A 42-year-old Thai female presented with anemic symptom and epigastric pain for 5 months. Physical examination was unremarkable. EGD showed a subepithelial mass approximately 3 cm. at the fundus (Figure 1). Subsequently, EUS was performed. It revealed a heterogeneous hypoechoic mass measuring 23x22 mm. in diameter. This mass had regular border, round shape, and originated from the fourth layer of the gastric wall. No perigastric lymph node was seen (Figure 2). EUS guided core needle biopsy was performed with a 19G needle. Histopathology showed neoplastic spindle cells compatible with gastrointestinal stromal tumor.
Diagnosis:

Gastrointestinal stromal tumor (GIST)

Discussion:

EUS is the most reliable test to delineate GI tract wall layers. It is currently the test of choice for diagnosing subepithelial lesions with the highest diagnostic value among other radiological tests. Moreover, EUS-FNA can provide cytopathological diagnosis of subepithelial lesions with the sensitivity, specificity and accuracy rate at 89%, 88%, and 89%, respectively.\(^1,2\)

In this case, the tumor was eventually diagnosed as GIST based on the results of EUS-FNA and EUS findings. Endosonographically, it is a hypoechoic tumor originated from the 4\(^{th}\) layer (rarely 2\(^{nd}\) layer).\(^3\) The EUS appearance of GIST’s is not specific and can be seen with other mesenchymal tumors. Hence tissue sampling of a suspected GIST by EUS-FNA is essential to establish the diagnosis.\(^4\)

References

A 61-year-old male presented with painless obstructive jaundice and significant weight loss. CT scan of upper abdomen showed an ill-defined mass occupying the hilum of liver causing biliary tract obstruction and carcinomatosis peritonei was also detected. Biliary metallic stents were placed across the hilar stricture by ERCP. Endoscopic ultrasound (EUS) demonstrated omental cake, ascites (Figure 1) and multiple intraabdominal lymphadenopathy (Figure 2). EUS-guided fine needle aspiration was performed from celiac lymph node for tissue diagnosis (Figure 3). Histopathological result showed well-differentiated adenocarcinoma.
Diagnosis:
Advanced stage cholangiocarcinoma

Discussion:
Preoperative diagnosis of hilar cholangiocarcinoma is difficult. Although ultrasound, CT scan, MRCP, and PET scan provide important clues regarding the differential diagnoses and staging, the definitive diagnosis requires tissue sampling. ERCP with brush cytology and intraductal biopsy is the standard approach for tissue diagnosis with high specificity, but the sensitivity was only 20-60%. EUS-FNA is an alternative for tissue diagnosis. The sensitivity of EUS-FNA for diagnosis of the primary tumor was 73% and significantly higher in distal than hilar cholangiocarcinoma. Another approach is EUS-FNA of the lymph nodes. Endoscopic ultrasonographic morphologies of the lymph nodes include long-axis length, roundness, echogenicity, and homogeneity. They are the only features differentiating benign from malignant lymphadenopathy in esophageal, pancreatobiliary, mediastinal, and celiac nodes, unfortunately, its efficacy is low in cholangiocarcinoma.

References
A 43-year-old female presented with dyspepsia for 2 months. EGD revealed a 1-cm. subepithelial mass in the gastric antrum (Figure 1). The patient was referred for EUS (Figures 2-3). EUS showed a heterogenous, hypoechoic lesion originating from the 3rd layer of the stomach measuring 13x13 mm.
Diagnosis:
Heterotopic pancreas

Discussion:
Heterotopic pancreas, also known as ectopic pancreas or pancreatic rest, is a pancreatic tissue existing in an organ or tissue distinct from the pancreas. It is usually found in the upper gastrointestinal tract, with >90% of the cases involving the stomach, duodenum or jejunum but can exist at any position in the abdominal cavity.\(^1\) Unusual locations are the colon, spleen or liver.\(^2\) Most affected patients are asymptomatic although a minority may present with a variety of symptoms such as abdominal pain and distension. Some of them can present with other symptoms including pancreatitis, islet cell tumor, pancreatic carcinoma, and pancreatic cyst.\(^3\) The typical endoscopic appearance in the stomach is as a firm round or oval umbilicated subepithelial nodule along the greater curvature situated several centimeters proximal to the pylorus.\(^1\) As it is a subepithelial lesion in origin, it should be distinguished from GIST. Endosonographically, pancreatic rest in the stomach is a hypoechoic, heterogeneous submucosal mass, although the muscularis propria and mucosa may be occasionally involved. This is occasionally difficult to differentiate from GIST based on EUS findings alone. In equivocal case, EUS-FNA is required. Description of ductal structures within the lesion is a distinctive feature, but is observed only in a minority of cases.\(^4\)

