G-I01

Endoscopic Local Therapy of Pancreatic Tumors- What's New ?

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Pancreatic tumors are composed of benign or malignant neoplasm and morphologically they can be divided into cystic or solid tumor. Histologically solid tumors are pancreatic ductal adenocarcinoma, neuroendocrine tumor (NET) or metastatic tumor. Cystic tumors are mostly comprised of mucinous cystic neoplasm, serous cystic neoplasm, intraductal papillary mucinous neoplasm and solid pseudopapillary neoplasm (SPN). For the management of these lesions, surgical resection has been the mainstay of therapy. However, pancreatic resection carries significant morbidity and mortality, especially when the lesion is located in the head portion.

Recently endoscopic local ablation modalities are introduced and several investigators are using these techniques actively. For the management of cystic tumor, EUS-guided ethanol lavage and/or paclitaxel injection is used and it showed very promising result without causing serious complications. The complete resolution (CR) rate was reported up to 70% in experienced centers. For the management of solid tumor, EUS-guided ethanol injection or EUS-guided radiofrequency ablation (EUS-RFA) are used showing variable results. Ethanol injection is very helpful for the management of small NET such as insulinoma. For insulinomas, small amount of ethanol injection can effectively abolish insulin hypersecretion and hypoglycemic symptom can be improved dramatically. EUS-RFA is widely applied to benign and malignant pancreatic tumors. It is applied for pancreatic cancer as one of adjuvant therapy and initial study shows promising result. EUS-RFA is also applied to benign solid tumors such as NET or SPN and CR was reported up to 70%.

EUS-guided local ablation is actively investigated by many researchers and has the potential for non-operative management of cystic and solid tumors of the pancreas. However, careful patient selection and individualized application is required to increase the efficacy and to avoid complications.

G-I02

Contrast-Enhanced Ultrasound in Differentiation between Benign Mural Lesions and Adenocarcinoma of Gallbladder

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Background: Mural lesions of gallbladder on ultrasound (US) are often difficult to characterize as benign or malignant.

Purpose: The aim of the study was to evaluate the role of contrast-enhanced US (CEUS) in characterization of gallbladder (GB) wall lesions and making distinction between benign wall thickening and GB adenocarcinoma, utilizing both quantitative and qualitative parameters.

Methods: A total of 26 patients with GB wall lesions detected on sonography underwent CEUS. Lesions were evaluated on the basis of morphological imaging features, enhancement pattern, dynamic real-time contrast uptake, and intralesional vascularity.

Results: Overall, 19 patients had final diagnosis of GB adenocarcinoma, whereas seven patients had benign etiology. CEUS has enabled the differentiation of nonenhancing tumefactive sludge from enhancing mural lesions, thus improving the accuracy of morphological assessment of lesions. The intactness of outer wall was better assessed on CEUS. The dynamic postcontrast assessment showed that carcinoma showed early washout of contrast compared to benign thickening ($P = 0.002$). Nonlayered mural enhancement or thick enhancing inner layer with nonenhancing thin outer layer was associated with adenocarcinoma. The classification of intralesional vascularity on CEUS was not helpful in distinguishing benign lesions and adenocarcinoma.

Conclusion: CEUS can increase the diagnostic confidence in differentiation between benign mural lesions and adenocarcinoma of GB.

Keywords: Carcinoma gallbladder, contrast-enhanced ultrasound, ultrasound

(Kumar I, Yadav YK, Kumar S, Puneet, Shukla RC, Verma A. Utility of Contrast-Enhanced Ultrasound in Differentiation between Benign Mural Lesions and Adenocarcinoma of Gallbladder. J Med Ultrasound. 2019 Dec 16;28(3):143-150. doi: 10.4103/JMU.JMU_62_19. PMID: 33282657; PMCID: PMC7709532.)

G-I03

EUS-guided Biliary Drainage/anastomosis (EUS-BD/A)

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Introduction

Trans-papillary procedures are still main stay in endoscopic biliary drainage. However, trans-mural approach with interventional endoscopic ultrasound/endosonography (I-EUS) technique is widely accepted as salvage treatment recently and spreading rapidly. It depended on the development of techniques, devices and published many clinical trials.

Indications

Basically, EUS-BD/A was salvage procedure when the conventional ERCP related procedures are difficult/failed. There 2 factors of indications; required biliary drainage and creation of the biliary access route. The cases with duodenal stricture, surgically altered anatomy are good indications. Recently, there are some challenges to extend the indications of EUS-BD/A; primary drainage, preoperative drainage, children cases and massive ascites cases according to the development of the procedures and devices.

