**PBS-1**

**Whether a Wait-and-See or Choleretic Therapy Is Effective in Acalculous Gallbladder Following Removal of Biliary Stones?**

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**Backgrounds:** In patients with acalculous gallbladder in situ after complete removal of common bile duct (CBD) stones, there is no definite guideline for the management of remnant gallbladder. Aim: To evaluate whether a wait-and-see policy or add on therapy with choleretics is justified in acalculous gallbladder in situ following complete removal of CBD stones by ERCP.

**Methods:** Patients were randomized to a 3-month add-on therapy with choleretics (UDCA 600 mg or T erpene derivatives 300 mg/day) (Group A) or just wait-and-see policy (Group B) after complete clearance of CBD stones by ERCP. None of the patient had definite gallstones in the gallbladder except for sludge. The primary outcome was new development of biliary complications between the two groups during a observational period.

**Results:** Two hundred and eighteen patients were enrolled; 110 of the 218 patients were randomized to the group A and the others were randomized to the group B after complete removal of CBD stones. Number of CBD stones, dilatation, and mean number of ERCP sessions for complete CBD clearance were not different between the two groups. Median follow-up period was 701 days (range, 105-1523) in group A and 565 days (93-1229) in group B. After the median follow-up of approximately 2 years, 11 patients (10%) in group A returned with further biliary events (cholecystitis requiring cholecystectomy, n=2; cholangitis requiring ERCP, n=9). Among the patients in group B, 15 (13.9%) returned with further biliary events (cholecystitis requiring cholecystectomy, n=2; cholangitis requiring ERCP, n=13). There was no choleretics-related complication requiring additional therapy or withdrawal. Median biliary event-free survival was not different (636 vs. 402 days, Log-rank p=0.066).

**Conclusions:** During the observational period, biliary complications were more frequent in the wait-and-see group without statistical difference. Further long-term follow up is required to reach statistical difference.

**Key Words:** ERCP, Gallbladder in situ, Choleretics, Bile duct stones

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**PBS-2**

**Intraductal Ultrasonography-Directed Management of Bile Duct Stones without Radiocontrast Cholangiogram**

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**Background/Aims:** Intraductal ultrasonography (IDUS) is an examination of the bile duct using a thin-caliber ultrasonic probe, yielding real-time, high-quality cross-sectional images. We prospectively evaluated the feasibility and safety of IDUS-directed stone removal without radiocontrast cholangiogram (RC) in naïve patients with common bile duct (CBD) stones.

**Methods:** A total of 38 naïve patients with suspected CBD stones (<20mm in size) were enrolled in this study. If echogenic materials with acoustic shadow were seen with IDUS, we performed endoscopic sphincterotomy and removed the identified CBD stones. The primary outcome was success rate of CBD stones removal without RC. The secondary outcomes were conversion rate to conventional endoscopic retrograde cholangiography (ERC) with RC, fluoroscopy time, clinical responses, and complications.

**Results:** A total of 38 naïve patients (13 males) with suspected CBD stones were included in this study. The median age was 69.0 years. IDUS was successfully performed in all enrolled patients (38/38,100%). No echogenic material was observed in 3 patients (1 Mirrizzi syndrome, 2 spontaneous passages of CBD stones). IDUS-directed stone removal was successfully performed without RC in 35 patients with CBD stones (35/35,100%). There was no conversion to conventional ERC with RC. Median fluoroscopy time was 10 sec (range, 0-336). There were no immediate and delayed complications related to the IDUS-directed stone removal. However, 3 (7.9%) patients developed asymptomatic hyperamylasemia and recovered without complications.

**Conclusions:** IDUS-directed stone removal without RC is feasible and safe for patients with CBD stones. We anticipate a potentially important role of IDUS in the field of various therapeutic interventions.

**Key Words:** Cholangiography, Endoscopic retrograde, Ultrasonography, Intraductal, Common bile duct calculi
Do Balloons Larger than 15 mm in Size Increase the Risk of Adverse Events in Endoscopic Papillary Large Balloon Dilation?

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Background: Endoscopic papillary large balloon dilation (EPLBD) using large-diameter balloons (12-20 mm) was introduced to facilitate the removal of large bile duct stones and minimize the need for endoscopic mechanical lithotripsy (EML). In the current study, we aimed to assess whether balloons larger than 15 mm in size increase the risk of adverse events in EPLBD or not.

Methods: We retrospectively reviewed the ERCP database system of our center from March 2004 to July 2013 and recruited patients with bile duct stones who had received EPLBD. We analyzed the outcomes and adverse events of EPLBD based on balloon sizes.

Results: Of 279 patients, 114 patients belonged to the EPLBD with endoscopic biliary sphincterotomy (EPLBD-EST) group and 165 patients to the EPLBD without EST (EPLBD-alone) group. In the EPLBD-EST group, 49 patients used balloons larger than 15 mm (larger balloon group) and 65 patients used smaller balloons sized between 12 and 15 mm (smaller balloon group). There were no significant differences between the larger and smaller balloon groups in terms of adverse events, although there was a tendency toward the larger balloon group having a higher rate of severe to fatal adverse events (4.1% vs. 0.0%). In the EPLBD-alone group, 36 patients belonged to the larger balloon group and 129 patients to smaller balloon group. The adverse events did not differ significantly between the two groups, and no severe to fatal adverse event occurred in either group.

Conclusions: EPLBD with EST for removing bile duct stones seems to have a non-statistical, but prominent tendency toward severe to fatal adverse events when balloons larger than 15 mm are used, compared to a smaller balloon sized between 12 to 15 mm.

Key Words: EPLBD, Large balloon, Bleeding, Perforation

Clinical Characteristics of Multiple Recurrent Primary Common Bile Duct Stones

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Background and Aims: The common bile duct (CBD) stones which are remained at the location that originated called primary CBD stones. Recurrence rate of CBD stones after endoscopic treatment were known as 4 to 24 %. The aims of this study were to evaluate the clinical characteristics of multiple recurrent primary CBD stones during 11 years follow-up and risk factors for multiple recurrence of primary CBD stones compared to once recurrence group.

Methods and Materials: 96 patients had experienced recurrence of primary CBD stones after successful endoscopic treatment for primary CBD stones at Hanyang University Hospital from April 2003 to July 2014. Among 96 patients with recurrent CBD stones, 26 patients who had multiple recurrence that is more than 2 times of recurrence were included. We analyzed the clinical, endoscopic, radiologic and laboratory findings of patients with multiple recurrent primary CBD stones.

Results: The rate of multiple recurrence of primary CBD stones was 4.9 %. The mean age was 68.08 ± 9.89 years and male to female ratio was 1:1.6 (10:16). The patient who had most recurrent primary CBD stones experienced 11 times. Almost half of the patients had recurrence of primary CBD stones as following (3 times (n=8), 4 times (n=2), 5 times (n=1), 6 times (n=1), 8 times (n=1)). 15 patient received EPLBD for additional treatment of recurrent CBD stones. Enterococcus was most common pathogen in bile culture. We compared multiple recurrence group to once recurrence group. In univariate analysis, multiple recurrence group had more juxtaampullary diverticulum (10 (38.5%) vs 14 (20%), $p=0.046$) and pneumobilia (16 (61.5%) vs 20 (28.6%), $p=0.003$). In multivariate analysis, multiple recurrence group had more pneumobilia with statistical significance (OR 4.0, CI 1.56-10.3, $p=0.004$).

Conclusion: Pneumobilia was a independent risk factor for multiple recurrent primary CBD stones.

Key Words: Primary bile duct stones, Recurrent, Multiple, Risk factors
**PBS-5**

**Partially Covered versus Uncovered SEMSs with Anti-Migration Properties for Malignant Distal Biliary Stricture**

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**Background and Aims:** Self-expandable metal stent (SEMS)s have been widely used for the palliation of inoperable malignant distal biliary obstruction. The aim of our study was to compare the feasibility and outcomes of partially covered and uncovered SEMSs with an identical mesh structure and anti-migration properties such as low axial force and flared ends.

**Methods:** Patients who were diagnosed with inoperable malignant distal biliary obstruction between January 2006 and May 2013 at our center were randomly assigned to either partially covered SEMS or uncovered SEMS (BONASTENT, Standard-Sci Tech, Korea), and the following parameters were prospectively compared: cumulative stent patency, overall patient survival, stent dysfunction-free survival, adverse events.

**Results:** Of 103 patients, the partially covered SEMS group included 51 and the uncovered SEMS group included 52. There were no statistically significant differences in the cumulative stent patency, overall patient survival, stent dysfunction-free survival, incidence of pancreatitis and cholecystitis between both stent groups ($p=0.795, 0.276, 0.953, 0.118, \text{ and } 0.073$). Albeit statistically non-significant, 3 cases of stent migration were encountered in the partially covered SEMS group, while not in the uncovered SEMS group; two of these stent migration cases were in patients with ampullary cancer, and the remaining one was in a patient with cancer in the upmost distal bile duct with short-length stricture, while no stent migration was encountered in patients with pancreas cancer.