References
A 45-year-old female presented with significant weight loss and early satiety for 3 months. Linear EUS was performed. Upper endoscopy revealed nodular, thicken of the gastric wall with poor distention upon maximum air inflation (Figure 1). The lesion started from the area below esophagogastric junction (EGJ) downward to the antrum. Friable mucosa was noted around the antrum, and the scope could pass through the pylorus. Endosonographically, thickening gastric wall was noted, measuring 13 mm. in its maximum thickness (Figure 2). Muscularis propia and muscularis mucosa were measured as 4 and 8 mm. respectively (Figure 3). A round homogenous hypoechoic well-defined lymph node sized 8x7 mm. in diameter was identified (Figure 4). Ascites was not seen. A fine needle aspiration from the gastric wall was performed and the tissues were sent to pathological examination. Histological result showed poorly-differentiated adenocarcinoma.
Diagnosis:
Linitis plastica from poorly-differentiated adenocarcinoma of the stomach

Discussion:
Linitis plastica is a rare form of diffuse infiltrative gastric adenocarcinoma. The characteristic endoscopic feature is marked thickening of the gastric mucosal folds and gastric wall rigidity that fail to distend on insufflation.¹ The most common site is the antral and pyloric regions. Lesion are mainly located in subepithelial layers. Consequently, mucosal biopsy showed negative results for malignancy up to 30%.² EUS is useful for differentiating between benign and malignant entities in the patients with large gastric folds as it can delineate gastric walls layer by layer. Only the thickened deep layers from EUS is considered to be an independent predictive factor of malignancy.³ The recent study from China presented EUS features in biopsy-proven gastric linitis plastica.⁴ About sixty percent of the patients showed that the five sonographic layers had disappeared and had been replaced by hypoechogenic thickening of the gastric wall. In the rest of the patients, the first three sonographic layers were blurred and thickened, and the forth layer was significantly thickened.⁴

References
A 30-years-old male presented with severe epigastric pain radiating to his back for 4 days. He had a history of heavy alcoholic drinking about 120 grams per day for 10 years and also had several episodes of epigastric pain for 2 months. After a conservative treatment of acute pancreatitis, he developed an intractable vomiting. He was diagnosed as acute on top chronic pancreatitis with gastric outlet obstruction. A CT scan of abdomen (Figures 1-2) and esophago-gastro-duodenedoscopy with push enteroscopy (Figures 3-4) were done for investigating the cause of his vomiting. EUS was performed for an evaluation of local complication of pancreatitis (Figures 5-6). An ill-defined heterogenous hypoechoic lesion measuring 24x25 mm. at the head of pancreas representing a walled-off necrosis with adjacent swollen mucosa of the 2nd part duodenum was discovered.

Figure 1  Computed tomography of abdomen showed a 5.8x3.8x3.8 cm. rim enhancing fluid collection at pancreatic head, causing pressure effect to the 2nd to 3rd part of duodenum (arrow). There also were multiple non-enhancing cystic portions scattered in entire pancreas, consistent with acute necrotic collections.

Figure 2  Computed tomography showed a peripancreatic fluid collection at the pancreatic head causing extremely upstream dilatation of proximal duodenum, stomach and esophagus.
Diagnosis:

Acute on top chronic pancreatitis with gastric outlet obstruction due to duodenal mucosal edema and a walled-off pancreatic necrosis

Figures 3-4 Push enteroscopy showed severe swollen and erythematous duodenal mucosa with adjacent external compression and yellowish discharge protrude into the lumen of the 2nd to 3rd part of duodenum.

