Endoscopic ultrasound

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Endoscopic ultrasound (EUS) continues to present a rich source of innovation, allowing it to evolve from a diagnostic procedure to a therapeutic modality. This was obvious from the numerous high-quality presentations at the 2014 Digestive Disease Week (DDW) held in Chicago, Illinois. This review discusses several of the presented abstracts of innovations in the field of EUS.

Chronic PancreatitisChronic pancreatitis leads to significant morbidity in patients, and diagnosis can be very elusive especially in early stage disease. Magnetic resonance imaging (MRI) with magnetic resonance cholangiopancreatography (MRCP) and EUS are thought to detect subtle pancreatic parenchymal and ductal abnormalities before chronic pancreatitis is apparent from traditional imaging and function tests. The Rosemont classification,[1] published in 2009, is an EUS-based criterion developed from expert consensus opinion, which incorporates pancreatic parenchymal and ductal features, and classifies them into major and minor criteria correlating with the diagnosis of chronic pancreatitis. However, findings are not correlated with histology or cytology as there is no reference standard with which to compare radiographic and function testing.

Trikudanathan et al[2] presented data from 37 patients with noncalcific chronic pancreatitis who were undergoing total pancreatectomy with islet autotransplantation. All patients had undergone both contrast-enhanced MRI-MRCP and EUS within 1 year before surgery. Standard EUS features for chronic pancreatitis (four ductal and five parenchymal) and qualitative MRI-MRCP features (ductal irregularity, stenosis, dilation, side branches, cysts, atrophy, decreased T1 signal, and duodenal filling) were determined and compared with severity of pancreatic fibrosis on histology obtained from wedge biopsies of the resected pancreas using the Ammann classification system. A fibrosis score of 2 or more was considered abnormal. MRI-MRCP features correlated with the severity of fibrosis ($r = 0.44$; $P = 0.006$). However, there was no significant correlation between the standard EUS features and degree of fibrosis ($r = 0.12$; $P = 0.5$). This suggests that standard EUS criteria are suboptimal for the detection of early histological abnormalities of noncalcific chronic pancreatitis.

Further studies to correlate pancreatic histology with EUS features in chronic pancreatitis are important to continue to clarify the role of EUS in the diagnosis and management of chronic pancreatitis.

EUS-GUIDED FINE-NEEDLE ASPIRATION

EUS-guided fine-needle aspiration (FNA) continues to be the mainstay of diagnostic EUS applications. Various factors are thought to affect the diagnostic yield and ease of tissue access, such as needle type and size, FNA technique, and the presence of an on-site cytopathologist.[3] At DDW, many questions were revisited in the presented abstracts about the various techniques and needle sizes for tissue acquisition.

Type of needle

There were many presentations on comparative studies of various needle types. Hasan et al[4] presented data from a multicenter, randomized trial comparing 19- and 25-gauge needles for EUS-FNA of large (>35 mm), solid, pancreatic mass lesions using the fanning technique and without the use of suction. The main outcome measures were the median number of passes required to obtain on-site diagnostic accuracy, specimen quality, and complications. A total of 80 patients were randomized (40 in each arm). With the exception of specimen bloodiness, which was significantly greater in the 19-gauge cohort, there was no significant difference between the groups in the median number of passes required to establish on-site diagnostic adequacy, final diagnosis, technical failures (none), or complications (none). The authors concluded that the

Abbreviations: CLE, confocal laser endomicroscopy; CTC, circulatory tumor cell; DDW, Digestive Disease Week; ERCP, endoscopic retrograde cholangiopancreatography; EUS, endoscopic ultrasound; EUS-BD, EUS-guided biliary drainage; EUS-LB, EUS-guided liver biopsy; FNA, fine-needle aspiration; MRCP, magnetic resonance cholangiopancreatography; MRI, magnetic resonance imaging; nCLE, needle-based CLE.

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19-gauge needle has no advantage over the 25-gauge needle for establishing on-site diagnostic adequacy when performing EUS-FNA of large, solid, pancreatic mass lesions.

Other presented abstracts also suggested that the diagnostic yield of EUS-FNA for solid lesions is not influenced by the size of the needle used (19, 22 or 25 gauge), or needle type (core or regular).

