Topics related with endoscopic ultrasound (EUS) made up considerable portion among many invited lectures presented in International Digestive Endoscopy Network 2012 meeting. While the scientific programs were divided into the fields of upper gastrointestinal (UGI), lower gastrointestinal, and pancreato-biliary (PB) categories, UGI and PB parts mainly dealt with EUS related issues. EUS diagnosis in subepithelial lesions, estimation of the invasion depth of early gastrointestinal cancers with EUS, and usefulness of EUS in esophageal varices were discussed in UGI sessions. In the PB part, pancreatic cystic lesions, EUS-guided biliopancreatic drainage, EUS-guided tissue acquisition, and improvement of diagnostic yield in indeterminate biliary lesions by using intraductal ultrasound were discussed. Advanced techniques such as contrast-enhanced EUS, EUS elastography and forward-viewing echoendoscopy were also discussed. In this paper, I focused mainly on topics of UGI and briefly mentioned about advanced EUS techniques since more EUS related papers by other invited speakers were presented afterwards.

Key Words: Endosonography; Early gastrointestinal cancer; Subepithelial lesion; Technique
nancy in the selection of therapeutic options for the best treatment result. EUS plays an important role in the evaluation of invasion depth of hollow viscus cancer including esophageal cancer, gastric cancer, and rectal cancer.

Accuracy of EUS in evaluation of esophageal cancer

Recent studies have shown that if the targets were properly selected, endoscopic resection of early esophageal cancer results in a 5-year survival rate of 98% and low recurrence rate. According to a meta-analysis, the pooled diagnostic sensitivity and specificity of EUS for T1 stage were 86.1% and 99.4%, respectively. Among T1 cancer, mucosal esophageal cancer is subclassified into M1, M2, and M3, which respectively correspond to the cancer invasion of the epithelium, lamina propria, and muscularis mucosa. M1 and M2 cancers are the candidates for endoscopic resection with no risk of lymph node metastasis. High frequency miniprobe demonstrates well defined nine-layered structure of esophageal wall, which is in good correspondence with histological layers and provides high accuracy in decision making process for the selection of treatment options of early esophageal cancer. Shimoyama et al. performed EUS with 12 to 20 MHz miniprobe for T staging and they were able to select correctly all candidates of endoscopic therapy. But there are also other conflicting studies insisting EUS does not appear to be sufficiently accurate in T staging. To reach a definite conclusion, further studies with larger numbers of patients using adequate instrument and long term follow-up results would be necessary since most of the reports have small patient populations and used various low- and high-resolution instruments.

Accuracy of EUS in evaluation of gastric cancer

EUS provides higher accuracy of gastric cancer staging compared to that of computed tomography (CT). Accuracy of CT in T and N staging of gastric cancer were 76% and 70%, respectively, but those of EUS were 86% and 90%.

Accuracy of EUS in evaluation of rectal cancer

According to a meta-analysis, pooled sensitivity of EUS in diagnosing mucosal rectal cancer was 97.3% and pooled specificity was 96.3%. Authors recommended that EUS should be strongly considered for staging of early rectal cancers to select proper indication of endoscopic treatment.

ADVANCEMENT OF TECHNIQUES IN EUS

In early days, piezoelectric crystal was used to generate ultrasound in EUS, but electronic scanning method has been adopted for both radial and linear echoendoscope these days. As a result, endosonographer can use color/power Doppler flow image. In addition, other advanced techniques such as contrast-enhanced EUS (CE-EUS) and EUS-elastography are available.

With development of linear echoendoscope, EUS-FNA has been employed. Many therapeutic applications of EUS are on the way. For better maneuverability, prototype of forward viewing convex echoendoscope has been developed recently.

CE-EUS

CE-EUS is composed of two main categories; CE power-Doppler EUS (CED-EUS) and CE harmonic EUS (CEH-EUS). After injection of contrast materials, increased intensity of week flow signal can be examined with color or power Doppler. Therefore, by using CED-EUS, differentiation of vascular-rich area and hypovascular area is possible with clarity. After development of harmonic EUS, it is possible to get images of microcirculation and parenchymal perfusion with CEH-EUS. The use of CE-EUS allows a better visualization and differentiation of hypoenhanced mass suggestive of pancreatic adenocarcinoma and a hyperenhanced lesion which indicates an inflammatory mass.