Kinds of EUS-BD/A

EUS-guided biliary drainage/anastomosis (EUS-BD/A) is classified according to the target bile duct; extra- and intrahepatic bile duct (IHBD, EHBD). EUS-BD/A for EHBD is punctured from the duodenal bulb, and called EUS-guided choledochoduodenostomy (EUS-CDS). EUS-guided BD/A for IHBD has some types according to the various digestive tract, Stomach; EUS-guided hepaticogastrostomy (EUS-HGS), jejunum; hepaticojejunostomy (EUS-HJS) and duodenum; hepaticoduodenostomy (EUS-HDS). In EUS-HGS and EUS-HJS, approach to the IHBD, but right posterior IHBD was approached in EUS-HDS procedure.

Trans-ESCR (Endosonographically/EUS-guided created route) procedures

Representative procedure of trans-ESCR procedure is endoscopic necrosectomy for walled off necrosis through the ESCR including placed Transluminal drainage/anastomosis stent (T-DAS). EUS-BD/A is the drainage method but anastomosis simultaneously. We can manage various biliary disease through the ESCR mainly stone and stricture management. After creation of the ESCR or placed covered SEMS,

Transluminal drainage/anastomosis stent (T-DAS)

Conventional trans papillary stents were placed for the keeping the luminal patency at the papilla or stricture. However, in the EUS-D/A procedure, the aim of the stent placement was keeping the ESCR. Then, we should distinguish T-DAS from the conventional stent. T-DAS including both plastic and metallic (Tubular and Lumen apposing metal stent) stent.

Procedure steps of EUS-BD/A

Extrahepatic approach (EUS-CDS): Puncture the common bile duct (CBD) from the duodenal bulb with 19 G needle under EUS image. Subsequent guide wire insertion toward to the IHBD, dilation of the puncture route and T-DAS placement were performed under fluoroscopic guidance.

Intrahepatic approach (EUS-HGS, -HJS and -HDS): EHBD was punctured from stomach, jejunum and duodenum with 19 G needle. GW manipulation was more difficult than EHBD approach because of thin duct and tortuous IHBD. Dilation step was most difficult through the liver parenchyma. In Japan, there are some dedicated dilators, thin tip boogie and cautery dilator and drill dilator. Additional ballon dilation was required in almost cases, but minimum dilation was favorite because of avoidance of bile leakage. Selection of Covered SEMS as a T-DAS was recommended to reduce the bile leakage. However, for the benign cases, plastic stent was selected for exchangeability. Some endoscopists used full-covered SEMS with antimigration flaps or double pigtail stent inserted in the covered SEMS cavity. Prevention of migration which required surgical procedure was crucial. Double GW technique was helpful for the scope stability and important as the safety wire.

Conclusion

We can perform EUS-BD/A as salvage procedure but extended the indications according to the development of the technique and devices. Trans-ESCR procedures was developed as well. The author believe that EUS-BD/A can become primary procedure because of avoidance of post procedural pancreatitis and feasible for performance

G-01

Diagnosis of Gallbladder Cancer by Ultrasound

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Since many patients with gall bladder cancer (GBC) are diagnosed intraoperatively at the time of cholecystectomy for cholelithiasis, an important issue is the screening of patients with symptomatic biliary tract disease for the possibility of coexisting GBC. Ultrasound is the usual initial diagnostic study for presumed-benign gallstone-related disease. Many patients with an incidental GBC are found retrospectively to have had suspicious US findings (eg, a solitary or displaced stone, or an intraluminal or invasive mass) that were not recognized preoperatively. Findings that are suggestive but not diagnostic of GBC include mural thickening or calcification, a mass protruding into the lumen, a fixed mass in the gallbladder, loss of the interface between the gallbladder and liver, or direct liver infiltration. Small polypoid lesions within the gallbladder may represent adenomas, papillomas, cholesterolosis, or carcinomas. Polyps over 1 cm in diameter are more likely to contain an invasive cancer than smaller ones. In one series, cancer was found in 23 and 0 percent of polyps larger than and smaller than 1 cm, respectively. Thus, cholecystectomy should be strongly considered for patients with gallbladder polyps >1 cm. For the overall accuracy of US for staging the local and distant extent of a suspected GBC is limited. Additional imaging (typically cross-sectional imaging with computed tomography [CT] or magnetic resonance imaging [MRI]/magnetic resonance cholangiopancreatography [MRCP]) is needed for patients who have concerning findings on US (calcification, a mass protruding into the lumen, loss of interface between gallbladder and liver, direct liver infiltration, gallbladder polyps ≥10 mm, or a thickened gallbladder wall that is not explained by cholecystitis).

