Transgastric pure-NOTES peritoneoscopy and endoscopic ultrasonography for staging of gastrointestinal cancers: a survival and feasibility study

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The staging of gastrointestinal (GI) cancers is one of the most important tasks of gastroenterologists as accurate staging can help in offering the best treatment to the patient. Over last few years with the availability of advanced imaging modalities like endoscopic ultrasound (EUS) and integrated Positron emission tomography (PET)-computed tomography (CT), our ability to stage GI cancers has improved considerably. However, even with modern imaging technologies, around 10–40% of GI malignancies remain understaged [1,2]. Also, one meta analysis has shown the EUS does not have consistently high sensitivity and specificity in assessing liver and peritoneal metastasis from gastric cancer [3]. However, we earlier had shown that in the presence of ascites EUS guided FNA can help in detecting peritoneal deposits [4].

Natural orifice transluminal endoscopic surgery (NOTES), a novel approach to the endoluminal endoscopic surgery that has the advantage of avoiding abdominal incision, holds considerable promise [1]. NOTES has been shown to be feasible in a number of surgical procedures and no scarring, no pain and shorter hospitalization are potential advantages of this procedure [1]. NOTES diagnostic peritoneoscopy has been demonstrated earlier to be feasible and could be an option to diagnostic laparoscopy for staging GI cancers [5,6]. Transgastric NOTES with the possibility of combining NOTES peritoneoscopy with intraperitoneal EUS seems to be an exciting field and could be an useful diagnostic tool for staging of upper gastrointestinal (GI) cancers. In the current porcine model study, the authors have evaluated the feasibility of transgastric NOTES peritoneoscopy and intraperitoneal EUS as a pure-NOTES procedure.

The current survival experiment study was done in 10 female pigs. The procedure was done under general anesthesia after intravenous antibiotic prophylaxis. Initially intra luminal EUS was done (GF-UCT140-AL5, Olympus Corporation). Then, the peritoneal access was obtained through the stomach. The EUS-guided puncture of the gastric wall was done with a 19G needle (EchoTip Ultra, Cook Medical), carefully avoiding vessels and adjacent organs. The needle placement in the peritoneum was controlled by instillation of sterile saline. After securing guide wire the fistula tract was dilated with an 18-mm CRE balloon (CRE Wire guided balloon, Boston Scientific) over guide wire. In difficult cases (3 separate cases), a sphincterotome (CleverCut3, Olympus Corporation) was used to expand the puncture hole so as to allow the passage of the CRE balloon. After dilatation, the ultrasonic videogastroscope was advanced to the peritoneal cavity and a Veress needle was introduced through the abdominal wall for creating pneumoperitoenum. After placing the EUS scope in the peritoneal cavity, intraperitoneal EUS was performed. After completing the examination, the EUS scope was exchanged with a dual-channel gastroscope, and thereafter peritoneoscopy was performed. The authors attempted to see the various intra abdominal structures with intraluminal EUS, intraperitoneal EUS and peritoneoscopy that are considered to be clinically important when evaluating GI cancers. Each structure that was visualized one point was given, with a maximum score of 15 points, nine points and 13 points, for intraluminal EUS, intraperitoneal EUS and peritoneoscopy, respectively. After completion of the procedure, the access site in the stomach was closed by an over the scope clip (OTSC).

The median total procedural time for the procedure was 94 min (range 74–130 min) with the median time for gaining EUS-guided access to the peritoneal cavity being 25 min (range 12–62 min) and median time for OTSC closure being 11 min (range 3–28 min). The median time for intraluminal EUS, intraperitoneal EUS and peritoneoscopy was 11 min (range 7–14 min), 13 min (range 8–20 min) and 10 min (range 6–23 min), respectively. The median visualization score of intra luminal EUS was 15 (range 14–15 points). Intraperitoneal EUS resulted in a median score of 6 (range 1–8 points). The inferior mesenteric artery was only visualised in one pig (10%), and the left liver in three pigs (30%). The median score of peritoneoscopy was 12 points (range 8–13 points) and visualisation of the left liver lobe (60%) and left hemi-diaphragm (80%) was found to be difficult as the
The view was obstructed by either an air-distended stomach or by the spleen. The authors concluded that transgastric pure- NOTES peritoneoscopy and intra peritoneal EUS combined with intra luminal EUS is feasible and provides sufficient peritoneal evaluation and therefore, this technique could have potential for minimally invasive staging of GI cancers.