Figures 5-6 An ill-defined heterogenous hypoechoic lesion measuring 24x25 mm. at the head of pancreas representing a walled-off necrosis with adjacent swollen mucosa of the 2nd part duodenum.
Discussion:

Severe acute pancreatitis can result in duodenal obstruction from duodenal mucosal edema or external compression due to inflammation and edema of the pancreas, pseudocysts or pancreatic abscess.\textsuperscript{1,2} The incidence of duodenal obstruction in hospitalized patients with pancreatitis is 1.2\%.\textsuperscript{3} In one case series, only 9 of 878 patients of pancreatitis had duodenal obstruction associated with acute pancreatitis. All of them involved with the second or third part of duodenum.\textsuperscript{1} Duodenal obstruction associated pancreatitis is usually self-limited and successfully treated with conservative management. However, fibrosing pancreatoduodenitis may occur and requires a surgical intervention.\textsuperscript{1,3} Walled-off pancreatic necrosis (WON) which found in 1-9\% of the cases. Typically occurred at 4 to 6 weeks after the initial episode of pancreatitis and may lead to pain, fever and chill. CT scan, MRI or ultrasonography can be used for diagnosing such local collection of the pancreas. Endoscopic ultrasonography (EUS) can be applied for both diagnostic and therapeutic intentions and it is so called EUS-guided transgastric necrosectomy.\textsuperscript{4,5}

References

A 70-year-old male presented with chronic epigastric pain, bloating and regurgitation for 6 years. Abdominal examination was unremarkable. EGD showed gastritis and enlargement of the major ampulla measuring about 1.5 cm. in diameter at the second part of duodenum (Figure 1). Biopsy was performed. Pathological finding showed papillary adenoma with focal high grade dysplasia. MRI of upper abdomen showed a large major papilla protruding into the duodenal lumen measuring 1.2 cm. in diameter (Figure 2). EUS was performed. It revealed a heterogenous hypoechoic ampullary mass measuring 1.0x2.2 cm. in diameter with pancreatic invasion. Normal CBD and pancreatic duct were noted. No peripancreatic lymphadenopathy were identified (Figure 3). Whipple operation was performed. The surgical histology showed tubulovillous adenoma of the ampullar of Vater with focal malignant change into adenocarcinoma (in situ), free all resected margins, no peripancreatic node metastasis (0/12 nodes) (Figure 4).
A heterogenous hypoechoic ampullary mass measuring 1.0x2.2 cm. in diameter was identified.  

Histological findings showed tubulovillous adenoma of ampullar of vater.

Diagnosis:
Ampullary adenocarcinoma in situ

Discussion:
Ampullary tumors comprise less than 1% of malignant gastrointestinal tumors.1 Endoscopic findings of malignant transformation are the induration or rigidity of the lesion, the presence of ulcerations, lack of elevation after submucosal injection or the presence of a submucosal mass.

Normal papilla by a radial technique shows a hypoechoic, homogeneous thickening, with a crescent moon shape, well demarcated lesion next to the duodenal wall. By a linear technique, the boundaries of the papilla are less clear but opening and the tract of the bile and pancreatic ducts through the papilla can be better observed. It is difficult for EUS to identify a focal malignancy within an ampullary adenoma but invasive carcinoma can be excluded. Ampullary adenocarcinoma shows more hypoechoic and heterogeneous echogenicity than adenoma.2
EUS can be used for T and N staging in TNM classification: T1 identified as no interface between ampullary tumor and duodenal wall. T2 identified as interface between ampullary tumor and duodenal wall. T3 identified as invasion of ampullary carcinoma in the periampullary pancreatic tissue less than 2 cm. T4 identified as invasion greater than 2 cm. or to other structures. Positive lymph nodes or “N” criteria include lymph nodes greater than 10 mm. round shape, distinct margins, hypoechogenicity and confirmed by FNA. Meta-analysis showed the sensitivity and the specificity for detecting nodal invasion at 70% and 74%, respectively.

References
A 72-year-old Thai male presented for an annual medical checkup. CT scan of upper abdomen revealed an 8 mm. hypoechoic nodule at the body of pancreas. MRI of upper abdomen showed numerous lobulated cystic lesions scattering along the pancreas with connection to dilated main pancreatic duct (Figure 1). Radial-array EUS was performed. It demonstrated anechoic lesion measuring 19x13 mm. with thin internal septation without mural nodule at the head of pancreas (Figure 2) and another 21 mm. cystic lesion at the tail of pancreas (Figure 3). The main pancreatic duct was diffusely dilated measuring about 5 mm. at the body of pancreas (Figure 4).