G-02

Endoscopic Ultrasound-guided Gastroenterostomy Already as an Impeccable Treatment of Malignant Gastric Outlet Obstruction?

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Malignant gastric outlet obstruction (GOO) is a common complication in patients with locally advanced pancreatobiliary or gastroduodenal malignancy causing luminal stricture at the level of the pylorus or duodenum. Traditionally, two treatment modalities exist for malignant GOO.

Endoscopic enteral stenting (ES) is characterized by a fast relieve of symptoms. However, this comes at the cost of high rates of reinterventions due to stent obstruction causing by tumor ingrowth or overgrowth in up to 33% of cases. On the other hand, surgical gastroenterostomy (SGE) is distinguished by its high success rate and low rate of reinterventions, but post-operative course may be complicated by significant morbidity.

A third treatment option was recently introduced: Endoscopic ultrasound-guided gastroenterostomy (EUS-GE) is a novel procedure for palliation of malignant GOO. EUS-GE may combine the theoretical advantages of both approaches (ES and SGE), creating a relatively large gastroenteric anastomosis, while using a minimally invasive technique at a distance from the primary tumor. However, EUS-GE remains unoptimized, with some limitations that need to be overcome. All reports of EUS-GE have been published only by experts of the procedure because the currently followed procedure is technically difficult and must be improved and simplified further to facilitate its use in clinical practice. LAMS design must also be improved because the currently available LAMSs have a maximum diameter that does not appear to be appropriate for EUS-GE, which usually requires a bigger anastomosis and minimal risk of stent obstruction and migration. However, in the near future, EUS-GE will be expected to become one of the standard treatments for malignant GOO.

G-03

EUS-FNA for Pancreatic Cystic Fluid Analysis. Surgery or Observation?

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In current guidelines, EUS may provide superior image quality. In addition, EUS-FNA with cystic fluid analysis could examine mucin, biochemistry, tumor markers and cytology analysis, even gene analysis to stratify the risk of malignant potential. It may allow definite cyst classification and provide the treatment strategy, including surgery or observation, in the pancreatic cystic neoplasm

G-04

Does Cytological Evaluation of Endoscopic Ultrasonography Guided Tissue Acquisition still have Value in Fine Needle Biopsy Era?

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Endoscopic ultrasonography-guided tissue acquisition(EUS TA) has been the mainstay for tissue proof for pancreatic lesions. In the past endoscopic ultrasonography-guided fine needle aspiration(EUS FNA) was the only choice for specimen acquisition. Since the introduction of endoscopic ultrasonography-guided fine needle biopsy(EUS FNB), it has been the preferred method. As we know, EUS-FNA mainly provides cellular specimens for cytological evaluation and EUS-FNB provides histologic ones for histologic assessment instead. Is EUS-FNA still valuable in the era of EUS-FNB?

Pancreatic lesions could be divided into solid mass and cystic lesions. Reviewing the literature there is no obvious difference between EUS FNA and EUS FNB for the yield rate of solid mass. For cystic lesions, we might not obtain adequate tissue for histologic evaluation by EUS FNB and we could aspirate the cyst fluid for cytological evaluation and biochemical analysis by EUS FNA.

In the daily practice sometimes we would obtain the result of no malignant tumor on histologic evaluation but positive for malignant cells on cytologic evaluation for pancreatic solid mass. We reviewed our records of patients receiving EUS-FNA/B and inferred the possible factors affecting the above results. Larger size and post-treatment status seem to be the precipitating factors.

According to our data, we concluded that cytological evaluation still has value for pancreatic solid mass in the EUS-FNB era. We suggest choosing liquid-based cytology rather than conventional smears for better cytological quality and better cytological evaluation.

G-05

EUS-guided Interventions in Patients with Malignant Afferent Loop Syndrome

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Endoscopic ultrasound (EUS)-guided interventions have emerged as a promising alternative for managing malignant afferent loop syndrome (MALS), a rare complication following upper abdominal surgeries. Traditional treatments like palliative surgery or percutaneous drainage are being supplemented by EUS-guided techniques, which offer less invasive options with high success rates.

