

# Missed lesions in endoscopic ultrasound

Douglas G. Adler, David L. Diehl<sup>1</sup>

Department of Gastroenterology and Hepatology, University of Utah School of Medicine, Utah, <sup>1</sup>Department of Gastroenterology and Nutrition, Geisinger Medical Center, Danville, Pennsylvania, USA

Endoscopic ultrasound (EUS) is now widely recognized as a vital tool for the diagnosis and management of a wide variety of disorders, both within and outside gastroenterology. To become a skilled practitioner of EUS it takes time, effort, dexterity, patience, and perseverance. Eventually, the most serious students of EUS become proficient; EUS exams can be carried out with a high level of accuracy and in a timely manner. Most EUS exams correctly identify relevant structures, both normal and pathologic, but even the most experienced endosonographer can miss key findings during an exam. This is a difficult realization for most of us but it is nonetheless true and recognition of the limitations of EUS, both operator- and technology-dependent, can help to minimize errors or missed lesions. EUS-fine needle aspiration (FNA), for all of its value, it also not a perfect procedure and has limitations.<sup>[1]</sup>

Missing premalignant or malignant lesion is one of the most feared complications of EUS. Unlike endoscopic retrograde cholangiopancreatography (ERCP), in which complications are often acts of commission (actively doing things that cause bleeding, perforation, or pancreatitis), complications or poor outcomes in patients undergoing EUS are more likely to be acts of omission.

Some factors that can limit the value of EUS are patient-related. In patients with significant intraabdominal fat, pancreatic imaging by EUS may be limited as the pancreas may be diffusely hyperechoic due to fatty infiltration. Some patients have an atrophic pancreas that could be related to advanced age, diabetes, and/or metabolic syndrome.

One of the largest risk factors for a difficult EUS exam is extensive chronic pancreatitis. We depend on the normal pancreatic parenchyma in EUS to serve as a point of distinction to pathologic lesions that are typically hypoechoic and stand out in contrast to the surrounding normal pancreas. Chronic pancreatitis, especially advanced chronic pancreatitis, can result in extreme parenchymal heterogeneity, extensive or total loss of normal pancreatic parenchyma, shadowing from inflammation, scarring, hyperechoic foci, or inflammatory fluid collections. All of these findings can distort the pancreas and can limit the ability of EUS to detect mass lesions in these patients (whose very chronic pancreatitis increases their risk of developing pancreatic cancer in the first place).

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

**How to cite this article:** Adler DG, Diehl DL. Missed lesions in endoscopic ultrasound. *Endosc Ultrasound* 2015;4:165-7.

Access this article online	
Quick Response Code: 	Website: <a href="http://www.eusjournal.com">www.eusjournal.com</a>
	DOI: 10.4103/2303-9027.162993

## Address for correspondence

Dr. Douglas G. Adler, Department of Gastroenterology and Hepatology, University of Utah School of Medicine, Huntsman Cancer Center, 30N 1900E 4R118, Salt Lake City, Utah - 84132, USA. E-mail: [douglas.adler@hsc.utah.edu](mailto:douglas.adler@hsc.utah.edu)

Received: 2015-04-22; Accepted: 2015-07-19

In patients without chronic pancreatitis, acute pancreatitis can cause inflammatory changes that can mask significant findings or be misinterpreted as a mass. EUS evaluation of the pancreas is often requested by patients with idiopathic acute pancreatitis (especially if the disease is recurrent). It is unresolved in the literature as to how long one should wait to do a EUS exam after an episode of pancreatitis. Many endosonographers wait for 4-6 weeks after an episode of acute pancreatitis to let the inflammation settle down and get a better look at the entire gland. Performing EUS during an episode of acute pancreatitis, unless one is looking for a biliary or pancreatic duct stone, is often of very limited clinical value.

There are conflicting opinions, both in the literature and in the minds of endosonographers, on whether or not a biliary stent affects the ability of EUS to detect pancreatic lesions and make a biopsy of the same.<sup>[2,3]</sup> Only three studies have looked at cytologic yields of EUS-FNA of pancreatic masses after a stent has been placed with the idea being that a biliary stent can reduce the accuracy and/or yield of FNA.<sup>[4-6]</sup> Two of these studies showed reduced FNA yields if a stent was in place, and one showed no different outcomes in EUS-FNA if patients had a biliary or plastic stent. Other data suggest that EUS to stage pancreatic cancer is unaffected by the presence of a stent.<sup>[7]</sup>

One study specifically addressed cases of missed pancreatic neoplasms.<sup>[6]</sup> This study analyzed cases of missed lesions contributed by nine expert endosonographers. Cumulatively, these physicians retrospectively identified 20 patients in whom a pancreatic neoplasm was missed on EUS. When analyzing the features or clinical factors that may have led to the missed lesions, 12 out of the 20 cases of missed malignancies had EUS features of chronic pancreatitis, again emphasizing the limitations of EUS in this setting. Three patients had diffusely infiltrating carcinoma that was not mass-forming. Other unusual causes of missed pancreatic neoplasms were “prominent ventral dorsal split” in two patients and recent acute pancreatitis in one patient. This study primarily focused on patient-related factors and not operator-related factors.