**Diagnosis:**

Branch duct type intraductal papillary mucinous neoplasm (BD-IPMN)
Discussion:

IPMNs are divided into 3 types including main duct type (MD-IPMN), branch duct type and mixed type.\(^1\) EUS provides the sensitivity and the specificity at 86% and 99% respectively for the diagnosis of IPMN.\(^2\) MD-IPMN is demonstrated as diffusely or segmentally dilated main pancreatic duct (MPD) more than 5 mm. in diameter without obstruction.\(^1\) BD-IPMN is shown as a well-defined pancreatic cystic lesion communicating with the MPD.\(^1\) Unfortunately, connection between pancreatic duct and cysts cannot be demonstrated in all. Mural nodule, solid component and MPD larger than 10 mm. are features that suggestive for malignant transformation of IPMN.\(^3\)

References

A 60-year-old Thai male presented with recurrent epigastric pain and weight loss for 10 kg in a month. He intermittently passed melena for 3 weeks. Upper endoscopy revealed multiple ulcerative masses with central necrotic area along duodenal C-loop (Figures 1 and 2). EUS demonstrated an irregular heterogeneous hypoechoic lesion measuring 20 mm. in thickness occupying the whole layers of duodenal wall (Figure 3). A perilesional homogeneous hypoechoic round lymph node measuring 12 mm. in diameter was identified (Figure 4). Histological report from mucosal biopsy was compatible poorly differentiated adenocarcinoma.
Diagnosis:
Duodenal adenocarcinoma

Discussion:
EUS has not been widely used for an evaluation of small bowel disease because the limitation of its oblique endoscopic view which makes the passage of the scope into deep small bowel seeming impossible. Fortunately, the recently designed forward-viewing radial-array echoendoscope makes EUS feasible for the small bowel endosonographic examination. Preoperative evaluation by EUS is useful as it can determine size, echogenicity, invasion depth of the tumor, origin or margin of the lesions and regional lymph nodes metastasis. Typical endosonographic appearances of duodenal carcinoma are heterogenous hypoechoic lesion with poorly determined margins, and loss of all layers architecture. The accuracy for predicting the malignant duodenal epithelial lesions is 93.5%. EUS currently gains popularity as the reliable preoperative diagnostics tools for local staging of upper GI malignancy.

References
An 86-year-old female presented with acute abdominal pain for 10 days. She denied fever and jaundice. Physical examination was normal. Her liver function test showed mild jaundice and transaminitis. Transabdominal ultrasonography demonstrated multiple small gallstones in the gallbladder. There was a hyperechoic lesion measuring about 6 mm. in diameter with posterior acoustic shadow in CBD (Figure 1). CBD measured as 10 mm. in diameter. Choledocholithiasis was diagnosed. Endoscopic retrograde cholangiography was performed. Cholangiogram showed multiple filling defects in dilated CBD (Figure 2). Standard sphincterotomy was done. Seven pigmented stones were removed with a trapezoid basket and a balloon.
Diagnosis:
Choledocholithiasis

Discussion:
Stones in the bile duct typically originate from the gallbladder. However, they can primarily develop in the bile duct. The clinical presentations vary widely from no symptom to ascending cholangitis or acute pancreatitis. In classical cases, diagnoses can be made by history and physical examination. However, in equivocal cases, radiological tests are required to confirm or exclude the presence of stones in the CBD. Transabdominal ultrasound which seems to be the least invasive test, unfortunately provides the low sensitivity around 30% whereas ERCP which is the gold standard has the sensitivity and the specificity rate at 94% and 95%, respectively. To date, EUS with a lower complication rate than ERC has replaced ERC to prove the presence of CBD stones. According to the ASGE guideline, the patients who have symptomatic gallstone with intermediate likelihood of choledocholithiasis based on clinical predictors (e.g. age older than 55 years, abnormal liver biochemical test other than bilirubin) are candidates for an EUS evaluation of CBD stones.