EUS-guided gastrojejunostomy (EUS-GJ) and EUS-guided hepaticogastrostomy (EUS-HGS) are two primary interventions. EUS-GJ involves creating a connection between the stomach and the jejunum using a fully covered self-expandable metal stent (FCSEMS). This method has shown high technical and clinical success rates, with minimal adverse events and acceptable recurrence rates. EUS-HGS, on the other hand, provides biliary drainage by creating a connection between the stomach and the bile ducts. It is particularly useful when EUS-GJ is not feasible or has failed.

Studies have demonstrated that EUS-guided interventions outperform percutaneous drainage in terms of clinical success, reduction in bilirubin levels, and lower rates of adverse events. These techniques offer a viable and effective alternative for patients with MALS, improving their quality of life and reducing the need for re-interventions.

In summary, EUS-guided interventions, particularly EUS-GJ and EUS-HGS, are effective and safe options for managing malignant afferent loop syndrome, providing significant benefits over traditional methods.

G-06

Computer-aided Quantification of Time-intensity Curves Derived from Contrast-enhanced Harmonic Endoscopic Ultrasound Imaging

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Contrast-enhanced harmonic endoscopic ultrasound (CEH-EUS) has emerged as a valuable tool for differentiating between various types of pancreatic tumors, due to its capability to reveal the microvascular structure of these tumors. However, most CEH-EUS images are currently assessed subjectively, without incorporating quantitative analyses such as time-intensity curves (TICs).

CEH-EUS images can be converted into TICs, which represent as indicators of vascular patterns. Various parameters can be extracted from TICs, including the area under the curve, appearance time, peak enhancement, time to peak, wash-in time, wash-in rate, wash-out time, and wash-out rate. These TICs enable quantitative CEH-EUS, facilitating comparisons of the vascular patterns associated with different pancreatic tumors.

However, significant variability affects the image results, complicating comparisons across different imaging sources. This variability arises from factors related to the scanner settings, patient characteristics, and the properties of the microbubbles used.

In this presentation, I will discuss the current progress toward achieving the goal of quantitative CEH-EUS.

G-07

Application of Intraductal EUS for the Biliopancreatic Disease

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Intraductal endoscopic ultrasound (IDUS) has emerged as a promising diagnostic and therapeutic tool for biliopancreatic diseases. By integrating the capabilities of endoscopic ultrasound (EUS) with intraductal visualization, IDUS offers a high-resolution assessment of the biliary and pancreatic ducts, enhancing the accuracy of diagnosis for conditions such as choledocholithiasis, cholangiocarcinoma, and pancreatic ductal adenocarcinoma. This technique involves inserting a miniature EUS probe directly into the biliary or pancreatic duct, allowing for detailed imaging of the ductal walls and adjacent structures, which often results in more precise identification of subtle lesions compared to conventional imaging methods.

The application of IDUS is particularly valuable in differentiating between benign and malignant biliopancreatic strictures, a frequent diagnostic challenge. The high-resolution imaging provided by IDUS facilitates the detection of early-stage malignancies, improving early intervention outcomes. Moreover, it plays a significant role in the evaluation of indeterminate biliary strictures, identifying lesions that may be missed by other diagnostic modalities such as endoscopic retrograde cholangiopancreatography (ERCP) or magnetic resonance cholangiopancreatography (MRCP). Therapeutically, IDUS has been utilized in conjunction with ERCP for targeted biopsies and interventions, further enhancing its utility in managing complex biliopancreatic pathologies.

Despite its advantages, the application of ID-EUS remains technically demanding and requires specialized equipment and expertise. However, with advances in imaging technology and procedural techniques, IDUS is expected to play an increasingly central role in the diagnosis and management of biliopancreatic diseases, offering a less invasive, more precise alternative to traditional approaches.

G-08

Characteristic of CEH-EUS of Metastatic Liver Malignancy

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At present, contrast-enhanced computed tomography (CE-CT) has been widely used as a standard imaging modality to determine the stage of malignancy. However, it cannot detect liver metastases smaller than 1 cm efficiently, considering that the accurate detection rate of liver metastasis by CE-CT is around 50%. Since its first description in 1999, EUS has become an alternative diagnostic modality for diagnosing and detecting liver tumors. The basic technique of EUS, that is, fundamental B-mode EUS (FB-EUS), can detect liver metastases that are undetectable in conventional imaging modalities. In addition, EUS has an advantage over other imaging modalities in that samples for histopathological evaluation can be obtained by fine-needle aspiration (FNA) during this procedure.