**Conclusions:** There were no statistically significant differences in the cumulative stent patency, patient survival, stent dysfunction-free survival, and adverse events between the partially covered and uncovered SEMSs with an identical mesh structure and anti-migration properties. Migration of partially covered SEMSs was mainly encountered in patients with cancer of the ampullary or upmost distal bile duct with a short-length stricture.

**Key Words:** SEMS, Covered stent, Uncovered stent, Biliary stricture

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**PBS-6**

**The Therapeutic Outcomes of Fully Covered Self-Expanding Metal Stent in Benign Biliary Strictures**

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**Aim:** Fully covered self-expanding metal stents (FCSEMSs) have become accepted as a treatment tool of benign biliary stricture (BBS). The purpose of this study was to identify the outcome of FCSEMSs in treatment of BBS.

**Methods:** Between September 2007 and October 2013, FCSEMSs were placed endoscopically in 132 patients with BBS at Asan Medical Center. The pre-procedure diagnoses included gallstone-related stricture, chronic pancreatitis, post-surgical stricture, post-transplant anastomotic stricture, and the other(n=12). The medical records of patients were retrospectively reviewed.

**Results:** The success rate of FCSEMS placement was 99.2%. The mean duration of stent time was 118.1±84.8 days. Stent placement-related adverse events, including pancreatitis (8.3%), cholangitis (6.1%), and duodenal perforation (0.9%), occurred in 25 patients. Stent removal was accomplished successfully in 98.2% of patients. Overall Stricture resolution rate was 78%. The rate of resolution was significantly lower in patients with chronic pancreatitis than other BBSs (68.1% vs. 83.5%, $p=0.033$). Stent migration (odds ratio, 0.21; 95% confidence interval, 0.09-0.51) and duration of indwelling stents, over 90 days (odds ratio, 2.99; 95% confidence interval, 1.26-7.09), were also associated with stricture resolution. Stent migration was reported in 41 patients. Migration rate was significantly related to presence of anchoring flap on stent (Odds ratio, 0.302; 95% confidence interval 0.097-0.936; $p=0.031$). The rate of stricture recurrence was 25.2% and median duration of stricture recurrence was 390 days (range 4-903). The stricture recurrence tended to be more frequently occurred in patients with chronic pancreatitis than the others etiology of BBSs (35.3% vs. 19.7%, $p=0.033$).

**Conclusion:** In this study, FCSEMSs showed satisfactory results for treatment of BBSs in terms of a high success rate of stent placement and removal, and stricture resolution.

**Key Words:** Biliary tract disease, Benign stricture, Stent
**PBS-7**

### 12 mm Non-Flared Fully Covered Metallic Stent Having Long Lasso for Intraductal Placement for Malignant Biliary Stricture

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**Background and Aims:** Suprapapillary intraductal placement of fully covered self-expandable metallic stent (FCSEMS) for malignant biliary stricture (MBS) may prevent duodeno-biliary reflux and cholangitis. Non-flared, convex both ends of FCSEMS can minimize ductal injury by stent itself. Thus, intraductal placement of a non-flared FCSEMS can be a novel stent for MBS. The aim of this study was to evaluate the efficacy of newly modified, non-flared FCSEMS having 12mm in diameter with long lasso for intraductal placement in patients with MBS.

**Methods:** 34 Patients with MBS and obstructive jaundice were enrolled in this study. The non-flared FCSEMS has 12mm in diameter with central portion of 8mm and long lasso of 7cm in distal end. Newly modified metallic stent was placed above the papilla. The main outcome was mean stent patency, and adverse effect. Perioperative complications were accessed in cases that undergone surgical resection of MBS.

**Results:** Technical and clinical success rate was 100%. Early complications (≤30 days) were occurred in 1 patient (post-procedure mild pancreatitis). Eight patients received surgery after stenting, and there were no peri- or postoperative complications. The mean stent patency was 277 days (range, 34-456). Late complications (>30 days) were occurred in 26.9% (7/26) with stent migration in 2 patients, and stent occlusion in 5 patients.

**Conclusions:** Intraductal placement of the non-flared FCSEMS with large diameter of 12mm can be a novel stent in patients with MBS for both preoperative and palliative management. Long-term follow up and prospective comparative studies with large number of patients were needed to evaluate the usefulness of intraductal placement of this stent.

**Key Words:** Malignant biliary stricture, Covered self-expandable metallic stent

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**PBS-8**

### Small Cell versus Large Cell-Sized Metal Stent in Endoscopic Bilateral Stent-In-Stent Placement for Malignant Hilar Biliary Obstruction

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**Background and Aims:** Although the large cell-sized biliary stent facilitates the contralateral stent deployment through the mesh of the first metallic stent for stent-in-stent (SIS) technique, there are concerns about the vulnerability to tumor ingrowth. The aim of this study was to compare the clinical outcomes of endoscopic bilateral SIS placement according to the cell size of a self-expandable metallic stent (SEMS).

**Patients and Methods:** A total of 58 patients were enrolled who underwent an endoscopic bilateral SIS placement of SEMS for malignant hilar biliary obstruction due to cholangiocarcinoma or gallbladder cancer. Finally, 43 patients who underwent a successful stent insertion were included in the analysis and divided into the small cell-sized stent (SCS) and large cell-sized stent (LCS) groups. We retrospectively compared comprehensive clinical and laboratory data in both groups.

**Results:** There were no significant differences in clinical characteristics between the SCS (n = 21) and LCS (n = 22) groups. Successful drainage was achieved for all 43 patients (100%) and both groups did not significantly differ in early complications (38.1% vs. 18.2%, p=0.146), late complications (14.3% vs. 22.7%, p=0.698) and tumor ingrowth (33.3% vs. 45.5%, p=0.416). The duration of stent patency and overall survival were not significantly different between the two groups (p=0.086 and p=0.320, respectively).

**Conclusions:** The endoscopic bilateral SIS placement for malignant hilar biliary obstruction shows no differences in stent patency, survival, complications and clinical courses according to the cell size of SEMS.

**Key Words:** Cell size, Malignant hilar biliary obstruction, Self-expandable metallic stent, Stent-in-stent
PBS-9

Diagnostic Approach Using EUS-FNB and Transpapillary Biopsy according to IDUS Findings in Malignant Biliary Obstruction

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Background and Aims: Although tissue sampling on ERCP is an initial procedure for histologic diagnosis of malignant biliary obstruction (MBO), EUS-guided sampling is emerging as an accurate diagnostic procedure. However, the diagnostic yields of EUS and ERCP-guided sampling on MBO were reported variously. The aim of this study was to evaluate the usefulness of the diagnostic approach using EUS-guided FNB (EUS-FNB) and ERCP-guided transpapillary biopsy (TPB) according to intraductal ultrasonography (IDUS) finding in patients with suspected MBO.

Patients and Methods: A total of 151 patients with suspected MBO underwent IDUS and TPB during ERCP at first. Based on the result of IDUS, all patients were classified as 72 patients (47.7%) with intrinsic type and 79 patients (52.3%) with extrinsic type of MBO. If the malignancy was not confirmed by initial TPB, 2nd endoscopic TPB for intrinsic type of MBO and EUS-FNB using a core biopsy needle for extrinsic type of MBO was performed, respectively.

Results: The overall diagnostic accuracy of 1st endoscopic TPB was 76.2%. The diagnostic accuracy of 1st endoscopic TPB in intrinsic type was significantly higher than in extrinsic type (84.7% vs 68.4%; p=0.022). In 11 patients of intrinsic type with negative for malignancy by 1st TPB, 2nd endoscopic TPB was achieved a diagnostic accuracy with 72.7%. In 25 patients of extrinsic type with negative for malignancy by 1st TPB, the diagnostic accuracy of EUS-FNB was 88.0%. The overall diagnostic accuracy of 1st TPB combined with 2nd TPB in intrinsic type and EUS-FNB in extrinsic type was 96.0%.

Conclusions: The TPB appears still a useful initial tool to be able to diagnosis and treatment of patients with MBO at the same time on ERCP. In addition, the diagnostic approach using 2nd endoscopic TPB or EUS-FNB according the IDUS findings is considered highly effective to improve a histologic diagnostic accuracy of MBO in patients with negative for malignancy by 1st trial of endoscopic TPB.

Key Words: Endoscopic ultrasonography, Fine needle aspiration biopsy, Bile duct obstructions, Intraductal ultrasonography

PBS-10

Comparing ProCore® Needle with Conventional Fine Needle in EUS-Guided Tissue Sampling for Suspected Pancreatic Cancer

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Background and Aims: The ProCore® needle was thought to be more accurate than endoscopic ultrasound (EUS)-guided fine needle aspiration (FNA). But, the EUS-FNA showed excellent yields in the large pancreatic lesions which seemed to be comparable to ProCore® needle and there was no head to head comparison of these needles. Therefore, we compared diagnostic accuracy of ProCore® needle with conventional fine needle in patients with suspected unresectable pancreatic cancer.