References
A 36-year-old Thai male presented with jaundice for a month. He had a history of right upper quadrant abdominal pain lasting for 2 days before jaundice. He denied fever or chill. Liver function tests showed directed hyperbilirubinemia. CT scan of abdomen showed common bile duct dilatation, measuring 9 mm. in diameter without any gallstone or other explainable causes of CBD obstruction. Radial-array EUS revealed a hyperechoic material with posterior acoustic shadow measuring 8 mm. in diameter in the dilated CBD (Figure 1). Choledocholithiasis was diagnosed. Consequently, ERC was performed and showed multiple filling defects in dilated CBD (Figure 2). Standard sphincterotomy was done. Stones were removed successfully by balloon extraction.
Diagnosis:
Choledocholithiasis

Discussion:
In order to demonstrating a CBD, transabdominal ultrasound is the suboptimal test because of its poor sensitivity (22-55%).\(^1\) Traditionally, ERCP has been accepted as the gold standard tool for diagnosis and treatment but ERCP is associated with significant complication. Thus, in patients with intermediate risk for the presence of common bile duct stone, EUS or MRCP should be used as the first diagnostic tool to avoid the unnecessary risks from ERCP procedure.\(^2\)

Both EUS and MRCP have the sensitivity and the specificity rate around 90% and 99% respectively for the detection of common bile duct stone.\(^3\) However, the stone size is affecting the diagnostic rate of MRCP for choledocholithiasis. The sensitivity of MRCP decreases to 33-71% in the setting of small CBD stones (<6 mm.)\(^1\) In contrast, the sensitivity of EUS for diagnosing CBD stones was not affected by the small size of stones (<5 mm.)\(^4\)

References
A 59-year-old male presented with acute alcoholic pancreatitis 6 months ago. He had a past history of significant alcoholic drinking. MRI of upper abdomen showed pancreatic parenchymal atrophy, no calcification nor mass were detected. Bile ducts were normal. EUS was performed for an evaluation of chronic pancreatitis. It showed normal main pancreatic duct measuring 2 mm. in diameter without calculi or irregularity (Figure 1). Hyperechoic strandings and foci were seen in the head of pancreas (Figure 2). Atrophy and lobulations were noted in the body and tail of pancreas. Pancreatic mass could not be detected.
Diagnosis:

Early chronic pancreatitis

Discussion:

Endoscopic ultrasound (EUS) has become a well-accepted tool for the diagnosis of chronic pancreatitis. EUS can detect early stage of chronic pancreatitis that may be missed by other radiomodalities.\textsuperscript{1} The most practical diagnostic criteria for the diagnosis of chronic pancreatitis is Rosemont criteria which can be divided into two groups of criteria: parenchymal and ductal criteria.\textsuperscript{2} Each subgroup can be classified to major criteria and minor criteria. Parenchymal criteria compose of hyperechoic foci with or without shadowing, lobularity with or without honeycombing, cysts, and stranding. Ductal criteria are main pancreatic duct (MPD) calculi, irregular MPD contour, MPD dilatation, dilate side branches, and hyperechogenic MPD margin. These components are used for an evaluation of chronic pancreatitis (consistent, suggestive, and indeterminate).\textsuperscript{3,4} In this patient, EUS findings of hyperechoic stranding foci and lobulations were found and suggestive for chronic pancreatitis.

References

A 59-year-old male with a history of total laryngectomy for pyriform carcinoma presented for chromoendoscopy as a part of esophageal cancer surveillance. Chromoendoscopy with Lugol’s solution revealed an unstained lesion sized 1.5x1 cm. located at 26 cm. from the incisor. EUS was done to evaluate for tumor invasion. EUS showed a heterogeneous hypoechogenic lesion with an invasion to esophageal submucosa, compatible with T1 invasion (Figure 1). Thus endoscopic submucosal dissection was performed. Histopathological result showed complete resection of squamous cell esophageal carcinoma.
Diagnosis:
Early squamous cell carcinoma of esophagus

Discussion:
Accurate TNM staging of esophageal cancer is important as it will determine the specific treatment and prognosis.\(^1\) Cross-sectional imaging including CT scan, MRI and PET scan are suitable for an evaluation of metastatic or advanced stage esophageal cancer, unfortunately these tests are limited in capability to stage an early or locally advanced stage of esophageal cancer as they cannot clearly delineate esophageal wall layer.\(^2\) In contrast, EUS provides the most accurate local staging of esophageal cancer with the sensitivity for tumor invasion (T stage) at 81%-90% [higher in advanced (T4) than early disease (T1)].\(^2\)

