Published online: 2019-09-26

A Novel Flexible Cryoprobe for EUS-Guided Pancreatic Biopsies

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Gastrointest Endosc 2013 [Epub ahead of print]

Endoscopic ultrasound (EUS) guided fine needle aspiration (FNA) is an established technique for diagnosis and staging of various gastrointestinal malignancies.1,2 EUS FNA can help in obtaining material for cytological analysis so as to correctly diagnose various pancreatic lesions and lymphadenopathy of unknown cause.[1-3] However, the sensitivity, specificity and accuracy of cytological analysis varies because of small quantity of material obtained during FNA. To overcome these limitations of cytological analysis following alternative strategies have been used:

1. Use on-site cytologist to determine whether an adequate specimen has been obtained or not.
2. Using a trucut biopsy needle so as to obtain core of tissue for histological analysis.
3. Recently, developed ProCore (Cook Medical Inc., Bloomington, IN) needle has been shown to improve tissue acquisition.[4]

Flexible cryoprobes have been earlier used to debulk bronchial tumors and also have been shown to obtain high-quality tissues for histological evaluation during bronchoscopy.[5,6] The authors hypothesized that a flexible EUS cryoprobe may help to obtain adequate tissue specimens for histological assessment and conducted this animal non survival study.

They prospectively compared the quality of pancreatic biopsy specimens obtained by using a novel flexible cryoprobe (18 gauge, Erbe, Tübingen, Germany), a flexible 19-gauge FNA probe (Echotip Ultra, (Cook Medical Inc., Bloomington, IN)), or a tru cut (TC) biopsy probe (18 gauge, Monopty Core Biopsy Instrument, Bard, Tempe, Ariz) in live animals and human cadaver models. The live animal model was used to evaluate the quality of tissue obtained as well as to evaluate the bleeding times whereas the human cadaver model was used to assess the handling of the cryoprobe with the EUS equipment. The pancreatic biopsies were obtained in 4 anaesthetized pigs under laparotomy control to assess bleeding time. The cryoprobe (CB) was tested as direct puncture with the probe (CB-1) and in conjunction with different specimen retrieval sheaths (1.6-mm sheath, group CB-2; 1.75-mm sheath, group CB-3; 2.53-mm sheath, group CB-4; and via transduodenal puncture (group CB-5). FNA and TC biopsies also were also obtained from each animal. To test the practical applications of cryoprobe through an echoendoscope the authors tested it in two recently deceased human cadavers (<72 hours postmortem), (a) through laparotomy puncture by using each technique (CB, EUS-FNA, and TC) and (b) with standard EUS equipment by using an Olympus GF-UCT140-AL5 (Evis Exera II, Olympus, Hamburg, Germany) echoendoscope with an ALOKA processor (ProSound Alpha 10; Aloka Europe, Zug, Switzerland).

They found that the median bleeding times were 41.5 seconds (IQR 27.25- 67.5 seconds) for FNA compared with 7.5 seconds (IQR 5.5-10.25 seconds) for CB and 7.5 seconds (IQR 5.5-10 seconds) for TC biopsy specimens. These shorter bleeding times for CB could be related to the single pass in CB compared with multiple passes taken during FNA. While scoring the artifacts, the authors found that the CB had fewer artifacts than FNA ($p=0.016$) and they were comparable to the TC biopsy specimens. Also the retrieval of CBs with a sheath did not result in more artifacts compared with direct puncture. However, the transduodenal CBs had more artifacts as compared to direct puncture with CB ($p=.028$). The authors also found that the histological assessabliltiy of CB was significantly superior to FNA ($p<0.0001$) and was comparable to the TC biopsy specimens. However, the use of sheaths led on to decrease of the histological assessabliltiy. Also the retrieval of CBs with a sheath did not result in more artifacts compared with direct puncture. The specimens obtained using cryo probe was found to be larger than the FNA specimens ($p=0.010$) but smaller than TC biopsy specimens ($p=0.0011$). The biopsy specimens obtained using a sheath as well as transduodenally were found to be smaller than the direct cryo biopsy specimens.

While evaluating the CB probe with standard EUS equipment the authors found that no increased stiffness was observed through cooling of the probe as well as no abnormal

friction was noted between the cryo probe and the echoendoscope channel and also the maneuverability was similar to a 19-gauge FNA needle based on subjective impressions of the 3 examiners. Also, the tissue could be extracted with a single pass of the CB probe through transgastric and transduodenal punctures in all the cases. The authors concluded that the EUS-guided cryobiopsy gave better specimen quality for histological analysis and a shorter bleeding time compared with a conventional 19-gauge FNA needle in the animal model.