Patients and Methods: We conducted randomized controlled non-inferiority study at Samsung Medical Center between July 2013 and August 2014. A total of 30 consecutive patients who was suspected to have an unresectable pancreatic cancer were enrolled. They were randomized to either first FNA group or first ProCore® group. We performed four needle passages on each patient with twice by FNA (NA-230H-8022; Olympus Medical Systems) and twice by ProCore® (ECHO-HD-22-C; Wilson Cook Medical) needle. The primary outcome was diagnostic accuracy between two groups. The secondary outcomes included yield of core tissue retrieval, and rate of complication. This study was supported by Olympus Medical Systems Corporation.

Results: Among the 30 patients, 16 patients were enrolled to FNA group and 14 patients were enrolled to ProCore® group. There was no significant difference in age, gender, size and location of the lesion, and laboratory findings between two groups. The overall diagnostic accuracy was 93.8% (15/16) in FNA group and 100% (14/14) in ProCore® group (p=0.34). Furthermore, the yield of core tissue retrieval showed no difference between 2 groups (93.8% vs. 78.6%, p=0.22). None of the complication including bleeding, infection and pancreatitis was reported.

Conclusions: The diagnostic accuracy, yield of core tissue retrieval, and safety profile is comparable between conventional fine needle and newly developed ProCore® needle in suspicious unresectable pancreatic cancer.

Key Words: Pancreatic cancer, EUS-FNA, ProCore
The Estimation of Contrast Enhanced Harmonic Endoscopic Ultrasound in the Differentiation of Lymphadenopathy

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**Background:** Although contrast enhanced harmonic EUS (CEH-EUS) has been used to differentiate solid pancreatic mass, there is no data to its application in the evaluation of lymphadenopathy. We evaluated retrospectively the contribution of CEH-EUS to the differentiation of malignant lymphadenopathies by observing enhancement pattern after injection of contrast agent.

**Patients and Methods:** Between Aug 2013 and Apr 2014, 50 patients with suspected lymphadenopathy were retrospectively enrolled. All lymph nodes were examined by CH-EUS and enhancement degree was checked according to contrast injection time: early and late phase. Standard diagnosis was obtained by means of fine-needle aspiration cytology, surgical biopsy, or enlargement of lymphadenopathy on follow up image modality.

**Results:** Among 50 patients with lymphadenopathy, 12 were excluded due to no lymph node in final diagnosis (n=1), insufficient final data (n=10), and no histologic diagnosis (n=1). Of lymph nodes examined, 31 were malignant and 7 were benign. Hypo-enhancement during early phase was detected in 20, of which 18 were malignant and 2 were benign. Hypo-enhancement during late phase was identified in 32, of which 28 were malignant and 4 were benign. Among 31 malignant lymphadenopathies, 28 were revealed as malignant by EUS-FNA. Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy was 58.06%, 71.43%, 90%, 27.78%, 60.53% in early hypo-enhancement pattern, respectively, and 90.32% (p=0.004), 42.86% (p=0.592), 87.5% (p=1.000), 50% (p=0.362), 81.58% (p=0.04) in late hypo-enhancement pattern. There was statistically higher sensitivity and accuracy in late hypo- or non-enhancement pattern compared to early hypo or non-enhancement pattern. But there was not different statistically in diagnosis of malignant lymphadenopathy between late hypo- or non-enhancement and EUS-FNA.

**Conclusion:** CH-EUS may be a useful noninvasive methods in differentiating lymphadenopathies.

**Key Words:** Endoscopic ultrasound, Contrast, Lymphadenopathy, Malignancy, Enhancement

Diagnostic Efficacy of Endoscopic Ultrasound Elastography for Pancreatic Disease in Korea

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**Background/Aims:** Endoscopic ultrasound elastography (EUS-EG) represents a new imaging procedure that allows quantification of tissue stiffness, with a high degree of accuracy for the differential diagnosis of pancreatic disease. The aim of this study was to evaluate the efficiency of quantitative EUS-EG for the differentiation of normal pancreas, chronic pancreatitis (CP), and pancreatic cancer (PC).

**Methods:** Between January 2014 and August 2014, 37 patients with PC, 25 patients with CP and 406 patients without pancreatic disease who underwent EUS were prospectively enrolled. EUS-EG was performed using linear Pentax EUS and Hitachi HI VISION Preirus. The quotient B/A (strain ratio; SR) is considered as the measure of the elastographic evaluation. Area A is representative of the pancreatic lesion strain. Area B refers to a soft peripancreatic tissue strain. The SR results were measured at the head and body, respectively. Results and Conclusions: A total of 406 patients (mean age 58 years, 201 male) were included. The median SR was 3.6 (1.5-8.8; min-max) for normal, 7.1 (3.6-29.6) for CP, 17.2 (5.4-391.3) for PC. There was not significant linear correlation between the SR and patient’s age in normal pancreas. The SR was different significantly in three groups respectively (NP vs. CP; p<0.001, NP vs. PC; p<0.001, CP vs. PC; p<0.001). The area under the curve (AUC) of EUS-EG for diagnosing CP was 0.819 (95% confidence interval (CI) 0.775-0.863), the sensitivity and specificity was 84.0% and 80.0% (cut off SR of 5.45). The AUC of EUS-EG for PC was 0.966 (95% CI 0.944-0.988), the sensitivity and specificity was 94.6% and 98.6% (cut off SR of 9.15). In our study, we provided the reference range of SR value of normal pancreas, CP, and PC respectively as well as good parameters of the AUC analysis. Also, EUS-EG is a promising useful method for differentiating normal pancreas, CP and PC. Further research in this method is needed.

**Key Words:** EUS, Elastography, Strain ratio, Chronic pancreatitis, Pancreatic cancer
Endoscopic Papillary Large Balloon Dilation with versus without Sphincterotomy for Large Common Bile-Duct Stone

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Aim: We aimed to compare prospectively safety and efficacy of endoscopic papillary large balloon dilation (EPLBD) with preceding endoscopic sphincterotomy (EST) to those of EPLBD without EST for the treatment of large common bile-duct (CBD) stone.

Methods: Two hundred patients with large CBD stone were prospectively enrolled in four tertiary referral centers from July, 2010 to August, 2014. The patients were randomly allocated into A group (EPLBD with EST) and B group (EPLBD without EST) and each group had 100 patients. The endoscopic procedure was performed according to the protocol (12 mm or more of balloon diameter; 60 seconds of balloon dilation time; single session of EPLBD; minor EST) in each group. Procedure-related adverse events, mortality, and technical success were evaluated in each method, and the clinical outcomes were compared between both groups.

Results: Overall adverse event rate was 5% and 1% respectively in A and B groups (p=0.097). The difference of post-ERCP pancreatitis rate between both groups was not significant statistically (3% vs. 1%, p=0.621). Perforation and major bleeding did not occurred in both groups. There was no procedure-related mortality in both groups. Overall success rate was not different in A and B groups (88% vs. 92%, p=0.345) as well as initial success rate (78% vs. 77%, p=0.28). And the difference of mechanical lithotripsy rate in both groups was not significant (8% vs. 6%, p=0.579).

Conclusions: The current data show that both EPLBD with preceding EST and EPLBD without EST are safe and effective for the treatment of large CBD stone. It is suggested that implementation of EST first before the procedure is not essential to ensure safety and efficacy of EPLBD.

Key Words: Balloon Dilation, Sphincterotomy, Endoscopic, Choledocholithiasis

Direct POC Using a Multibending Ultraslim Endoscope: Novel Method for Free Hand Insertion of a Scope into the Bile Duct

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Background and Aims: Direct peroral cholangioscopy (DPOC) using an ultraslim endoscope has been increasingly applied for diagnosis and treatment of diverse biliary diseases. However, the usefulness of DPOC is limited by low, inconsistent success rates. The success rate can be increased by assistance of several accessories, but it’s technically demanded and cumbersome. In addition, maintenance of desired scope position during interventional procedure is difficult. The aim of this study was to evaluate the success rate of free-hand direct insertion into the bile duct using a newly developed multibending ultraslim endoscope as for a dedicated cholangioscope for DPOC.

Patients and Methods: A total of 52 patients with biliary disease were prospectively enrolled. Each patient was performed two trials of DPOCs using a multi-banding cholangioscope (Olympus Co., Tokyo, Japan) after a conventional ultraslim scope (GIF-XP290N, Olympus) without assistance of accessories. If a multibanding DPOC without accessory failed, an intra-ductal balloon-guided DPOC was performed. The success was defined as successful advancement of the endoscope into the bifurcation or the obstructed segment of the biliary tree within 15 minute without accessory.