**Commentary**

The authors of the current feasibility study have attempted to combine NOTES with peritoneoscopy and intra peritoneal EUS in order to improve our sensitivity and specificity for staging of GI cancers and that too by using minimally invasive techniques. In this animal model study, the authors have reported that intraluminal EUS, NOTES peritoneoscopy and intraperitoneal EUS had visualization rates of 100%, 92%, and 67%, respectively. Although, intraluminal EUS has improved our ability for locoregional staging of GI cancers, still a number of patients do tend to have over or under staging of GI cancers. A meta analysis had shown that intra luminal EUS as standalone procedure cannot obtain consistent high sensitivity and specificity in assessing liver and peritoneal metastases from gastric cancers. To improve upon the staging capabilities, staging laparoscopy has been used and shown to be superior to CT and transabdominal ultrasonography for detection of small superficial hepatic and peritoneal lesions [7,8]. NOTES peritoneoscopy has also shown comparable results to laparoscopy in a small human study [9]. The natural extension of this approach would be to add ultrasound to visible NOTES peritoneoscopy to improve deeper intra peritoneal visualization and the authors have demonstrated the same in this animal study. It is indeed a step forward but we need to improve our instruments for NOTES so that we can achieve better maneuverability to have better and wider visualization of the intra abdominal structures. The results of future randomized animal as well as clinical studies will only determine that whether this innovative mini-invasive technique will be of relevance for staging of GI cancers.

**Endoscopic ultrasound-guided vascular therapy: Is it safe and effective?**


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The improvement in endoscopic diagnosis and haemostatic techniques has improved the outcome in patients with GI bleed. However, some patients have refractory bleed or bleed from lesions that are not visible on the mucosa and thus could not be seen on endoscopy. These patients usually need vascular interventions like angioembolisation or surgery. EUS is a minimally invasive modality that can provide high resolution images of various upper intra abdominal organs because of the close proximity of the transducer to the structures that are to be imaged. Moreover, on EUS the vascular structures can be easily identified as well as various needle interventions can also be done making it an attractive therapeutic tool by which various vascular interventions can also be conducted. The authors of the currently discussed case series of 8 patients attempted to evaluate the effectiveness and possible complications of ten EUS guided vascular interventions in the treatment of refractory gastrointestinal bleeding.

Seven patients presented with hematemesis or melena whereas in one patient with acute pancreatitis a pseudoaneurysm of gastroduodenal artery was detected on EUS assessment. Six patients had experienced between one and three previous episodes of gastrointestinal bleeding whereas one patient with vascular lesion in the gastric fundus did not have any prior episodes of GI bleed. Three patients had deep variceal bleed whereas 5 patients had arterial bleed (pseudoaneurysm in 1, arterial bleed in 2 and Dieulafoy’s lesion in 2 patients). One patient with gastric varices was also found to be having a dissecting pseudoaneurysm of the splenic artery, which was treated during the same procedure. Six patients had undergone previous endoscopic treatment. Following conventional endoscopy, a linear endoscope with a large working channel (3.8mm; Pentax UTK, Japan) with Doppler-enhanced EUS was used. After localization of the abnormal bleeding vessel, the target vessel was punctured with a 19-gauge needle (EchoTip; Cook, Winston Salem, USA), followed by the injection of a sclerosing agent under direct visualization. The sclerosing agent used was polidocanol 2% (4mL) in two patients and a combination of cyanoacrylate and Lipiodol (2mL) in the remaining six. Doppler monitoring was performed at the end of the procedure to ensure the disappearance of the Doppler signal. The procedure was successful in 7/8 (88%) patients on first attempt and in one patient the hemostasis could be achieved by second session of EUS guided procedure. Over a follow period of 3 to 18 months, one patient rebled form a new vascular lesion 9 months later which was treated by radiologi- embolisation. EUS-guided vascular therapy is an exciting field and preliminary data in the form of case reports or studies in animal models, suggest EUS guided angiotherapy is feasible,
safe and effective [10]. The safety and efficacy of EUS guided vascular therapy in patients with esophageal-gastric varices has been demonstrated in prospective and controlled studies [11,12]. However the data on the use of this exciting modality in other vascular structures is limited. EUS-guided angiography of celiac trunk and hepatic/splenic veins has been reported in the animal models. These difficult patients have been treated by EUS-guided injection of absolute alcohol, polidocanol, cyanoacrylate or coils into these vessels [13,17]. This pilot case series has demonstrated the feasibility and effectiveness of the EUS-guided vascular approach, even in the emergency care situation as many patients had active bleeding during the procedure. However, the data available is still limited and multicenter, prospective controlled studies have to be conducted before we can finally embark on this new journey of therapeutic EUS. Also we need to compare its results with contemporary competing radiological interventions. This new technique has also limitations and side effects especially limited visual field of the scope in contrast to a wider field available with radiological interventions, the risk of damaging the operating channel of an expensive endoscope with the sclerosants, and risk of inducing infections [10].

References

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