References
A 57-years-old male presented with an incidental pancreatic cyst. He had no history of abdominal pain, nausea/vomiting, weight loss, steatorrhea or jaundice. Computed tomography (CT) of abdomen showed a lobulated multiseptated, mixed hypo- and hyperdense solid cystic lesion measuring 6x5 cm. in diameter with central calcification involving the head and neck of pancreas causing dilation (5 mm.) of the upstream main pancreatic duct (Figures 1-2). The pancreatic parenchyma appeared atrophic without calcification. EUS revealed a multi-loculated cysts with honeycomb appearance located at the head to neck of pancreas. It measured 55x68 mm. in maximal diameter. It has both micro and macrocystic appearance and was not communicated with the main pancreatic duct (Figures 3-5). Fluid was aspirated for 1 mL and tested for a String test which resulted as negative. Cystic fluid CEA and amylase levels were reported as low.
Figures 3-4 EUS revealed a multi-loculated pancreatic cysts measuring 55x68 mm in diameter with honeycomb appearance located from the head through the neck of pancreas.

Figure 5 EUS showed a dilated main pancreatic duct measuring 6 mm in diameter.

Figures 6-7 T1-weighted magnetic resonance (MR) with gadolinium showed an enhancement of the thin septations that radiate from a central scar. T2-weighted MR showed a homogeneously hyperintensity lesion and dilation of the proximal part of pancreatic duct.
Diagnosis:
Pancreatic serous cystadenoma

Discussion:
Pancreatic serous cystadenoma (SCA) is the most common cystic tumor of the pancreas and it is mostly benign in nature. SCA originates from centro-acinar cells which are lined by a simple, glycogen-rich cuboidal epithelium. It is commonly found in female at age 7th decades. It comprises of multiple small fluid-filled cysts, and can arise in any region of the pancreas. Most patients are asymptomatic but may have non-specific symptoms including abdominal pain, nausea/vomiting and rarely jaundice or weight loss. It is associated with Von Hippel-Lindau syndrome in certain cases. SCA manifests typically as a microcystic or honeycombed lesion, however, 20% of them have macrocystic apperance. The highly suggestive feature on CT scan or MRI of SCA is a focal, well-demarcated lesion with central scar or “sunburst” calcification, which found in only 20% of SCA. EUS typically reveals a lobular multimacro and/or microcystic lesion in the pancreas with posterior acoustic enhancement reminiscent of a honeycomb without connecting to the main pancreatic duct. The cystic fluid appeared thin, clear, non-mucinous and/or bloody appearance. Cystic fluid analysis of CEA level <4 ng/mL has 100% and 93% in the sensitivity and the specificity, respectively.

References
An asymptomatic 76-year-old male presented with widened mediastinum detected during a routine chest X-ray. CT scan of chest showed an irregular enhancing mass measuring 4.6x6.7x16.7 cm. with matted paraesophageal lymph nodes at the prevertebral region of right lung. There were feeding arteries arisen from descending aorta and branches of right pulmonary artery (Figure 1). Primary lung cancer was suspected. EUS examination demonstrated a large well-defined, irregular border, heterogeneous hypoechoic mediastinal mass located at 25-38 cm. deep from the incisor. The mass measured about 6 cm. in diameter (Figure 2). EUS-FNA was performed with a 25G FNA needle. The final cytopathological diagnosis was squamous cell carcinoma of the lung.
Diagnosis:

Squamous cell lung cancer with mediastinal metastasis

Discussion:

EUS is well suited to evaluate the lesions located in the posterior mediastinum. The lesions could be lung cancer, metastatic cancer, lymphoma, tuberculosis, neurogenic tumors, duplication cysts, mediastinal abscess, and atrial myxoma etc. The overall sensitivity and specificity of EUS-FNA for diagnosing malignant lymph nodes is >90%. The most common primary site for metastatic mediastinal lymph nodes is lung cancer, of which 80% are non-small-cell lung cancers (NSCLC) and the other 20% are small-cell carcinomas. The recent studies report that EBUS-TBNA is also highly accurate for mediastinal staging of NSCLC. EBUS-TBNA and EUS-FNA appear to be equally successful in sampling the tissue. The subcarinal nodal station, nodes in the right paratracheal regions are more easily accessed by EBUS-TBNA, whereas nodes in the subaortic and left tracheobronchial angle are better sampled by EUS-FNA.