Results: The success rate of a multibanding DPOC without accessory was significantly higher than a conventional DPOC (90.4% vs. 28.8%; p<0.001). The 5 patients failed in multibanding DPOC without accessory were all success with an intraductal balloon-guided multibanding DPOC. The success of interventional procedures was achieved with 36 of 37 (97.8%) trials including 11 intraductal biopsies, 9 intraductal lithotripsy. Adverse event was observed in one patient of mild hemobilia.

Conclusions: A high success rate of free hand direct insertion of a scope into the bile duct was achieved with newly developed multibending ultra-slim endoscope with experienced endoscopist. DPOC without assistance of accessories can be possible with further development.

Key Words: Direct peroral cholangioscopy
Background and Aim: Endobiliary radiofrequency ablation (EB-RFA) is a new endoscopic palliation and adjunctive tool. Although EB-RFA has been increasingly performed worldwide, the main concern is the likelihood of an iatrogenic thermal injury leading to perforation or bleeding. Therefore, we aimed to assess the effects of thermal and coagulation injury after in vivo EB-RFA using a novel RFA catheter (ELRA® RF catheter, STARmed, Korea).

Method: Twelve mini-pigs were divided into four groups according to electrode length (33 vs. 18 mm) and RFA target temperature (75 vs. 80 °C). All pigs underwent endoscopic retrograde cholangiography (ERC) and EB-RFA for 120 seconds. Additional cholangiogram was taken immediately after RFA, and all pigs were sacrificed after 24 hours to assess the macroscopic/microscopic RFA injury.

Results: The ERC and application of the EB-RFA was successful in 100%, and post-RFA cholangiogram did not show the contrast leakage. Macroscopic ablation length and microscopic maximal injury depth of 33mm RFA electrode were significantly longer and deeper than those of 18mm (24.3±2.0 vs. 18.5±3.3 mm, p=0.015; 2.93±0.67 vs. 2.05±0.27 mm, p=0.002). Microscopic ablation area (microscopic ablation length x maximal injury depth) of 33 mm electrode was also significantly larger than that of 18 mm (55.0±13.3 vs. 36.5±8.0 mm², p=0.015). However, there were no statistically differences of macroscopic/ microscopic ablation related parameters according to target temperature. In addition, the assessment of resected specimen in 24 hours after RFA did not show any perforation or bleeding.

Conclusion: The novel RFA catheter (ELRA®) is easy to handle, and can effectively deliver RF energy to the bile duct. The EB-RFA of target temperature of 75-80°C and 2 minutes is safe and has no complication in vivo swine model. Further clinical studies are warranted in order to validate the effectiveness of EB-RFA for patients with malignant biliary obstruction.

Key Words: ERCP, RFA, Endobiliary, Animal, Experiments
**PBS-17**

**Prophylactic Pancreatic Stent Placement after Duodenal Endoscopic Snare Papillectomy: Prospective, Randomized study**

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**Background and Aims:** Endoscopic snare papillectomy (ESP) is an efficient treatment for benign tumors of the duodenal major papilla. However, acute pancreatitis is the most common and serious complication following an ESP. The aim of this study was to compare the rate of post-ESP pancreatitis in patients who did or did not receive prophylactic pancreatic stent placement.

**Methods:** From March 2010 and June 2014, consecutive patients who were to undergo ESP were randomized to pancreatic stent placement group (stent group) after ESP or to no pancreatic stent placement group (No stent group). The overall outcomes after ESP including complications were compared between the two groups.

**Results:** The 38 patients who received ESP for the treatment of major duodenal papillary tumors were enrolled. 21 patients were assigned to the stent group and 17 patients to the no stent group. Post-ESP pancreatitis developed in 8 patients (21.1%, 8/38), The overall incidence of Post-ESP pancreatitis were 23.8% (5/21) in the stent group and 17.6% (3/17) in the no stent group (p = 0.709). Although there was no statistical significance, post-ESP pancreatitis was higher in the stent group.

**Conclusions:** The development of post-ESP pancreatitis were not significantly different in patients with prophylactic pancreatic stent placement compared to those without it. Our data suggest that the effectiveness of prophylactic pancreatic stent placement after ESP may be doubtful. Therefore, more large scaled prospective, randomized controlled studies regarding the effectiveness of pancreatic duct stent placement to reduce incidence of post-ESP pancreatitis are needed.

**Key Words:** Endoscopic snare papillectomy, Pancreatitis, Prophylactic pancreatic stent

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**PBS-18**

**EUS-Guided Ethanol-Lipiodol Mixture Ablation Treats Small Pancreatic Neuroendocrine Tumors**

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**Background/Aims:** Little is known about the standard care of small (less than 2cm in diameter) pancreatic neuroendocrine tumors (PNETs). Recent advance in linear endoscopic ultrasonography (EUS) and the need for a minimally invasive modality have encouraged development of EUS-guided interventions for small PNETs. The present study evaluated the safety and efficacy after EUS-guided ethanol-lipiodol mixture ablation (EUS-ELM) for small PNETs.

**Methods:** Thirty-four patients with small PNETs who underwent EUS-ELM from March 2013 to April 2014 were prospectively enrolled. The technical feasibility, efficacy, and safety of EUS-ELM were analyzed.

**Results:** A total of 54 EUS-ELM sessions were successfully performed (mean, 1.59 sessions per patient, 1.32 sessions per tumor), which included 41 initial sessions and 13 repeated sessions owing to incomplete ablation. The mean diameter of the tumors was 10.6 mm (range 5-20 mm). No major complications, including pancreatitis, were seen in any patient. Thirty-three patients were followed up for a median of 12 months (range 6-19 months) and one patient underwent surgical resection because of high Ki-67 expression. A single treatment session with injection of 0.5-3.3 mL of ELM (mean, 1.4±0.86) mL resulted in complete response (CR) at 3-month CT imaging in 22 (55.0%) of 40 tumors. In 13 patients with a residual viable tumor, complete ablation was achieved with a second session of ELM ablation in 7 patients. Overall, primary technique effectiveness (PTE) rate was 72.5% (29 of 40). Significantly better PTE rate was achieved in patients with well-marginated lipiodol-uptake (capsulated) tumors than those with noncapsulated tumors (p = .004). Tumor progression was not observed during the follow-up.

**Conclusions:** EUS-guided ELM ablation can be used to treat PNETs less than 2.0cm in diameter safely and effectively, often in a single session. Tumor pattern (presence of capsule in lipiodol-uptake) may be the early predictive factor of PTE.

**Key Words:** EUS, Neuroendocrine tumor, Ethanol, Ablation
PBS-19

Long-Term Outcome of Endoscopic Transpapillary Gallbladder Drainage: A Single-Center Experience

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Background and Aims: The treatment of choice of acute cholecystitis is cholecystectomy. But there are patients who have high surgical risk or who cannot undergo immediate surgery. In such cases, endoscopic transpapillary gallbladder drainage can be a feasible alternative option. We reviewed long-term data of endoscopic transpapillary gallbladder drainage in single tertiary referral center.

Patients and Methods: Patients who underwent endoscopic transpapillary gallbladder drainage from June 2007 to August 2014 in Asan Medical Center were retrospectively reviewed. Procedure methods, success rate, complications and clinical courses were analyzed.

Results: A total of 172 patients underwent transpapillary gallbladder drainage. The reasons of the procedure were old age (65 years or older), underlying cancer, high surgical risk. 127 procedures were successful using stent or ENGBD (technical success rate 73.8%). Double-pigtail stent was successfully inserted in 97 patients (56.4%). The procedures were failed in 45 patients (26.2%) because of failed cystic duct cannulation, anatomic variation of cystic duct, non-visualization of cystic duct. The mean age of the patients treated with double-pigtail stent was 67.2 years (standard error 1.50, range 33-90), and mean follow-up periods of the patients were 20.4 months (standard error 2.17, range 1-86). Early adverse events (<1 month) were mild pancreatitis (n=17), cholangitis/choleangiohepatitis (n=9), cystic duct injury (n=1). Late adverse events (>1 month) were stent migration (n=5), and stent malfunction causing recurrent biliary pain (n=3). After the procedure, PTGBD was performed in 1 patient because of recurrent cholecystitis, and 17 patients underwent cholecystectomy. The mean stent patency was 17.8 months (standard error 2.185, range 1-61).

Conclusions: Transpapillary gallbladder drainage with double-pigtail stent can be a safe, feasible alternative option of cholecystectomy in patients who have high surgical risk.

Key Words: Endoscopic transpapillary gallbladder drainage, Cholecystectomy

PBS-20

Needle Knife Fistulotomy as an Initial Biliary Access in CBD Stone Patients at High Risk for Post-ERCP Pancreatitis

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Background/Aim: We intended to assess the feasibility of needle knife fistulotomy (NKF) as an initial procedure for biliary access in common bile duct (CBD) stone patients with high risk of post-endoscopic retrograde cholangiopancreatograph (ERCP) pancreatitis (PEP).