EUS-elastography

Tissue elastic imaging represents a technique that allows calculation and visualization of the hardness of tissue. Real-time tissue elastography with ultrasonographic approach is combined to EUS. With this technique, the real-time visualization of the calculated strain value can provide information on tissue hardness at the area of interest and the distribution pattern of tissue hardness as well. In addition to EUS image, these information can guide to select the most probable malignant
lymph node to approach for EUS-FNA.\textsuperscript{15,16}

Forward viewing EUS

EUS-FNA is now an indispensable procedure in both diagnosis and treatment of gastrointestinal diseases. Recently forward viewing convex echoendoscope has been developed to overcome the limitations of conventional oblique viewing echoendoscope. Kida et al.\textsuperscript{17} reported that even though imaging field is narrower, image quality and penetration of forward viewing echoendoscope is nearly the same as those of conventional oblique viewing echoendoscopes. He also reported that it was easier to perform EUS-FNA with forward viewing echoendoscope compared to oblique viewing echoendoscope.\textsuperscript{17} For therapeutic approach, usage of forward viewing echoendoscope was better with easy pass through gastrointestinal wall.\textsuperscript{18}

CONCLUSIONS

Since the development of EUS in early 1980’s, EUS evolved a lot and it plays an important role in the diagnostic and therapeutic fields of current gastroenterology, especially for subepithelial lesions and early gastrointestinal cancers. EUS is an essential tool that guides therapeutic approach. Development of advanced technology such as CE-EUS and EUS-elastography has elevated the diagnostic power of EUS and EUS-FNA. Development of forward viewing EUS will enhance therapeutic usage of EUS in the near future.

Conflicts of Interest

The author has no financial conflicts of interest.

REFERENCES

1. Moon JS. Endoscopic ultrasound-guided fine needle aspiration in submucosal lesion. Clin Endosc 2012;45:117-123.
2. Huang WH, Feng CL, Lai HC, et al. Endoscopic ligation and resection for the treatment of small EUS-suspected gastric GI stromal tumors. Gastrointest Endosc 2010;71:1076-1081.
3. Othman MO, Wallace MR. Endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD) in 2011, a Western perspective. Clin Res Hepatol Gastroenterol 2011;35:268-294.
4. Kim EY. Endoscopic ultrasound-guided fine needle aspiration in low vissus cancer. Clin Endosc 2012;45:124-127.
5. Puli SR, Reddy JR, Bechtold ML, Antillon D, Isdahl JA, Antillon MR. Staging accuracy of esophageal cancer by endoscopic ultrasound: a meta-analysis and systematic review. World J Gastroenterol 2008;14:1479-1490.
6. Shimoyama S, Imamura K, Takeshita Y, et al. The useful combination of a higher frequency miniprobe and endoscopic submucosal dissection for the treatment of T1 esophageal cancer. Surg Endosc 2006;20:434-438.
7. Young PE, Gentry AR, Acosta RD, Greenwald BD, Riddle M. Endoscopic ultrasound does not accurately stage early adenocarcinoma or high-grade dysplasia of the esophagus. Clin Gastroenterol Hepatol 2010;8:1037-1041.
8. Habermann CR, Weiss F, Riecken R, et al. Preoperative staging of gastric adenocarcinoma: comparison of helical CT and endoscopic US. Radiology 2004;230:465-471.
9. Kim GH, Park do Y, Kida M, et al. Accuracy of high-frequency catheter-based endoscopic ultrasonography according to the indications for endoscopic treatment of early gastric cancer. J Gastroenterol Hepatol 2010;25:506-511.
10. Park JM, Ahn CW, Yi X, et al. Efficacy of endoscopic ultrasonography for prediction of tumor depth in gastric cancer. J Gastric Cancer 2011;11:109-115.
11. Rovera F, Dionigi G, Boni L, Cutaiar S, Di Carmine M, Dionigi R. The role of EUS and MRI in rectal cancer staging. Surg Oncol 2007;16 Suppl 1:S51-S52.
12. Puli SR, Bechtold ML, Reddy JR, Choudhary A, Antillon MR. Can endoscopic ultrasound predict early rectal cancers that can be resected endoscopically? A meta-analysis and systematic review. Dig Dis Sci 2010;55:1221-1229.
13. Hirooka Y, Itoh A, Kawashima H, et al. Diagnosis of pancreatic disorders using contrast-enhanced endoscopic ultrasonography and endoscopic elastography. Clin Gastroenterol Hepatol 2009;7(11 Suppl):S63-S67.
14. Ishikawa T, Itoh A, Kawashima H, et al. Usefulness of EUS combined with contrast-enhancement in the differential diagnosis of malignant versus benign and preoperative localization of pancreatic endocrine tumors. Gastrointest Endosc 2010;71:951-959.
15. Xu W, Shi J, Zeng X, et al. EUS elastography for the differentiation of benign and malignant lymph nodes: a meta-analysis. Gastrointest Endosc 2011;74:1001-1009.
16. Gheonea DI, Stoian A. Beyond conventional endoscopic ultrasound: elastography, contrast enhancement and hybrid techniques. Curr Opin Radiol 2011;27:423-429.
17. Kida M, Araki M, Miyazawa S, et al. Fine needle aspiration using forward-viewing endoscopic ultrasonography. Endoscopy 2011;43:796-801.
18. Iwashita T, Nakai Y, Lee JG, Park do H, Mathusamy VR, Chang KJ. Newly developed, forward-viewing echoendoscope: a comparative pilot study to the standard echoendoscope in the imaging of abdominal organs and feasibility of endoscopic ultrasound-guided interventions. J Gastroenterol Hepatol 2012;27:362-367.