Contrast-enhanced imaging technology using microbubble sonographic contrast agents (Ex. Sonazoid) has been recently developed, and contrast-enhanced harmonic EUS (CH-EUS) has emerged as a powerful imaging modality to assess the microvasculature and hemodynamics of target lesions in real time. Several papers have previously been reported that CH-EUS is clinically useful with its ability to visualize microvascular structures of the tumors, it exhibits extremely high sensitivity for detecting small tumors. Different metastatic hepatic malignancy may present their own characters, therefore this lecture focused on the characteristic of CEH-EUS of metastatic liver malignancy.

G-09

AI in NAFLD and HCC: Diagnostic Role of Imaging

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Ultrasound (US) is the most common screening tool for fatty liver, liver cirrhosis, and hepatocellular carcinoma (HCC). However, the staging of hepatic steatosis and fibrosis and the diagnostic performance of ultrasound are highly operator-dependent and should be performed by experienced personnel. We aimed to develop deep learning models for accurately staging hepatic steatosis and automatically detect and diagnose hepatic lesions in a larger dataset with HCC as the dominant malignancy.

There are three methods to quantify fatty liver disease, including comparing bright levels of liver and kidney, measuring attenuation of US signals, and quantifying scattered signal distribution. The Hepato-Renal Index (HRI) is the brightness ratio of the liver parenchyma over the renal cortex in each selected ROI. Some software automatically places 2 ROIs on the optimal position in the liver parenchyma and renal cortex, reducing scanning time and inter- and intra-observer variability. The attenuation means energy loss of ultrasound wave with a hypoechoic appearance at the distant field and increasing values with fat content. The backscatter means microstructural properties in tissue with echogenic appearaance

We enrolled patients diagnosed with hepatic tumors by the abdominal US from January 2002 to December 2020 in a retrospective cohort with the diagnosis of malignant (HCC, cholangiocarcinoma, and metastasis) and benign lesions (hepatic cysts, hemangiomas, focal fatty sparing, focal nodular hyperplasia, and other benign findings). 1,576 patients with 4,600 images, and 6,001 lesions were analyzed. Deep learning models included ResNet50, Xception, Inception Resnet V2, and EfficientNet-B5 for non-real-time classification and YOLO v4 for lesion automatic detection and diagnosis. We analyzed the receiver operating characteristic (ROC) curve to determine the diagnostic performance. Then, the mean Average Precision (mAP) score was evaluated for lesion detection by the area under the precision-recall curve after the average of each category.

G-10

Cryoablation for Liver Malignancy

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Image-guided percutaneous ablation for primary and metastatic liver tumors has become increasingly important for patients who are not suitable for surgical treatment. However, the absence of clear guidelines means that the choice of devices and techniques largely depends on what is available and the operator's preference. According to the current data, cryoablation appears to be a safe treatment modality for liver cancer. In this talk, we will review the current state of different ablation methods and evaluate the feasibility of cryoablation in liver tumors.

G-11

RT for HCC, Photon, Proton or Carbon

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Hepatocellular carcinoma (HCC) is one of the most common cancers in the world. Most HCC patients have impaired liver function due to hepatitis or liver cirrhosis, and only approximately 20-40% of patients are candidates for resection. Maximal preservation of normal liver volume and function is an important consideration in the choice of treatment.

For early-stage small liver tumors (BCLC 0/A), photon stereotactic body radiotherapy (SBRT) has also achieved good results in both retrospective and phase I/II trials, with a 2-year local control (LC) rate of about 80-95%. The survival rate of SBRT is similar to that of radiofrequency ablation (RFA).

Proton beam therapy (PBT) for HCC treatment has been applied for decades, and many clinical results have shown excellent 3-year to 5-year local control (LC) rates ranging from 85-95%, with nearly no major complications.

Heavy particles, in comparison to photons or protons, can induce a stronger relative biological effectiveness (RBE; photon: proton: carbon = 1: 1.1: 3). A threefold increase in RBE does not equal a threefold increase in therapeutic effectiveness. The more powerful the treatment weapon, the more carefully the patients must be selected. There is no absolutely superior treatment method, only the most suitable one.