Method: A total of 53 patients who underwent ERCP using NKF for CBD stone at our institution between July, 2013 and August, 2014 were prospectively enrolled in this study. The procedures was performed by an expert biliary endoscopist (S.J.) who has experience of ERCPs (>500 ERCPs/year for 12 years). They had one or more of the following risk factors of PEP; young age (<60 years), female, or normal bile duct diameter (≤9 mm). Success rate of CBD cannulation and CBD stone removal, and post-ERCP complications such as pancreatitis, cholangitis, bleeding, or perforation were assessed.

Results: Of the 53 patients, 24 patients had one risk factor of PEP, 20 had two, and 9 had three. Median procedure time spent from CBD cannulation to CBD stone removal was 7.1 minutes (range, 2.0 - 28.0 minutes). Success rate of CBD cannulation and stone removal using NKF was 94.3% (50/53) and 98% (49/50), respectively. None of the patients experienced post-ERCP pancreatitis, cholangitis, bleeding, or perforation.

Conclusions: NKF can be feasible as an initial procedure for biliary access in CBD stone patients with high risk of PEP if the procedure will be performed by an expert biliary endoscopist.

Key Words: Needle knife, Biliary cannulation, Post-ERCP pancreatitis, ERCP, Complications
Multicenter Survey of the Patient’s Preference for Alternative Biliary Drainage after Failed ERCP

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Background: Endoscopic ultrasound-guided biliary drainage (EUS-BD) is an emerging alternative technique to percutaneous transhepatic biliary (PTBD) after failed ERCP, which has potential benefits such as internal drainage and physical convenience compared with PTBD. However, its clinical practice has been restricted due to limited data. The aim of this study was to evaluate patient’s preference for EUS-BD or PTBD in the tertiary referral centers when ERCP is unsuccessful.

Methods: We performed cross-sectional survey in 3 tertiary-referral centers, and enrolled 150 patients who received ERCP for the drainage of suspected malignant biliary obstruction. They were given a questionnaire that described the technique, the benefits, and the complication rates of EUS-BD and PTBD. And then, they were queried about their preference for biliary drainage as a salvage technique, the reasons for selection, their previous treatment experiences and the risks that they were willing to undergo for EUS-BD.

Results: Total 140 patients answered this questionnaire. One hundred five patients (75.0 %) of them wanted to undergo EUS-BD (one center which offered EUS-BD [40/44; 90.9%] vs. other two centers which did not offer [65/96; 67.7%]). The reasons for selection were followed: 1) internal drainage (80.0%), 2) higher success rate and acceptable complication rate (15.2%), 3) simultaneous procedure (12.4%), and 4) others (4.8%). Most patients (71.4%), who preferred PTBD, cited because of low complication rate. The previous treatment experiences such as endoscopy, ERCP, and PTBD does not influence the selection of biliary drainage techniques. The preference for EUS-BD significantly decreased according to increasing complication rate (p<0.001).

Conclusions: Most patients preferred EUS-BD to PTBD if overall adverse event in EUS-BD would be comparable to PTBD in this multicenter survey. EUS-BD may be a generally preferable procedure after failed ERCP.

Key Words: Endoscopic ultrasound, Biliary drainage, Percutaneous approach, Preference

The Utility of Intraductal US before Direct Peroral Cholangioscopy in Evaluation of Indeterminate Biliary Lesions

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Background: Although direct peroral cholangioscopy (POC) using an ultra-slim upper endoscope permits high resolution endoscopic images and tissue confirmation for indeterminate bile duct lesions, it has technical difficulty in performing. Therefore, indications of direct POC were not established. Intraductal ultrasonography (IDUS) can be easily applicable during endoscopic retrograde cholangiopancreatography (ERCP) and provide high-resolutional, cross-sectional images of the bile duct. We evaluated the utility of IDUS before direct POC in evaluation of indeterminate biliary lesions.

Methods: Total 48 patients with indeterminate biliary lesions in preceding conventional imaging modalities including ERCP were evaluated by IDUS. Based on the findings of IDUS, direct POC was performed in patients with suspicious malignant stringentes or other inconclusive findings. Patients with benign lesions like stone/sludge or nonspecific wall thickening undergone clinical follow-up after endoscopic treatment. Final diagnoses were confirmed by histopathologic results and/or clinical follow-up outcomes.

Results: IDUS diagnosed benign biliary lesions in 20 patients. All these patients had benign clinical outcomes during follow-up period. Direct POC was performed in 28 patients and successful in 27 patients (96.4%). Direct POC-guided target biopsy and histopathological confirmation were acquired in 25 patients. Final diagnoses by direct POC included 14 cholangiocarcinoma, 1 intraductal papillary neoplasm with dysplasia, 1 bile duct adenoma and 11 benign lesions. The sensitivity, specificity, and diagnostic accuracy of IDUS combined with direct POC for the diagnosis of malignant biliary lesions were 100%, 97.0%, and 97.9%.

Conclusion: IDUS may be useful for decision making of need of direct POC in evaluation of indeterminate biliary lesions. Stepwise evaluation with IDUS and direct POC using an ultra-slim endoscope was highly accurate in evaluation of indeterminate biliary lesions.

Key Words: Intraductal ultrasonography, Peroral cholangioscopy, Indeterminate biliary lesion
**PBS-23**

**Endoscopic Ultrasound-Guided Drainage without Fluoroscopic Guidance for Extraluminal Complicated Cysts**

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**Background and Aim:** Endoscopic ultrasound (EUS)-guided transmural drainage is generally performed under fluoroscopic guidance. But, several discomforts were developed because the rooms for fluoroscopic and EUS examination were separated in many centers. The aim of the present study was to retrospectively evaluate the safety and efficacy of endoscopic ultrasound (EUS)-guided drainage of extraluminal complicated cysts without fluoroscopic guidance.

**Methods:** We retrospectively reviewed for 9 patients aged 14 to 76 from November 2012 to July 2014 who had undergone non-fluoroscopic EUS-guided drainage of extraluminal complicated cysts. 10 procedures in 9 patients were performed via a transgastric (n=7), transduodenal (n=1) and transrectal (n=2) approach. One or two 7 Fr pigtail stents were inserted to establish complete drainage.

**Results:** The extraluminal complicated cysts included symptomatic large or infected pseudo cysts on pancreas (n=8), abscesses from perforated diverticulitis (n=1) and post-appendectomy complication (n=1). The mean size of lesions was 6.1 cm (range 2.8-10.1) and the mean time spent per procedure was 28 minutes (range 16-50). Endoscopic drainage was successful in 9 of 10 (90%) procedures in 9 patients. One patient with infected pseudocyst after pancreaticoduodenectomy had only aspiration due to poor patient cooperation and small sized cyst (2.8 cm). One 7 Fr pigtail stent was placed in 8 procedures. One patient placed two 7 Fr pigtail stents in infected pancreatic pseudocyst required an additional percutaneous catheter drainage in infected peripancreatic fluid collection. There were no complications of the procedure. All patients had symptomatic improvement and revealed radiological partial to complete resolution (1 loss) in short-term (1 week to 3 month) follow up CT findings.

**Conclusion:** EUS-guided drainage without fluoroscopic guidance is a technically feasible, safe and effective procedure of treatment for extraluminal complicated cysts.

**Key Words:** Endoscopic ultrasound-guided drainage, Extraluminal complicated cyst, Fluoroscopy

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**PBS-24**

**Comparison of Slow-Pull vs. Suction Technique for Histological Diagnosis in EUS Guided FNB of Solid Pancreatic Masses**

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**Background and Study Aims:** EUS-guided fine needle aspiration (EUS-FNA) of pancreatic masses is an established procedure for obtaining a pathological specimen. The efficacy of the slow-pull technique during EUS-guided fine needle biopsy (EUS-FNB) using core biopsy needle has been reported, but is still controversial. The aim of this study was to compare slow-pull technique and suction technique in histological results of solid pancreatic mass lesions.

**Patients and Methods:** Fifty-six consecutive patients with solid pancreatic masses who underwent EUS-FNB using 22- or 25-G core biopsy needle were prospectively enrolled in this study. After confirming of adequate cellularity on on-site cytology, 2 passes of needle using suction technique and then slow-pull technique was performed for each pancreatic solid mass during EUS-FNB. All acquired specimen from each EUS-FNB using suction technique or slow-pull technique was evaluated to sample quality and diagnostic yield for histological analysis.

**Results:** The success rates of adequate tissue sampling for histological evaluation were 94.6% and 96.4% with slow-pull technique and suction technique, respectively (p=0.647). The overall diagnostic accuracy for the malignancy using histologic samples was not significantly different between pull-back technique and suction technique (80.4% vs 82.1%, p=0.809). There were no procedure-related complications in both groups.

