Editorial

Use of endoscopic ultrasound-based techniques in tumor of the guts and beyond

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Submitted Nov 03, 2014. Accepted for publication Nov 21, 2014.
doi: 10.3978/j.issn.1000-9604.2014.12.01
View this article at: http://dx.doi.org/10.3978/j.issn.1000-9604.2014.12.01

Endoscopic techniques in gastroenterology have been developing rapidly over the past two decades. Advances in minimally invasive endoscopic techniques allow for the detection and treatment of more gastrointestinal (GI) diseases than ever. In a manner of speaking, the advent of miniature ultrasound device coupled with endoscopy further shapes up a new epoch of intraluminal exploration. Today, endoscopic ultrasound (EUS) detection is indicated for study of a wider-ranging conditions within the GI wall, and even going beyond the latter, applicable to the organs surrounding the GI tract (1), including the lung, pancreas, gallbladder, liver, adrenal glands, bladder, and uterus.

Endoscopic ultrasound (EUS)

EUS is a medical procedure which combines endoscopy with ultrasound to obtain images of organs within the chest and abdomen. During the procedure, a tiny ultrasound probe is introduced into the GI tract to screen for lesions in the surrounding areas. EUS may provide high-resolution images with a clear vision-field despite the air in guts, and by virtue of short wavelength and high frequency sounds, it can detect lesions millimeters in size which are hardly competent for computed tomography, magnetic resonance imaging, and other modalities that typically detect lesions of comparatively larger, centimeter-sized volumes. As recommended by a number of specialty guidelines (2-6), EUS has now become an irreplaceable tool in the diagnosis of hepatobiliary malignancies, lung cancers, as well as neoplasms of the esophagus, stomach, colon and pancreas. EUS is also useful for tumor staging in invaded adjacent organs because of its high accuracy, and it may offer valuable information for therapeutic decision-making and prognosis estimation (7).

Furthermore, the development of linear echo endoscopes in the 1990s paved the way for a new approach: the ultrasound-guided fine needle puncture. Subsequently, EUS has evolved from a purely diagnostic imaging modality to an interventional procedure. The devices enable access into extraluminal solid organs or viscera by penetrating through the GI wall. Tissue samples from these locations or within the GI tract can be collected for cytopathological study. In addition, fluid can be drained and therapeutic agents injected to intended locations under direct vision.

EUS fine needle aspiration

EUS-guided fine needle aspiration (EUS-FNA) is currently performed as a routine examination at an increasing number of endoscopic centers. Biopsy samples obtained by EUS-FNA are extremely important for cytological or histological examinations, because it is a safe and reliable method with notable efficacy (8). In particular, EUS-FNA is also crucial for determining the pathological nature of lesions which appear otherwise inaccessible and inconclusive (9). On its passage, the GI tract traverses through various anatomical regions closely related to a number of medical disciplines, including pulmonology, thoracic surgery, internal medicine, oncology, urology, gynecology, and endocrinology; thus, the use of EUS-FNA is not confined to GI oncology. In

skillful hands, the overall sensitivity of this procedure for malignancy can be something above >90% (10).

EUS-guided therapy

EUS-guided therapy serves as a multipotent approach in clinical practice, including the drainage of pancreatic, gallbladder or other visceral fluids, accessing the pancreatic and biliary systems, performing celiac plexus neurolysis, vascular interventions, and ablative therapies.

Significant efficacy and safety have made EUS the first-line therapy for uncomplicated pseudocysts (11). Although there is limited data in the literature, EUS-guided drainage and debridement have been successfully used in conditions such as abscesses in the lower and upper abdomen. For walled-off pancreatic necrosis (WOPN), multiple studies show that EUS-guided therapy is associated with a low morbidity and mortality rates (12), regardless of controversy.

Pancreatic cancer is a significant cause of morbidity and mortality; however, the current therapies offer modest benefits to most of the patients. EUS-guided fine needle therapy is becoming more promising, and is considered a cutting-edge technique in the rapidly updated therapeutics for pancreatic cancer, especially in a time when so many ablation therapies are available but remain palliative for advanced disease. Recently, initial success is reported in many studies in which medication injections and intra-pancreatic tumor therapy under EUS guidance are used (13), including EUS-guided radiofrequency ablation, EUS-guided alcoholic ablation, EUS-guided gene therapy, and EUS-guided interstitial brachytherapy. These procedures enable clinicians to manage pancreatic cancer in a relatively minimally invasive manner, with a low incidence of procedure-related complications. Believably, the latest cutting-edge techniques with EUS may be beneficial for treating this life-threatening disease in the near future.

Natural orifice transluminal endoscopic surgery (NOTES)

More aggressive endoscopic therapies such as endoscopic necrosectomy, full thickness resection, and endoscopic submucosal dissection have emerged along with the development of flexible endoscopy. NOTES is another recent technique that seems to be a promising alternative to conventional surgery. In NOTES, an endoscope passes through the natural orifice such as the mouth, urethra, or anus, and then through an internal incision in the stomach, vagina, or colon. Thereby, external incisions and incision-related complications are avoidable.

NOTES is improving as the GI closure instruments develop, and its application has been studied in animal and human models (14) that involve abdominal cavity exploration and biopsy, transvaginal cholecystectomy, transgastric appendectomy, transvaginal appendectomy, and transvesical peritoneoscopy.

EUS is essential for its value in evaluating and performing NOTES (15-18). Shu *et al*. showed the feasibility of NOTES interventions through a forward-viewing EUS (15). Currently, a variety of EUS-based procedures are available: EUS evaluation and endoscopic biopsy of intraperitoneal organs, EUS-guided radiofrequency ablation, EUS-FNA, and argon plasma coagulation for hemostatic control. EUS can detect lesions surrounding the GI tract as well as locate them during the NOTES procedure. EUS-guided drainage for pseudocysts and EUS-guided transluminal retroperitoneal endoscopic necrosectomy of WOPN have now been proven as effective in the clinical settings (15,19). While studies on NOTES are encouraging, widespread use of this technique relies much on the on-going development of more sophisticated, specialized devices and training. In addition, more studies with large sample size are warranted to validate the feasibility and safety of NOTES.

All in all, an increasing number of various tumors within and surrounding the guts can be diagnosed and treated with intra- and transluminal endoscopic techniques such as EUS and NOTES. More than ever, the GI tract serves as an important tunnel for exploration and manipulation of affected locations that anatomically extends beyond its boundary.

Acknowledgements

Disclosure: The authors declare no conflict of interest.

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Cite this article as: Pei C, Zeng G. Use of endoscopic ultrasound-based techniques in tumor of the guts and beyond. Chin J Cancer Res 2014;26(6):644-646. doi: 10.3978/j.issn.1000-9604.2014.12.01