EUS-FNA technique

When performing FNA of a solid lesion, different variations in the technique for tissue acquisition have been described, such as the use of a stylet, or the use of suction during FNA. Although these variations might affect the quantity of the sample, they do not seem to make a difference to the diagnostic yield, cellularity, or specimen bloodiness.[5,6]

Attam et al[7] described a novel wet suction technique involving flushing the EUS-FNA needle with 5 mL of saline in order to replace the column of air with saline, with the aim of improving the quality of the aspirate. Results were compared with the conventional air suction technique. A total of 117 solid lesions were sampled in a prospective, randomized, blinded study using 22-gauge needles. Patients were randomized for the first pass and then the other suction method was used for the next pass in an alternating manner. The needle was passed into the target lesion and then full suction was applied as the needle was moved back and forth within the lesion, either with the wet suction or conventional air suction technique. The wet suction technique yielded significantly higher cellularity in cell blocks compared with the conventional technique, resulting in a significantly better diagnostic yield of 85.5% vs. 74.4% ($P < 0.0001$), without any difference in the amount of blood in the specimen.

A few other papers presented at DDW tested a similar hypothesis in slightly different versions, with positive results compared with conventional suction techniques. Further studies may be needed to evaluate whether this simple and inexpensive modification of tissue acquisition can improve the diagnostic yield of EUS-FNA, as seen in these preliminary reports.

EUS-GUIDED CONFOCAL ENDOMICROSCOPY

Confocal laser endomicroscopy (CLE) has been used in a variety of gastrointestinal sites to generate "optical biopsies" of tissue. A new technique involves the introduction of a CLE probe (<1 mm in size) through a 19-gauge EUS needle for the imaging of cysts and solid lesions.[8] Benias et al[9] presented data on the first experience from the United States of needle-based CLE (nCLE) for the assessment of metastasis in enlarged lymph nodes. Eight patients referred for EUS tumor staging or for EUS-FNA of suspicious lymph nodes underwent nCLE assessment after injection of 2.5 mL of 10% fluorescein, followed by EUS-FNA for confirmation and comparison, using the same 19-gauge EUS-FNA needle. There were no adverse events and no antibiotics were given for the procedure.

Using typical EUS criteria, only three of the eight lymph nodes would have been regarded as malignant. However, nCLE examination showed features suggestive of malignancy in all eight cases, which were eventually diagnosed as adenocarcinoma (n = 5), low grade follicular B cell lymphoma (n = 1), myeloid sarcoma (n = 1), and squamous cell carcinoma (n = 1). It seems that nCLE technology shows promise as an additional method of assessing malignant involvement of lymph nodes and to help guide FNA of lesions by differentiating between stromal tissue and malignant tissue in real time.

THERAPEUTIC EUS-GUIDED DRAINAGE

EUS-guided drainage procedures have been an outstanding example of the evolving role of EUS from a diagnostic to a therapeutic modality. EUS needles have been combined with endoscopic retrograde cholangiopancreatography (ERCP) accessories to perform these procedures. However, an active area of research involves the development of dedicated devices for safe and efficient EUS-guided drainage procedures. Several presentations at DDW reported on the use of EUS using various access techniques and different stents for drainage of pancreatic pseudocysts and walled-off pancreatic necrosis, biliary drainage in normal as well as surgically altered anatomy, gallbladder drainage, and drainage of pelvic abscesses and fluid collections.

EUS-guided biliary drainage

A year ago, EUS-guided biliary drainage (EUS-BD) seemed to be the next frontier in EUS development, but the rising volume of data presented on the topic at this year's meeting suggests that we have already reached this milestone! EUS-BD is an alternative method for patients in whom ERCP for biliary access has failed. This could be due to difficult cannulation, obstruction, malignant infiltration, or surgically altered anatomy. EUS-BD could be performed as primary EUS-guided drainage, which includes transduodenal bile duct drainage and transgastric hepatic duct drainage, or as EUS-guided rendezvous where EUS-FNA provides antegrade transpapillary wire access through a bile duct puncture, followed by traditional over-the-wire ERCP maneuvers to accomplish biliary interventions. However, there is still significant morbidity associated with these procedures.[10]

Khashab et al[11] presented data from an international, multicenter, comparative trial of EUS-BD procedures via hepatogastrostomy or choledochoduodenostomy approaches. A total of 150 patients with obstructive jaundice due to distal malignant biliary obstruction were enrolled