**Conclusions:** The sample quality and diagnostic yield for histologic evaluation in EUS-FNB were not significantly different in the slow-pull and suction technique. Therefore, the slow-pull technique may be considered as an alternative method for patients with inadequate on-site cellularity by suction technique.

**Key Words:** EUS-FNB, Pancreatic mass, Slow-pull technique, Suction technique
PBS-25

Comparison of Cytologic and Histopathologic Examinations in the Diagnosis of Pancreatic Malignancy Using EUS-FNA

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Background/Aims: Endoscopic ultrasound-guided fine needle aspiration (EUS-FNA) has become a crucial diagnostic technique for pancreatic malignancies. The specimen obtained by EUS-FNA can be prepared to either cytologic or histopathologic examinations. The aim of this study was to compare accuracy rates of cytology and histopathology in the diagnosis of pancreatic malignancy using EUS-FNA.

Methods: Seventy-eight consecutive patients who underwent EUS-FNA and diagnosed as pancreatic malignancies between September 2013 and August 2014 were retrospectively enrolled. Both cytologic and histopathologic specimens were obtained to reach total four passes by two passes each with a randomized order. The diagnosis was confirmed by surgical specimen, biopsy of metastatic lesions, or clinical outcome. The pathologic results of EUS-FNA specimens and final diagnoses were correlated to measure accuracy rates.

Results: The enrolled patients consisted of 44 males (56.4%) and 34 females (43.6%), with the mean age of 64.4 ± 11.2 years. The most common diagnosis was ductal adenocarcinoma (70/78, 89.7%), followed by neuroendocrine tumor (6/78, 7.7%). The order of getting cytologic and histopathologic specimen was equally distributed. The overall accuracy of cytology plus histopathology was 92.3% (72/78), while those of cytology and histopathology were 85.9% (67/78) and 74.4% (58/78), respectively, with significant difference (p=0.018). The concordance rate of cytology and histopathology was 75.6% (59/78). The accuracy of cytology was significantly higher than that of histopathology, especially in the proximal lesions (p=0.044) and size < 3 cm (p=0.044).

Conclusions: Our study suggests that the cytologic examination of EUS-FNA specimen is more accurate than histopathology in the diagnosis of pancreatic malignancy regardless of aspiration order, particularly when lesions are located proximally and smaller than 3 cm.

Key Words: Endoscopic ultrasound-guided fine needle aspiration, EUS-FNA, Pancreatic neoplasms, Cytology, Pathology

PBS-26

Combination of Cyst Fluid CEA, Cytology and Viscosity to Differentiate the Pancreas Cystic Lesions

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Background and Aims: Because mucinous cysts have malignant potential, it is important to distinguish mucinous cysts from non-mucinous cysts for optimal treatment. The objective of the study is to investigate the value of combination of cyst fluid CEA, cytology and viscosity in the differential diagnosis of mucinous vs. non-mucinous pancreatic lesions in single tertiary hospital in Korea.

Patients and Methods: We investigated retrospectively patients who underwent EUS-FNA and cyst fluid analysis between January 2008 to May 2014 in Samsung Medical Center. The results of EUS imaging, cytology, and cyst fluid CEA, string sign were collected and compared using surgical histology or typical clinical features of pseudocyst.

Results: Total 177 patients underwent EUS-FNA and cyst fluid analysis of a pancreatic cystic lesion; 43 of these patients underwent surgical resection (16 MCN, 13 IPMN, 6 SCN, 4 pseudocyst, and 4 others), 9 patients were clinically confirmed as pseudocyst without surgery. The mean cyst fluid CEA was greater in mucinous cysts (2893.35ng/mL) compared with nonmucinous cysts (7.8ng/mL). Receiver operator curve analysis of the tumor markers demonstrated that cyst fluid CEA (optimal cutoff of 48.6ng/mL) for differentiating mucinous vs. nonmucinous cystic lesions. Using this cut-off value, sensitivity and specificity of cyst fluid CEA was 72.4% and 94.7% for identifying mucinous cysts. The accuracy of cyst fluid CEA (39/48, 81.3%) was greater than the accuracy of cytology (23/45, 51.1%), string sign (33/47, 70.2%). Cytology, string sign and cyst fluid CEA combination tests showed increased accuracy (45/48, 93.8%).

Conclusions: Of tested method, cyst fluid CEA is a most useful single test available for identifying mucinous cystic lesions of the pancreas including MCN and IPMN. And the addition of cytology and string sign to cyst fluid CEA increases overall accuracy for diagnosis of mucinous pancreatic cysts.

Key Words: Pancreas cyst, Fluid CEA, EUS-FNA, Mucinous
PBS-27

ENGBD versus Gallbladder Stenting before Surgery in Patients with Acute Cholecystitis and CBD Stone: A Pilot Study

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Background and Aims: Endoscopic transpapillary gallbladder drainage has been proposed as an effective bridge therapy in patients with acute cholecystitis. Our aims of this study were to compare the technical feasibility, clinical and surgical outcomes between endoscopic naso-gallbladder drainage (ENGBD) and transpapillary gallbladder stenting (ETGS) followed by ERCP as a bridge method before cholecystectomy in patients with acute cholecystitis and a high suspicion of common bile duct (CBD) stones.

Patients and Methods: From March 2010 to May 2014, a total of 30 patients were randomly assigned to the ENGBD group (n=15) or ETGS group (n=15). Technical and clinical success, procedure related adverse events, and surgical outcomes were compared between two groups.

Results: ENGBD and ETGS groups had similar outcomes in terms of technical success rate (86.7% 13/15 vs 93.3% 14/15; p=1.000) and clinical success rate (92.3% 12/13 vs 100% 14/14; p=0.481). Procedure related adverse events were encountered in 20.0% (3/15) in the ENGBD group (1 cystic duct perforation, 1 severe pancreatitis, and 1 self removal of ENGBD catheter), and 6.7% (1/15) in the ETGS group (1 mild pancreatitis) (p=0.598). Procedure related adverse events were encountered in 20.0% (3/15) in the ENGBD group (1 cystic duct perforation, 1 severe pancreatitis, and 1 self removal of ENGBD catheter), and 6.7% (1/15) in the ETGS group (1 mild pancreatitis) (p=0.598). Procedure related adverse events were encountered in 20.0% (3/15) in the ENGBD group (1 cystic duct perforation, 1 severe pancreatitis, and 1 self removal of ENGBD catheter), and 6.7% (1/15) in the ETGS group (1 mild pancreatitis) (p=0.598).

Conclusions: The feasibility and efficacy of ENGBD and ETGS followed by ERCP are comparable as a bridge to surgery in patients with acute cholecystitis and CBD stone.

Key Words: PTGBD, ENGBD, Gallbladder stenting

PBS-28

Air-Cholangiography Assisted Endoscopic Bilateral Self-Expandable Metal Stents Insertion for Malignant Hilar Obstruction

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Background and Study Aims: Although endoscopic biliary drainage is one of the major palliative treatments for unresectable malignant hilar obstruction, post-endoscopic retrograde cholangiopancreatography (ERCP) cholangitis could occur frequently due to the inadequate drainage, especially after contrast injection into biliary tree. The aim of this study was to evaluate the efficacy and safety of air-cholangiography assisted endoscopic bilateral self-expandable metallic stents (SEMS) insertion using stent-in-stent (SIS) technique for malignant hilar obstruction.

Patients and Methods: This study was included 47 patients among 70 patients who underwent endoscopic bilateral SEMS placement using SIS technique due to malignant hilar obstruction. They were divided into the two groups, air (n = 23) or iodine contrast (n = 24) cholangiography, respectively. We retrospectively compared the comprehensive clinical and laboratory data of both groups using prospectively maintained data bases.

Results: There were no significant differences between the two groups in technical success (87% vs. 87.5%, air vs. iodine contrast group, respectively), functional success (95% vs. 95.2%) and 30-day mortality (8.3% vs. 8.7%). Post-ERCP adverse events were occurred in five (21.6%) of the patients in air group and eight (41.7%) of the patients in iodine contrast group. Among them, the rate of cholangitis was significantly lower in air group (4.8% vs. 37.5%, p=0.010). In multivariate analysis, air-cholangiography assisted technique was associated with the lower incidence of post-ERCP cholangitis.

Conclusions: Air-Cholangiography assisted stenting might be a safe and effective method for the endoscopic bilateral self-expandable metal stent insertion using stent-in-stent technique in patients with malignant hilar obstruction due to similar success rate and lower incidence of post-ERCP cholangitis.

Key Words: Air cholangiography, Malignant hilar obstruction, Self-expandable metal stent
Feasibility of Self-Expandable Metal Stent for Removal of Stones in Patients with Small Caliber Common Bile Duct

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Background and Aims: The aims of this study were to evaluate the biliary self-expandable metal stents (SEMS) for removal of stones in patients with small caliber common bile duct (CBD) and for preservation of sphincter function.

