorrhage was seen with US, and mechanical pressure (in an attempt to tamponade the hemorrhage) was applied with the endoscope.

Bile peritonitis

Bile peritonitis is a rare complication of EUS-FNA. One patient developed bile peritonitis after an EUS-FNA of a pancreatic-head mass inadvertently perforated the distal common bile duct in a patient with biliary obstruction and ultimately required laparotomy.⁴⁵ During a study of the use of EUS-FNA to obtain bile directly from the gallbladder, in an attempt to identify patients with microlithiasis, bile peritonitis developed in two of the first 3 patients enrolled. This resulted in termination of the study.⁴⁶ EUS-FNA of solid gallbladder masses has been reported as safe in one small series of 6 patients.⁴⁷

Celiac plexus blockade/neurolysis

EUS can be used to perform celiac plexus blockade (in patients with chronic pancreatitis) or neurolysis (in patients with pancreatic cancer) as a means of achieving analgesia. The technique involves the delivery of corticosteroids (in blockade) or absolute alcohol (in neurolysis) plus a local anesthetic into the celiac plexus via EUS-guided injection with an FNA needle. Complications of this procedure include transient diarrhea (4%-15%), transient orthostasis (1%), transient increases in pain (9%), and abscess formation.^{36,37} Patients should receive adequate intravenous hydration before and after the procedure to reduce the incidence of orthostasis. Complications reported with percutaneous celiac plexus neurolysis include local pain (96%), diarrhea (44%),

hypotension (38%), as well as lower extremity weakness with or without paresthesia, paraplegia, perforation, chronic gastroparesis, retroperitoneal bleeding, hiccuping (from diaphragmatic injury), and hematuria (from renal injury).⁴⁸ These complications are likely not unique to the percutaneous and intraoperative approaches and probably can occur with the EUS-guided technique as well. Death resulting from EUS-guided celiac plexus injection has not been reported.^{49,50}

SUMMARY

For the following points: (A), prospective controlled trials; (B), observational studies; (C), expert opinion.

- EUS uses instruments that have different mechanical and optical properties than standard forward-viewing endoscopes and require special care in their use to minimize complications. (C)
- Patients undergoing EUS by experienced endosonographers are not at increased risk for perforation compared with standard endoscopy. Lack of operator experience, advanced patient age, difficulty with esophageal intubation, and dilation of esophageal cancers may all be risk factors for perforation. (B)
- Most complications of EUS are associated with performing FNAs. (B)
- The risk of bacteremia after EUS-FNA is low. (A)
- Patients undergoing EUS-FNA of solid lesions or lymph nodes do not require antibiotic prophylaxis. One exception may be transrectal FNA, although data supporting routine antibiotic use do not exist. (B)
- Patients who undergo EUS-FNA of cystic lesions (pancreatic or mediastinal) are at increased risk of fever and possibly infectious complications. Antibiotic prophylaxis is warranted in this setting. (B)
- Patients undergoing EUS-FNA of the pancreas have a 1% to 2% risk of pancreatitis. (B)
- Clinically significant bleeding and bile peritonitis are rare complications of EUS-FNA. (B)
- EUS-guided celiac plexus blockade or neurolysis carries a small risk of major complications, but the safety appears to be comparable with percutaneous celiac plexus blockade or neurolysis. (B)

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Prepared by:
STANDARDS OF PRACTICE COMMITTEE
Brian C. Jacobson, MD, MPH
Douglas G. Adler, MD
Raquel E. Davila, MD
William K. Hirota, MD
Jonathan A. Leighton, MD
Waqar A. Qureshi, MD
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