Commentary

Endoscopic ultrasound making resonance in cancer research

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Endoscopic ultrasound (EUS) is a novel technology that is being increasingly used for the diagnosis and management of cancers involving various organ systems. The technology was introduced three decades ago and its use has expanded exponentially in the past two decades. EUS-guided fine needle aspiration (FNA) is the best modality for tumor detection and tissue diagnosis even if the mass is weakly identified by other imaging modalities (1). EUS-FNA is capable of taking samples from masses that are not imaged by computed tomography or magnetic resonance imaging and lesions too deeply encased by adjacent vascular structures to allow percutaneous biopsy (2). EUS-guided FNA as well as EUS guided Trucut biopsy (TCB) has proven to be beneficial for benign and malignant diseases as well as staging of malignant tumors of the GI tract and adjacent structures (3). The application of EUS-guided therapy is especially appealing for malignancies because it provides accurate and effective palliative treatment. This is possible primarily due to two EUS characteristics: (I) its ability to deliver direct treatment to lesions unreachable by other means; and (II) the minimal invasiveness of EUS, which provides superior results with a low complication rate (4). EUS is being used to locally stage esophageal tumors (T staging), and it can be used for the assessment of esophageal submucosal tumors as well. Based on the EUS characteristics, we can positively identify the lesions that arise from exterior layers. This approach is particularly useful for evaluating invasion of local disease (especially esophageal cancer), tumor depth, nodal involvement, and detection of distant metastases (5). CT and magnetic resonance imaging lack the ability to differentiate the layers of the esophageal mucosa. Thus, these modalities cannot accurately discern the T stage of esophageal cancer (6). Therefore, EUS is a prerequisite before performing esophageal endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD). Esophageal leiomyomas, esophageal cancers, cystic lesions, lipomas, vascular lesions, and esophageal extraluminal compressions are some of the lesions that are commonly identified using EUS. EUS can be used to obtain cytology specimens from mediastinal nodal enlargement for the diagnosis and staging of bronchogenic carcinoma (7). EUS has a definitive role for evaluation of early gastric cancers and gastric submucosal lesions. Early gastric cancers can be staged using EUS and the feasibility of EMR or ESD can be determined. Gastrointestinal stromal tumors (GISTs) and other submucosal lesions can be diagnosed as well using EUS and their potential for ESD can be determined using EUS.

EUS-FNA can be used for histological diagnosis of biliopancreatic malignancies. EUS appears to be most useful for diagnosing small tumors (e.g., <2–3 cm diameter) and may also be helpful for evaluating the possibility of nodal and major vascular involvement (except for the superior mesenteric artery and vein). It provides clearer anatomic details of small pancreatic lesions than computed tomography or magnetic resonance imaging (8). This technology is very helpful in the setting of chronic pancreatitis presenting with a pancreatic head mass in cases in which it may be extremely difficult to differentiate between inflammatory masses and true malignancies by conventional imaging alone. EUS-FNA can be used for cytologic or histologic diagnosis of solid pancreatic lesions with features that are not typical for ductal adenocarcinoma.

Diagnostic yield for EUS-guided biopsies depends on site, size, and characteristics of target tissues, as well as technical and procedural factors (4). The main advantage is the ability to target small intrapancreatic masses. Nearly 25% of EUS targets of FNA in the pancreas cannot be imaged with CT (9). Using advanced EUS imaging and EUS-FNA, a 90% accuracy in differentiating ductal adenocarcinoma and other solid pancreatic lesions can be achieved (10). The ability to preoperatively determine vascular invasion by the tumor with EUS in cases of a pancreatic head malignancy involving the portal vein and superior mesenteric vessels can be of immense help to the surgeon. Recently, several studies have reported initial success with injection of various medications and therapeutic agents into pancreatic tumors under EUS guidance. EUS-guided injection of alcohol into a pancreatic tumor provides the ability to treat pancreatic cancer in a relatively minimally invasive manner with a very low incidence of procedure-related bleeding (4). EUS-FNA is very useful for the identification of pancreatic and duodenal neuroendocrine tumors as well as autoimmune pancreatitis that mimics pancreatic carcinoma both clinically and radiologically (11). EUS-FNA is technically successful in 90–95% of the procedures with a sensitivity of 80–95% and a specificity of 100% for diagnosing pancreatic cancer (12). The accuracy is lower in chronic pancreatitis (74% *vs.* 91% in one report) and in patients with obstructive jaundice (13). Pancreatic cystic neoplasms are another common indication for performing EUS with or without FNA or cyst fluid aspiration of the lesion. Based on the cyst morphology (e.g., size, wall irregularity, and intracystic contents), we can differentiate between pseudocysts and cystic neoplasms. In difficult cases, we can perform cyst fluid aspiration and analyses such as cyst fluid CEA, amylase, cytology, and CA 19-9. Endoscopic ultrasonography is considered to be a superior imaging modality for the evaluation of pancreatic cystic lesions because of the characteristic appearance of the cysts in EUS, the ability to detect main ductal communication and mural nodules, and the aspiration of cystic fluid for cytologic and biochemical analysis (14).

Rectal EUS can be used for local T staging of a rectal malignancy. Submucosal rectal tumors such as carcinoids and lipomas can also be identified by EUS. Deeper colonic submucosal tumors can be assessed by a mini-probe passed through a conventional colonoscope. Thus, EUS is useful for the management of various GI malignancies.

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