Patients and Methods: From February 2014 to July 2014, ten patients with bile duct stones who had small caliber common bile duct were enrolled. Achieving complete duct clearance, preserving sphincteric function and procedure-related complications were evaluated.

Results: The mean age was 47.3 years; the mean diameter of CBD was 8.8 mm; the mean diameter of stones was 5.6 mm; the mean number of stones was 1.5. In 9 (90%) patients, stones were removed using basket without mechanical lithotripsy; in 1 (10%) patient, stones were removed using mechanical lithotripsy. All stents were removed successfully using polypectomy snare or rat tooth. All patients have preserved sphincter of Oddi function. There were no significant procedure-related complications.

Conclusions: Trans-papillary SEMS facilitates bile duct stones removal in patients with small caliber bile duct. This technique appears to be effective in preservation of sphincter of Oddi function.

Key Words: Bile duct stones, Self-expandable metal stents, Sphincter of oddi

A Novel Flower Type Covered Metal Stent to Prevent Cholecystitis: Experimental Study in a Swine Model

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Background and Aims: Covered self-expandable metal stent (CSEMS) have the risk of cholecystitis which was related to the obstruction of the cystic duct orifice after CSEMS placement. A new flower-type CSEMS, a pentagon shaped stent with grooves at the sides parallel to the long axis, was designed, to prevent the obstruction of the cystic duct orifice. The aim of study was to investigate whether the flower-type CSEMS could protect against the cholecystitis in a swine model.

Methods: 14 domestic pigs were randomly underwent endoscopic placement of either the flower-type CSEMS or the conventional CSEMS. It was placed across the cystic duct orifice to impede bile drainage from gallbladder after the contrast dye (25ml) was injected for full expansion. Fluoroscopic image was performed on 24, 48 and 120 hours to check the drainage of contrast from gallbladder. The animal was sacrificed for histologic evaluation at 7 days. Histological examination was performed using scoring systems to determine the extent of inflammation, severity of neutrophil infiltration and presence of mucosal ulceration.

Results: All stents were successfully inserted into bile duct without any procedure-related complications. Histological total scores did not differ significantly in both group (median 2 vs 4 \( p=0.16 \)). But, the moderate inflammation with diffuse mucosal ulceration was observed in only two pigs of conventional CSEMS group. At 48 hours, the rate of all contrast drainage was high tendency in flower-type CSEMS than the conventional CSEMS without significant difference (71.4% vs. 28.6% \( p=0.28 \)). Early migration of stent was noted in 2 pigs of flower-type CSEMS group and 1 pig of conventional CSEMS group.

Conclusions: The new flower-type covered metal stent with five side grooves is technically feasible and may have only trend toward the prevention of cholecystitis without interfering of bile drain. Further studies with large number of animals are needed to validate the statistical difference.

Key Words: Self-Expandable metal stent, Acalculous cholecystitis, Endoscopic retrograde cholangiopancreatography, Swine
PBS-31

**The Effect of Pancreatic Sphincterotomy on the Prevention of Pancreatitis during ERCP Comparing with Pancreatic Stent**

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**Background and Aims:** Pancreatitis is the most frequent and distressing complication of endoscopic retrograde cholangiopancreatography (ERCP). Impaired drainage of the pancreatic duct is a commonly accepted mechanism of pancreatitis. We hypothesized that the pancreatic sphincterotomy would improve the flow of pancreatic duct and could prevent PEP in cases of difficult cannulation.

**Patients and Methods:** As a single center prospective randomized study, all consecutive patients who need ERCP were enrolled under selection criteria. When a difficult cannulation was occurred during ERCP, patients were randomly allocated into endoscopic pancreatic sphincterotomy (EPS group) and additional insertion of pancreatic stent (Stent group). After ERCP, we checked patients' abdominal symptom, serum amylase and lipase at 6, 24, and 48 hours after ERCP. The incidence and severity of PEP were compared between two groups.

**Results:** From Sep. 2012 to Aug. 2014, 210 patients underwent ERCP. Difficult cannulation was occurred in 39 (18.6%). Among patients with difficult cannulation, simple pancreatic sphincterotomy was applied in 21 and additional insertion of pancreatic stent in 18. There were no significant differences between EPS and Stent groups in respect of age, gender, and mean procedure time. PEP was occurred in 6 patients (30%) of EPS group and 5 (31.3%) of Stent group. The severity of pancreatitis was mild in 5 of EPS and 5 of Stent and moderate in each case of both groups. The rate of hyperamylasemia was 35.0% in EPS group and 31.3% in Stent group. There was no statistical difference in the incidence of PEP ($p=0.936$) and the rate of hyperamylasemia ($p=0.813$) between two groups.

**Conclusions:** For the prevention of PEP, prophylactic EPS might be approved as a safe and effective technique compared with stent insertion. However, further study is needed including more cases.

**Key Words:** ERCP, Pancreatic sphincterotomy, Pancreatic stent, PostERCP pancreatitis, Complication

PBS-32

**Hemoclip Application Using a Cap-Fitted Endoscopy to Treat Post-Sphincterotomy Bleeding in Patients Undergoing ERCP**

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**Background:** The risk of immediate or delayed bleeding following endoscopic biliary sphincterotomy (ES) during endoscopic retrograde cholangiopancreatography (ERCP) is reported from 2.0-5.3%. Although endoscopic clipping may effective method treatment of a wide variety of bleeding lesions of GI tract, mechanical clipping of post-ES bleeding has not been widely studied. A cap-fitted forward viewing endoscope can easily visualize the ampulla of Vater.

**Patients and Methods:** The study included 1,248 consecutive patients who underwent 1,248 ERCP with ES procedures between January 2011 and August 2014. ES-induced hemorrhage occurred in 45 patients (3.6%). Bleeding patterns (trickle, oozing, pulsatile, and exposed vessel) were recorded. Patients with oozing or trickle bleeding who did not respond to balloon compression or epinephrine solution injection and all the patients with pulsatile bleeding and/or exposed vessel on the ES site, received clipping.

**Result:** The mean age was 69.1±14.3 and sex ratio (M/F) was 32 (71.1%): 13 (28.9%) in 45 patients. Thirty nine patients had immediate endoscopic visible bleeding signs during ES, and 6 patients without endoscopic visible bleeding signs during ES who did not undergo clipping (0.48%) presented with delayed hemorrhage. Visible bleeding pattern following ES were: 19 trickle (42.2 %), 22 oozing (48.9 %), 3 pulsatile (6.7 %), and 1 exposed vessel (2.2%). Hemostasis was achieved by clipping in 45 of 45 patients (100%) who included patients with anti-platelet drug (n=9) and warfarin (n=2). The median number of clips used in all patients was 2.0 (range: 1-3). No patients had evidence of delayed bleeding after clipping on all visible bleeding signs. No patients had evidence of complication related to this procedure after clipping.

**Conclusion:** Hemoclip application using a cap-fitted forward viewing endoscopy is feasible, safe and may be an effective technique for the treatment and/or prevention of post-ES bleeding.

**Key Words:** Hemoclip, Post-Sphincterotomy Bleeding, ERCP
PBS-33

ERCP-Related Complications in the Super-Aged Elderly Over 80 Years: A Retrospective Case-Control Study

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Background/Aims: The use of therapeutic ERCP is now increasing due to a rapidly aging society. However, there are limited data on the efficacy of ERCP in the super-aged elderly over 80 years. The present study aimed to evaluate the efficacy and safety of ERCP for the elderly over 80 years.

Methods: Patients 80 years of age or older who underwent ERCP from June 2006 to April 2014 were defined as group A (n=312) and patients younger than 65 years who were randomly selected were defined as group B (n=312). The details of the patients were analyzed retrospectively from their medical records and the data in the endoscopic base. The main outcome measurements are ERCP-related complications and clinical outcomes.

Results: CBD stone combined with GB stone was the most common indication for ERCP in both groups, especially in the super-aged group. Comorbid diseases (70.5% vs. 29.8%, p<0.01) and the use of anti-thrombotic drugs (18.6% vs. 1.6%, p<0.01) were more frequent in the super-aged group. The procedure time was longer in the super-aged group (34.38 ± 16.80 min vs. 29.11 ± 14.33 min, p<0.01) and a second ERCP was more common in the super-aged group (32.1% vs. 19.9%, p<0.01). However, the technical success rate (94.9% vs. 97.4%, p=0.096) and the procedure-related complications (4.8% vs. 5.8%, p=0.592) were not significantly different between the two groups. Post-ERCP pancreatitis occurred in 1.3% (4/312; mild) of group A and in 2.9% (9/312; mild 8, moderate 1) of group B (p=0.262). Cardiopulmonary complications were observed in 1.9% (6/312) of both groups (p=1.00).

Conclusions: The use of therapeutic ERCP in the super-aged elderly over 80 years is comparable in efficacy and safety to its use in those under 65 years, although the elderly group had more comorbid diseases and used more anti-thrombotic drugs.

