Diagnostic and Therapeutic Applications of Endoscopic Ultrasound

Endoscopic ultrasound (EUS) has evolved over the past decade from being a diagnostic imaging modality to an interventional procedure with a less invasive approach compared with interventional radiology and surgical techniques. Some examples of innovative interventional EUS procedures include EUS-guided necrosectomy, pancreatic cysts and gallbladder drainage, EUS-guided celiac plexus neurolysis and block, fiducial placement and vascular intervention. These interventions and many others are considered technically challenging, and a significant skill set is required to perform both diagnostic and therapeutic EUS applications. However, we must carefully analyze the results of EUS-guided therapy before applying them in clinical practice.

Color Doppler EUS has the ability to precisely identify the vascular anatomy in patients with underlying portal hypertension and other gastrointestinal bleeding sources, including pseudoaneurysms and Dieulafoy’s lesions.[1,2] The efficacy of EUS-guided therapy in the management of nonvariceal upper gastrointestinal bleeding is only described in case reports and small case series. Fockens et al.[2] first described the diagnostic ability of EUS in eight suspected cases of Dieulafoy’s lesions. EUS-guided injection of sclerosing agents in the aberrant vessels was possible in 50% of cases. In patients with underlying portal hypertension, EUS-guided sclerotherapy of esophageal collateral veins does not provide additional benefit over standard endoscopic therapy in terms of safety and efficacy.[3] On the other hand, EUS-assisted cyanoacrylate (CYA) injection is associated with significantly reduced risk of late recurrent bleeding compared with conventional endoscopic injection (18.5% vs. 44.7%, respectively). However, the early rebleeding rate is thought to be similar between EUS-guided and endoscopic sclerotherapy (7.4% vs. 12.8%, respectively).[4] The safety, feasibility and applicability of EUS-guided coil embolization of gastric varices versus sclerotherapy (CYA injection) were studied in a multicenter study.[5] The two groups had a similar rate of variceal obliteration (90.9% vs. 94%, respectively).

The impact of circulating tumor cells (CTCs) on pancreatic cancer prognosis has been studied. The detection rate of CTCs released from pancreatic cancer is higher in the portal vein (PV) than that in peripheral blood. In addition, CTC counts have the potential to facilitate the detection of liver micrometastasis. According to Tien et al.[6] an increased CTC count in portal venous blood in patients with resectable peripanillary or pancreatic adenocarcinoma was significantly predictive of liver metastasis within 6 months after surgery. EUS-guided PV sampling is considered safe and feasible. PV CTCs in individuals with pancreaticobiliary cancers might be used for studying the prognostic tool to stratify the risk of cancer recurrence or metastasis.[7] With respect to EUS-guided placement of transhepatic PV stents, all available current data show that it is feasible and safe in the animal model.[8] However, to assess the safety of this technically challenging intervention, larger animal model studies are required before it can be deemed suitable for human trials.

Portal hypertension is a common complication of liver cirrhosis that could result in gastrointestinal variceal bleeding, ascites, hepatorenal syndrome and hepatic encephalopathy. Hepatic venous pressure (HVP) gradient predicts the development of these complications and is traditionally measured using an invasive transjugular approach with radiation exposure and intravenous contrast.[9] The role of EUS in portal hypertension is expanding rapidly into the treatment arena. The possibility of direct EUS-guided PV measurements was first demonstrated in animal models in 2015 by a gastroenterology group at a teaching hospital in Boston, USA. The team performed direct measurement of PV pressure in pigs using a digital pressure wire advanced with an EUS-guided 22G fine-needle aspiration.[10] Huang et al.[11] reported a 100% technical success and a lack of adverse events in 28 patients who underwent EUS-guided PV pressure measurements. Although results from laboratory and clinical studies demonstrate the benefit of this technique, more clinical trials are warranted before EUS can be recommended in the management of patients with liver disease.

In conclusion, EUS is frequently preferred over interventional radiologic and surgical techniques as a diagnostic and therapeutic approach for many gastrointestinal disorders. The high level of complexity and technical challenges associated with the continuously evolving EUS-guided...
procedures demand adequate training and the development of advanced equipment to perform these interventions safely and efficiently. Moreover, large randomized clinical trials addressing the risks and long-term outcomes of these EUS-guided interventions are required before applying them in clinical practice.

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REFERENCES

1. Levy MJ, Chak A. EUS 2008 Working Group document: Evaluation of EUS-guided vascular therapy. Gastrointest Endosc 2009;69:S37-42.
2. Fockens P, Meenan J, van Dullemen HM, Bolwerk CJ, Tytgat GN. Dieulafoy’s disease: Endosonographic detection and endosonography-guided treatment. Gastrointest Endosc 1996;44:437-42.
3. de Paulo GA, Ardenh JC, Nakao FS, Ferrari AP. Treatment of esophageal varices: A randomized controlled trial comparing endoscopic sclerotherapy and EUS-guided sclerotherapy of esophageal collateral veins. Gastrointest Endosc 2006;63:396-402.
4. Lee YT, Chan FK, Ng EK, Leung VK, Law KB, Yung MY, et al. EUS-guided injection of cyanoacrylate for bleeding gastric varices. Gastrointest Endosc 2000;52:168-74.
5. Romero-Castro R, Ellrichmann M, Ortiz-Moyano C, Subtil-Inigo JC, Junquera-Florez F, Gornals JB, et al. EUS-guided coil versus cyanoacrylate therapy for the treatment of gastric varices: A multicenter study (with videos). Gastrointest Endosc 2013;78:711-21.
6. Tien YW, Kuo HC, Ho BI, Chang MC, Chang YT, Cheng MF, et al. A high circulating tumor cell count in portal vein predicts liver metastasis from periampullary or pancreatic cancer: A High portal venous CTC count predicts liver metastases. Medicine (Baltimore) 2016;95:e3407.
7. Catenacci DV, Chapman CG, Xu P, Koons A, Konda VJ, Siddiqui UD, et al. Acquisition of portal venous circulating tumor cells from Patients with pancreaticobiliary cancers by endoscopic Ultrasound. Gastroenterol 2015;149:1794-803.
8. Park TY, Seo DW, Kang HJ, Cho MK, Song TJ, Park DH, et al. Endoscopic ultrasonography-guided placement of a transhepatic portal vein stent in a live porcine model. Endosc Ultrasound 2016;5:315-9.
9. Magalhães J, Monteiro S, Xavier S, Leite S, de Castro FD, Cotter J, et al. Endoscopic ultrasonography - emerging applications in hepatology. World J Gastrointest Endosc 2017;9:378-88.
10. Schulman AR, Thompson CC, Ryou M. EUS-guided portal pressure measurement using a digital pressure wire with real-time remote display: A novel, minimally invasive technique for direct measurement in an animal model. Gastrointest Endosc 2016;83:187-20.
11. Huang JY, Samarasena JB, Tsujino T, Lee J, Hu KQ, McLaren CE, et al. EUS-guided portal pressure gradient measurement with a simple novel device: A human pilot study. Gastrointest Endosc 2017;85:996-1001.

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