References

A 61-year-old male presented with acute confusion for 1 day. He had had a recent history of transient psychomotor retardation a month ago. Blood test showed a low level of sugar, high insulin level, and normal C-peptide concentration. CT scan of upper abdomen revealed a 1.0x0.6 cm. arterial enhancing lesion at the pancreatic body (Figure 1). EUS revealed a well-defined homogenous slightly hypoechogenic mass measuring 87 mm. in diameter at the neck of pancreas and not compressing the main pancreatic duct (Figure 2). Patient subsequently underwent a successful surgical enucleation. Surgical pathology was consistent with pancreatic neuroendocrine tumor (PNETs); insulinoma.
Diagnosis:
Insulinoma of the pancreas

Discussion:
Previously, gastroenteropancreatic neuroendocrine tumors (GEP-NETs) were rare with an incidence of 0.5% of all neoplasms. However, the incidence has been increased because of the advancement in radiological imaging. PNETs are clinically classified as either non-functioning or functioning PNETs. The functioning PNETs are usually small due to their early presentation from an over production of hormone (s). EUS is very helpful to locate this small tumor.

Potential pitfalls of EUS for the identification of insulinoma are its isoechoic appearance, small size, multiplicity, and pedunculated lesions at the pancreatic tail.

References
A 57-year-old Thai female presented with bowel habit change. Colonoscopy revealed a circumferential mass at the sigmoid colon. The scope could pass this narrowing segment (Figure 1). EUS to evaluate the depth of tumor invasion showed an irregular hypoechoic lesion measuring 38x36 mm. in diameter occupying at least half of the circumference of colonic wall (Figure 2). The lesion invaded to muscularis propria layer. Perilesional lymph node measuring 5x6 mm. in diameter was identified (Figure 3). It was staged as at least T3N1Mx by EUS. The patient underwent surgery and histology showed moderately differentiated adenocarcinoma with pericolonic nodes and later hepatic metastasis was confirmed. The final staging was T4N1M1.
Diagnosis:
Advanced sigmoid colon carcinoma (T4N1M1)

Discussion:
EUS is the accurate local staging tool for rectal cancer with the sensitivity and specificity at 80-96% and 75-98%, respectively.\(^1\) Typical EUS findings of colorectal cancer were hypoechogenic lesion infiltrating into colonic wall.\(^2\) The current design of EUS with oblique endoscopic view makes the passage of the echoendoscope beyond the rectum seeming difficult. Recently, a new forward-viewing, radial-array echoendoscope is available for local staging of colon cancer beyond the rectum. A recent study showed the superior accuracy of EUS over CT scan for local staging of colon cancer.\(^3\)

References
A 73-year-old Thai male presented with fever and epigastric pain for 5 days. He had a history of acute gallstone pancreatitis 3 weeks ago. Physical examination showed localized upper abdominal distension with cystic-consistency mass without jaundice. CT scan of upper abdomen revealed a large heterogeneous cyst containing air bubbles along the lesser curve of stomach (Figures 1 and 2). He was diagnosed as infected pancreatic pseudocyst endoscopic view during EUS showed a large bulging lesion of the gastric wall (Figure 3). EUS demonstrated a large anechogetic cyst measuring 12.2x11.5 cm. in diameter with small part of solid component lesion (Figure 4). EUS-guided drainage of the pseudocyst was performed with a 19G needle, a guide-wire and a cystotomy (Figure 5). A cystogastrostomy was created (Figure 6). A covered self-expanding metallic stents with angled flare ends (Nagi stent®, Taewoong Medical, Gyeonggi-do, Korea), 16 mm. in diameter and 30 mm. in length, was inserted. Fluoroscopy confirmed the stent was placed in a proper position (Figures 7 and 8). The distended abdomen became nearly flat at day 2 after the procedure. However, his fever remained elevated at day 4 after the drainage procedure; we therefore decided to perform the direct endoscopic necrosectomy (DEN) for 2 more times at day 6 and 9 (Figures 9 and 10). Minimal amount of turbid fluid was seen and removed during DEN. A serial CT scan of abdomen showed a significant improvement of post drainage pseudocyst (Figures 11 and 12).
Figure 3 EGD showed a huge bulging lesion of gastric wall.