Key Words: ERCP, Elderly, Complication

PBS-34

Histologic Effect of in Vivo Endoscopic Papillary Large Balloon Dilation on the Bile Duct in Swine Models

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Background/Aim: Endoscopic papillary large balloon dilatation (EPLBD) has been suggested to be a useful technique to remove large bile duct stones. However, there are still safety concerns about this procedure. We investigated histologic effect of in vivo EPLBD in normal (NBD) and dilated bile duct (DBD) models of swine.

Methods: Six mini pigs were used and allocated into two groups; DBD model group (n = 3) which are made by closure of the major duodenal papilla with a detachable snare, and another NBD model group (n = 3) with normal diameter of bile duct. EPLBD (12 mm-diameter, 3 atmosphere, 60 seconds, single session) was performed in all animals in vivo after endoscopic retrograde cholangiography (ERC). Cholangiogram was then obtained again after the procedure. All animals were sacrificed and the common bile duct (CBD) with major duodenal papilla was extracted one day later. ERC findings, gross and microscopic findings of the resected specimen were analyzed.

Results: The mean values of maximum CBD diameters were 5.0 and 14.1 mm respectively in both NBD and DBD groups. Right after EPLBD, dye leaked out from the distal CBD in cholangiogram and the gross and microscopic findings revealed perforation in CBD of all three NBD models. However, in all DBD models, any dye leakage or CBD perforation was not observed. There was no bleeding in both groups. This is the first in vivo animal study that shows safety of EPLBD which is applicable in the patient with large bile duct stone and dilated bile duct.

Conclusion: EPLBD is suggested to be safe method for dilated bile duct model of swine unless the balloon diameter exceeds its CBD diameter.

Key Words: Endoscopic papillary large balloon dilatation, Bile duct, Swine
Implication of Fecal Elastase-1 to Assess Nutritional Status in Patients with Pancreatic Disease

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Background/Aims: Fecal elastase-1 (FE-1) has been suggested for evaluating pancreatic insufficiency, but there have been limited literatures about its availability for the assessment of the nutritional status in patients with pancreatic disease, such as pancreatitis and pancreatic cancer. Malnutrition could significantly contribute to increased morbidity and hospitalization in these patients. This study aimed to assess the efficacy of FE-1 for evaluating nutritional status and morphological change in patient with pancreatic disease.

Methods: We prospectively collected data of the patients with pancreatic disease such as pancreatitis and pancreatic cancer between January 2014 and July 2014. A value of FE-1 < 200 μg was considered as impaired pancreatic function. The relationship between FE-1 and other nutrition risk scores, image grading score were analyzed.

Results: A total of 33 patients were eligible for analysis. Nutritional risk index (NRI) were 95.2 ± 21.3 in FE-1 < 200 μg group and 107 ± 5.1 in FE-1 > 200 μg group (p=0.02). Relative body weight (RBW) were 96.5 ± 21.3 < 200 group and 118.6 ± 13 > 200 group (p=0.06). Albumin level were 39.2 ± 7.2 (g/L) in FE-1 < 200 group and 44.7 ± 3.6 in FE-1 > 200 group (p=0.06). Cambridge classification scores were higher in FE-1 < 200 group.

Conclusions: FE-1 was significantly associated with NRI in patients with pancreatic disease. Elevated FE-1 tended to be associated with cambridge classification score. FE-1 may be used to assess nutritional status, disease severity and help physicians to offer proper nutritional support in patients with pancreatic disease.

Key Words: Fecal Elastase-1, Nutritional status, Pancreatic disease

The Usefulness of Concurrent Use of Fully Covered Metal Stents and Plastic Stents in Benign Pancreatic Duct Stricture

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Background and Aims: Recently, fully covered self-expandable metal stents (FCSEMSs) has been used for pancreatic ductal strictures in chronic pancreatitis. However, distal stent migration and stent-induced ductal stricture are not uncommon. The purpose of this study was to investigate the feasibility, efficacy, safety of concurrent use of FCSEMSs and plastic stents in patients with benign pancreatic ductal stricture.

Patients and Methods: We retrospectively reviewed the data of 18 patients who received endoscopic treatment with concurrent FCSEMSs and plastic stents for the benign pancreatic ductal stricture between August 2011 and November 2013. Additional plastic stents, which were longer than FCSEMSs, were inserted through FCSEMSs lumen.

Results: Stents placement was successful through the major (n=11) or minor papilla (n=7). All patients could achieve pain relief after stents placement. In all patients, stents could be easily removed median 181 days (range from 68 to 181 days) after stents insertion. There was no distal or proximal stent migration. Ductal stricture was resolved in 16 (88.9%) patients. During follow-up periods (median 527 days, range from 127 to 963 days), stent-induced ductal stricture did not develop after stent removal.

Conclusions: The concurrent use of FCSEMSs and plastic stents may be safe and effective in the treatment of benign pancreatic ductal stricture.

Key Words: Chronic pancreatitis, Fully covered self-expandable metal stents, Pancreatic stricture, ERCP
PBS-37

The Biodurability of Hydrophilic Coating for Plastic Stents in Bile Flow Phantom and a Swine Bile Duct Dilatation Model

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Aim: We evaluated whether plastic stents with hydrophilic coating (PS+HC) have longer patency and more improved biodurability than non-coated plastic stents (PS-HC) and conventional plastic stents in vitro and in vivo.

Materials and Methods: The bile flow phantom model containing various types of 10F plastic stents [6 polyethylene without coating (PE-HC), 6 polyethylene with coating (PE+HC), 6 polyurethane without coating (PU-HC), 6 polyurethane with coating (PU+HC) and 12 conventional stents (A and B stents) of two companies], provided continuous circulation of fresh human bile. The stents was removed and analyzed respectively 4 weeks and 8 weeks after bile exposure. Various types of plastic stents were inserted into the bile duct of 7 swine bile duct dilation models, and removed after 8 weeks. We performed a gross inspection, analysis of the patent area of the lumen and the inner surface by light microscopy and scanning electron microscopy (SEM) for the removed stents.

Results: In in vitro study, the biofilm was rarely formed in all stents 4 weeks after bile exposure. After 8 weeks, the PS+HC showed less formation of the biofilm and less luminal narrowing than PS-HC (% patent area: PE-HC, 92.9±2.7; PE+HC, 94.3±2.0; PU-HC, 90.2±6.4; PU+HC, 94.9±1.2; A stent, 95.1±3.7; B stent, 96.1±3.5) (p<0.001). Total 31 stents were inserted into the bile duct of 7 swine model, and 24 stents (6 PE+HC, 7 PU+HC, 5 A stents and 6 B stents) could be removed among them after 8 weeks. The PE+HC had a tendency to form biofilm more and make the lumen more narrow than other types (% patent area: PE+HC, 74.6±113.8; PU+HC, 82.8±10.7; A stent, 81.9±11.6; B stent, 81.8±16.7) (p=0.407). In SEM examination of the PS+HC, the hydrophilic coating layers were not damaged and well sustained until 8 week after bile exposure.

Conclusions: PS+HC tended to show less biofilm formation than PS-HC. Polyurethane seemed to be more patent and durable than polyethylene in hydrophilic coating techniques.

Key Words: Stents, Hydrophilic coating, Polyurethane, Polyethylene

PBS-38

Investigating MicroRNA Expression Profiles as a Useful Diagnostic Markers for Bile Track Cancer

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Biliary tract cancer, which includes intra- and extrahepatic cholangiocarcinoma and gall bladder cancer, is increasing in incidence. Even after histological examination, biliary tract cancer is often difficult to diagnose definitively. MicroRNAs (miRNAs) are an emerging class of molecules with roles in various cellular processes, including growth, survival, and apoptosis. Most importantly, aberrant expression of miRNAs has been implicated in cancer pathogenesis. Therefore measurement of miRNA expression in bile would be helpful in distinguishing between benign and malignant disease. The aim of this study was to confirm the existence of miRNAs in bile and to identify their potential as diagnostic biomarkers for bile tract cancer. We sampled bile from patients who underwent biliary drainage for biliary diseases such as bile tract cancer and choledocholithiasis. miRNA cloning were performed to identify bile miRNAs. The expression profiles of 1193 miRNAs were compared in patients with malignant disease (n = 11) and age-matched patients with the benign disease choledocholithiasis (n = 10). Differential analysis of bile miRNAs demonstrated that 29 of the 1193 miRNAs were significantly highly expressed in the malignant group. The resulting miRNA biomarkers were refined through bioinformatics analysis to generate classifiers that allow differentiation from benign disease. As a result, the analysis demonstrated that miR-30d and miR-92a could be useful diagnostic markers for BTC. These findings suggest that bile miRNAs could be useful biomarkers for hepatobiliary disease and that some miRNAs, particularly miR-30d and miR-92a may be helpful in the diagnosis and clinical management of BTC.

Key Words: miRNA, Biliary tract cancer, Bile