We have previously reported a patient with pancreatic cancer that did not appear on EUS, cross-sectional imaging, or even intraoperative ultrasound and was only identified by the presence of biliary strictures.<sup>[8]</sup> The true incidence of isoechoic lesions such as this is unknown as most are likely missed during EUS exams.

On an operator level, the choice of endoscope can affect lesion identification. For example, most would agree that the mediastinum is more rapidly and completely evaluated with a radial echoendoscope than a linear one. A focused EUS just to look at a single mediastinal target with a linear scope could potentially miss a pathology that a radial scope would be more likely to detect.

It should be stated clearly that it can be difficult to image the entire pancreas (as opposed to simply thinking that one has imaged the entire pancreas). The distal pancreatic tail that often abuts the splenic hilum can be difficult to fully evaluate, especially if the spleen is overlying. The pancreatic neck and genu can be incompletely seen from both the stomach and the duodenum, and only careful examination of this region from both locations can give a complete assessment. It is unclear if the radial or linear echoendoscope is better to view this area and data on this topic are limited.<sup>[9]</sup> The uncinate process, given its observation point in the distal duodenum, may be difficult to fully interrogate in some patients due to variations in gastric or duodenal anatomy. It can be hard to know if the entire uncinate process has been seen, especially in patients with atypical duodenal anatomy, that is, stenosis, gut malrotation, etc.

Operator-related factors also likely affect the outcome of a EUS exam, with experience being the most obvious one. Experience can be a double-edged sword. On the one hand, an experienced operator can rapidly detect pathologic findings but on the other hand, experience may also breed complacency. A novice operator is more likely to miss a key finding but may also be more aware of his/her limitations and thus, more meticulous in evaluating (and reevaluating) the pancreas.

It is prudent to document any perceived limitation in one's ability to conduct a complete examination. Postsurgical anatomy, most commonly a Roux-en-Y gastric bypass, typically severely hinders the ability to perform a comprehensive EUS exam. Complete pancreatic exams in patients with this history are almost impossible. Duodenal or pyloric strictures may limit evaluation of the pancreas as well. Other surgeries, including Billroth I or II anatomy and pancreaticoduodenectomy may also confer a limited ability to perform a complete exam.

If an exam is felt to be limited or indeterminate, it can often be valuable to repeat it in the future although this

may need to be done weeks or months after the original exam depending on the indications or circumstances.<sup>[10]</sup> Cross-sections imaging via computed tomography (CT) or magnetic resonance imaging (MRI) can provide a complete imaging of the pancreas in patients whose postsurgical anatomy proves to be an obstacle.

Overall, EUS in the hands of a skilled operator reliably provides excellent images of desired target structures, most commonly the pancreas. Both patient-related and operator-related factors can lead to a limited or incomplete exam, and all endosonographers should be aware of the possibility of missed lesions on EUS.

*Financial support and sponsorship*  
Nil.

*Conflicts of interest*

There are no conflicts of interest.

## REFERENCES

1. Fujii LL, Levy MJ. Pitfalls in EUS FNA. *Gastrointest Endosc Clin N Am* 2014;24:125-42.
2. Fusaroli P, Manta R, Fedeli P, *et al.* The influence of endoscopic biliary stents on the accuracy of endoscopic ultrasound for pancreatic head cancer staging. *Endoscopy* 2007;39:813-7.
3. Kim JJ, Walia S, Lee SH, *et al.* Lower yield of endoscopic ultrasound-guided fine-needle aspiration in patients with pancreatic head mass with a biliary stent. *Dig Dis Sci* 2014;60:543-9.
4. Fisher JM, Gordon SR, Gardner TB. The impact of prior biliary stenting on the accuracy and complication rate of endoscopic ultrasound fine-needle aspiration for diagnosing pancreatic adenocarcinoma. *Pancreas* 2011;40:21-4.
5. Siddiqui AA, Fein M, Kowalski TE, *et al.* Comparison of the influence of plastic and fully covered metal biliary stents on the accuracy of EUS-FNA for the diagnosis of pancreatic cancer. *Dig Dis Sci* 2012;57:2438-45.
6. Bhutani MS, Gress FG, Giovannini M, *et al.* No Endosonographic Detection of Tumor (NEST) Study. The no endosonographic detection of tumor (NEST) study: A case series of pancreatic cancers missed on endoscopic ultrasonography. *Endoscopy* 2004;36:385-9.
7. Shami VM, Mahajan A, Sundaram V, *et al.* Endoscopic ultrasound staging is adversely affected by placement of a self-expandable metal stent: Fact or fiction? *Pancreas* 2008;37:396-8.
8. Chan M, Scaife C, Thaker HM, *et al.* Adenocarcinoma of the pancreas undetected by multidetector CT, endoscopic ultrasound, or intraoperative ultrasound. *JOP* 2009;10:554-6.
9. Kaneko M, Katanuma A, Maguchi H, *et al.* Prospective, randomized, comparative study of delineation capability of radial scanning and curved linear array endoscopic ultrasound for the pancreaticobiliary region. *Endosc Int Open* 2014;2:E160-70.
10. Chen CH, Yang CC, Yeh YH. For biliary dilatation, a negative endosonography needs additional image studies in weight loss suggesting malignancy. *Dig Dis Sci* 2013;58:2345-52.