Figure 4 EUS demonstrated a large anechogenic cyst with some solid component.

Figure 5 Fluoroscopic view of a guidewire coiling inside the pancreatic pseudocyst.

Figure 6 The cystotome and diathermy was applied over a guide wire to create a cystogastrostomy tract.
Figures 7 and 8 EGD and fluoroscopy confirmed the proper position of stent (arrow).

Figures 9 and 10 Endoscopic images of the internal wall of pseudocyst during the direct endoscopic necrosectomy (DEN).
Figures 11 and 12: CT scan of abdomen after EUS-guided pseudocyst drainage procedure. The stable position of metal stent was confirmed (arrow). The pseudocyst significantly decreased in size.

**Diagnosis:**
EUS-guided cystogastrostomy for drainage of pancreatic pseudocyst with direct endoscopic drainage (DEN)

**Discussion:**
Endoscopic intervention for symptomatic pancreatic pseudocyst drainage comprises of conventional trans-luminal drainage, trans-papillary drainage, and EUS-guided trans-luminal drainage. The clinical outcomes and technical success of these methods are comparable. Nevertheless, the advantages of EUS-guided trans-luminal drainage are the visualized approach, onsite differential diagnosis, ascertaining the nature of a fluid collection, and feasibility to perform the procedure in non-bulging lesion.

The covered self-expanding metallic stents (CSEMS) with angled flare ends (Naçi stent ®, Taewoong Medical, Gyeonggi-do, Korea) is specifically designed for EUS-guided trans-luminal pseudocyst drainage. Advantages are the large caliber, long patency, and good visibility under fluoroscopy. However, stent migration can occur in around 15% and they can progress to severe complication including perforation or obstruction.
References


An 87-year-old female presented with fever and epigastric pain for 3 days. She had a past history of pancreatic cancer obstructing common bile duct that treated with a biliary metal stent 8 months ago. Her physical examination showed localized peritonitis at the right upper abdomen along with the positive murphy’s sign. She was diagnosed as acute gangrenous cholecystitis. CT scan of abdomen showed distended gallbladder with irregular wall. Pericholecystic fat stranding was also noted. The stent was in place (Figures 1-2). An emergency percutaneous cholecystostomy was performed. One week after the procedure, her peritonitis resolved and she started an oral intake. An elective cholecystectomy was offered, however the patient and her family declined and they chose to undergo an EUS guided cystogastrostomy instead.

EUS guided cystogastrostomy was performed with a 19-gauge needle (Echotip; Cook). A guidewire was then passed into the gallbladder (Figure 3). The tract was dilated with a needle knife and a 6-French Soehendra dilator. A 7-Fr 5 cm. double pigtail stent was successfully placed from the gallbladder to the stomach under fluoroscopic guidance (Figures 4-5). There was no complication.

Figures 1 and 2 CT scan of abdomen with contrast showed mild distended gallbladder with irregularity of the gallbladder wall and pericholecystic fat stranding (arrow).
Figure 3 EUS images showed mild gallbladder distention with percutaneous cholecystostomy catheter in place (arrow).

Figures 4 and 5 Fluoroscopic and endoscopic images of a double pigtail stent bridging between the gallbladder and the stomach.
Diagnosis

EUS-guided cholecystogastrostomy

Discussion

Acute cholecystitis may develop after metallic stent placement in malignant biliary obstruction. The standard management is cholecystectomy. However, since many patients in this setting are critically ill, and not suitable for surgery. An alternative treatment such as a percutaneous cholecystostomy may be offered, however, the discomfort form the external drain is a major concern. Recently, an endoscopic drainage including trans-papillary gallbladder drainage and EUS guided transmural drainage have become a more attractive alternatives.\textsuperscript{1,2,3} This case confirmed that an EUS-guided gallbladder drainage with a single-step stent placement is feasible and safe.\textsuperscript{4}

References