

Endoscopic ultrasound benefits in gastroenterology



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Endoscopy, a big fortune for disease around gastrointestinal tract

Gastroenterology, especially the techniques in gastrointestinal (GI) endoscopy, has developed rapidly in the past two decades. The progress made in minimally invasive endoscopic techniques enables more and more gastrointestinal diseases detected and treated. Getting to be mature, the techniques such as the endoscopic ultrasound (EUS), are now applicable to more indications and not that restrained by the condition of GI wall; besides, the techniques are even applied to the organs surrounding the GI tract ^[1], such as lung, pancreas, gallbladder, liver, adrenal glands, bladder, uterus and etc.

EUS

EUS is a medical procedure which combines endoscopy with ultrasound to obtain images of the internal organs in the chest and abdomen. During the procedure, a small ultrasound probe is inserted into the GI tract to screening for surrounding lesions. On account of the very close proximity between the probe and the lesion, it is referred to as internal scanning. The high frequency EUS provides very high-resolution images but not leading to vision impairment caused by the air in GI tract. EUS can detect lesions in millimeters by the high-resolution image processed with short wavelength and high frequency sound. And these tiny lesions cannot be detected by CT scan, MRI and other methods, which can only detect lesions of larger volumes, typically measured in centimeters. EUS, recommended by numerous professional guidelines ^[2-6], have now become an irreplaceable

tool in the diagnosis of hepatobiliary malignancies, lung cancer, esophageal cancer, gastric cancer, colon cancer and pancreatic cancer. EUS is also used to identify the tumor staging with invaded adjacent organs due to its accuracy, providing valuable information in selecting treatment protocols and estimating prognosis [7].

Furthermore, the development of linear scanning echo endoscopes has brought a new approach since the 1990s: the ultrasound-guided fine needle puncture. Since then, EUS has evolved from a purely diagnostic imaging modality to an interventional procedure. The devices make it possible to gain access into closed organs through the GI wall and the GI tract; not only the surrounding lesions of the GI tract are detectable, but also the samples can be collected for cytopathological diagnosis; besides, we can drain fluid and inject therapeutic agents to manage the diseases with the devices.

EUS-FNA

EUS guided fine needle aspiration (EUS-FNA) is currently performed as a routine examination in more and more endoscopic centers. It is extremely important to obtain the malignant samples with EUS-FNA for cytological or histological examinations safely and reliably with notable efficacy [8]; EUS-FNA is also essential in dependably excluding malignancy in indeterminate lesions, particularly for the otherwise inaccessible lesions⁹. The GI tract traverses through various anatomical regions with corresponding specialties such as pulmonology, thoracic surgery, internal medicine, oncology, urology, gynecology and endocrinology, so the application of EUS-FNA is not confined to gastroenterology. For experienced practitioners, the sensitivity of this

procedure in malignancy is over 90% ¹⁰. EUS-FNA is obviously significant in managing malignant tumors.

EUS-guided therapy

EUS-guided therapy covers immensely, including drainage of pancreatic fluids, gallbladder and other fluids, accessing to pancreatic and biliary systems; celiac plexus neurolysis; vascular interventions and ablative therapies.

Being safe and effective, EUS is the first-line therapy for uncomplicated pseudocysts ¹¹. Though there is still controversial, multiple studies have now shown that walled-off pancreatic necrosis (WOPN) can be treated with endoscopy at low morbidity and mortality ¹². Limited literature there is, still can EUS guided drainage and debridement be successfully applied to treatment for uncomplicated pseudocysts such as abscesses in the lower and upper abdomen.

EUS-guided fine needle therapy is becoming more promising. It is now considered as a cutting edge technique in the rapidly expanding field of therapy for pancreatic cancer ¹³, especially in an era when so many ablation therapies are confirmed with palliative effect for advanced pancreatic cancer. Pancreatic cancer is a significant cause of morbidity and mortality, the current therapies, however, benefit little to most patients. Recently, initial success is reported in many studies that medication injection and intra-pancreatic tumor therapy under the EUS guidance ¹³, including EUS-guided radiofrequency ablation, EUS-guided

alcoholic ablation, EUS-guided gene therapy and EUS guided interstitial brachytherapy. These techniques enable us to manage pancreatic cancer in a relatively minimally invasive manner with low incidence of procedure-related complications. These latest cutting-edge techniques may give hope in treating pancreatic cancer, the deadly disease in the near future.

Natural Orifice Transluminal Endoscopic Surgery (NOTES)

More vigorous endoscopic therapies emerge as the development of flexible endoscopic technology, such as endoscopic necrosectomy, full thickness resection and endoscopic submucosal dissection. So more and more diseases are now treated with endoscopy. NOTES, another up-to-date technique as a promising alternative to conventional surgery, is of great concern recently. In NOTES, an endoscope passes through the natural orifice such as mouth, urethra and anus, and then it goes through an internal incision in the stomach, vagina or colon, thus external incisions and incision-related complications would be avoidable.

The NOTES is improving as the GI closure instrument develops, and it is studied not only in animal models but also in humans^[1-4], involving abdominal cavity exploration and biopsy, transvaginal cholecystectomy, transgastric appendectomy, transvaginal appendectomy, transvesical peritoneoscopy and so forth.

According to literature, EUS is essential for its value in evaluating and performing NOTES^[1-5-18]. There is a promising platform for EUS-based NOTES in the future¹⁵. Jeong et al has shown the feasibility of NOTES

interventions through a forward-viewing endoscopic ultrasound ¹⁵ .

Currently, the following mentioned EUS-based procedures are performed:

EUS evaluation and endoscopic biopsy of intraperitoneal organs, EUS-guided radiofrequency ablation (EUS-RFA), EUS-guided fine needle aspiration (EUS-FNA) and argon plasma coagulation (APC) for hemostatic control. Not only can EUS detect the lesions surrounding the GI tract, but also can locate for the NOTES procedure. EUS guided drainage for pseudocyst and EUS guided transluminal retroperitoneal endoscopic necrosectomy of walled-off necrosis have now proved to be safe and effective in clinical setting ^{15, 19} . This is the real day for NOTES technique.

Studies on NOTES are encouraging, but still there is a long way to go. More sophisticated NOTES technique is to be explored to guarantee the safety of the procedure.

To summarize, more and more diseases surrounding the GI tract can be diagnosed and treated as the big fortune of endoscopic technique develops, such as the EUS and NOTES, and the GI tract will become the service tunnel of human body.

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