Commentary

Cryobiopsy has been shown to obtain high-quality tissues for histological evaluation during bronchoscopy and the current study has shown the technical feasibility as well as superiority of EUS guided cryobiopsy of pancreas in animal models as well as human cadavers.[5,6] Importantly, it has been shown that an adequate specimen could be obtained in all the cases by using a single pass only. This potential of obtaining good samples by a single pass has an immense potential of improving the feasibility and safety of EUS guided tissue acquisition. The concerns of removing a large chunk of tissue of enblock are risks of bleeding as well as risk of pancreatitis and pancreatic duct disruptions. Surprisingly in the current study, the bleeding rates have been shown to be lower with the cryo probes as compared to conventional FNA needle. This may be related to single pass taken while using a cryo probe as compared to multiple passes taken during FNA. The risk of pancreatitis and pancreatic duct leaks is real and these concerns should be evaluated by further animal studies and thereafter in human studies. This technology seems fascinating but the large diameter of the cryo probe (18G) and risks of removing large chunks of pancreatic tissue need to be addressed by further studies before this instrument sees the light of daily clinical practice.

Endoscopic Ultrasound-Guided Transmural and Percutaneous Transhepatic Gallbladder Drainage are Comparable for Acute Cholecystitis

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Gastroenterology 2012; 142: 805– 811

Acute cholecystitis is one of the common surgical emergencies and is usually treated conservatively with intravenous antibiotics. However, patients who do not respond to medical therapy may need emergency cholecystectomy. Laparoscopic cholecystectomy is usually considered the treatment of choice in patients with acute cholecystitis with low morbidity and mortality.[7,8] However, the surgical treatment is associated with higher morbidity and mortality in high risk patients. In such high risk patients alternative minimally invasive methods like percutaneous transhepatic gallbladder drainage (PTGBD) have been evaluated with response rates ranging from 56% to 100%.[9,10] Even this procedure is associated with complications like biliary peritonitis, bleeding, and pneumothorax and is difficult to do in patients with coagulopathy and massive ascites.[9,10] Endoscopic ultrasound (EUS) guided transmural gallbladder drainage (EUS-GBD) is a newer procedure that might be an effective alternative to PTGBD in high risk patients with acute cholecystitis with an added advantage of avoiding a percutaneous catheter and its associated discomfort. Although there are some case reports/series describing its successful use in high risk patients with acute cholecystitis but no prospective studies have evaluated its safety and efficacy.[11-13] The authors of the current study conducted a prospective, randomized trial comparing the technical feasibility and efficacy of EUS-GBD with that of PTGBD in high risk patients with acute cholecystitis.

All consecutive patients with acute cholecystitis who did not respond to conservative medical treatment and were considered high risk for emergency cholecystectomy because of underlying comorbid conditions (n=59) were randomized by computer-generated numbers to undergo EUS-GBD (30 patients) or PTGBD (29 patients). The EUS-GBD was done using a linear-array echoendoscope (GF-UCT240-AL; Olympus Optical, Tokyo, Japan) and the gall bladder body or neck was accessed through the puncture made using a 19 G needle at the prepyloric antrum or the bulb of the duodenum. After securing the guide wire, the tract was dilated using a 6F/7F bougie (Soehendra Biliary Dilatation Catheter; Cook Endoscopy). In cases of resistance, a triple-lumen needle-knife (Microtome; Boston Scientific) with a 7F shaft diameter was used to dilate the tract by using a pure cutting current over the tract. Post dilatation, a 5F nasobiliary drainage tube (ENBD-5; Cook Endoscopy) was coiled into the gallbladder. The PTGBD was performed by experienced interventional radiologists by placing a 8.5F pigtail drainage catheter using a transhepatic route. The primary end point of the study was the technical success whereas the secondary outcomes assessed were clinical success rates, complications, conversion rates to open cholecystectomy, and post-procedure pain.

The technical success rates were comparable between EUS-GBD (29 of 30; 97%) and PTGBD (28 of 29; 97%) as was the average time for the procedure (23±7 minutes for EUS-GBD vs. 24±10 minutes for PTGBD. There was one failure in each group and the clinical success rates in patients with technically successful procedure were 100% (29 of 29) for EUS-GBD and 96% (27 of 28) for PTGBD group (95% one-sided CI lower limit - 2%; $p = .0001$ for a non inferiority margin of 15%). Two patients (7%) in the EUS-GBD group (pneumoperitoneum that improved with conservative management in both patients) and 1 patients (3%) in the PTGBD group (hemobilia that was treated by blood transfusion) had complications ($p=0.492$). The median pain score was significantly lower in the EUS-GBD than in the PTGBD group (1 vs 5; $p < .001$).