Miscell-1

Diagnostic Yield and Clinical Impact of Video Capsule Endoscopy in Patients with Chronic Diarrhea: A Korean Multicenter Study

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Korean Gut Image Study Group

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Background/Aims: Most of studies about video capsule endoscopy (VCE) have been focused on the evaluation of obscure gastrointestinal bleeding. However, it is increasingly used in other indications associated with small bowel disease. Chronic diarrhea is sometimes unexplained, and small bowel disorders can be one of the causes. The aim of this study was to evaluate the diagnostic yield and clinical impact of VCE in patients with chronic diarrhea.

Methods: We retrospectively analyzed records in the VCE nationwide database registry from October 2002 to August 2013. From data base of VCE registry (n=2,964), total 91 patients of 15 medical centers (60 male to 31 female, mean age, 47 ± 19 year) were evaluated for VCE due to chronic diarrhea.

Results: The duration of chronic diarrhea was 13.7 ± 42.4 months (range 1-360 months). Prior to VCE, 74 patients (81.3%) underwent colonoscopy and 52 patients (57.1%) underwent abdominal pelvic computed tomography. The positive diagnostic yield of VCE was 45.1% (41/91). However, 16.5% (15/91) showed inconsistent result, and 38.5% (35/91) was negative. Most common findings were normal in 30 (33.3%) patients, Crohn’s disease in 15 (16.5%), erosions in 10 (11.1%), and nonspecific ulcers in 7 (7.7%). Most common diagnoses were functional diarrhea associated with irritable bowel syndrome in 30 (33.3%) patients, Crohn’s disease in 15 (16.5%), eosinophilic enteritis in 3 (3.3%) patients, small bowel tumor in 3 (3.3%), intestinal tuberculosis in 1 (1.1%) and Celiac disease in 1 patient (1.1%). After VCE examination, 41.8% (38/91) of previously diagnosed patients were changed. 70.3% (64/91) patients underwent medical treatment and 3.3% (3/91) patients underwent endoscopic treatment.

Conclusions: These results suggest that VCE can be helpful in patients suffering from chronic diarrhea that cannot be explained by established examinations. VCE had favorable diagnostic yield and clinical impact in patients with chronic diarrhea.

Key Words: Capsule endoscopy, Diagnostic yield, Chronic diarrhea

Miscell-2

Job Stress and Job Satisfaction among Healthcare Workers of Endoscopy Unit

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Background and Aims: Management of healthcare workers’ job stress is critical for improvement of health care service. There are many studies concerning healthcare workers’ job stress, but research about endoscopy unit workers is minimal. The aim of this study is to estimate the job stress and job satisfaction among endoscopy unit workers for efficient management of medical resources and improvement of medical services of endoscopy unit.

Methods: We surveyed doctors, nurses and nurse assistants at endoscopy unit of three medical centers in Korea. The questionnaire included a demographic characteristics, job stress questionnaire (short form KOSS; Korean Occupational Stress Scale) and job satisfaction questionnaire. Data analysis was conducted by IBM SPSS 20.

Results: Average total job stress score of endoscopy unit workers was 45.66±6.86 which is in the range between 1st and 2nd quartile (25-50%) of Korean reference job stress value. Subanalysis of KOSS score grouped by subscale showed that job demand score (66.7±16.01) was above the 3rd quartile (75%-%) of reference value. Also, there is statistically significant difference among endoscopy units in the job demand subscale score. In addition, job stress and job satisfaction were significantly different among job positions (p=0.045 and p=0.002 for each). Correlation analysis showed job stress and job satisfaction are significantly correlated with each other (r=-0.626, p<0.01).

Conclusions: Job stress score was different according to their job positions, which implies that improving organizational and rewarding system (e.g., by fair personnel management policy) would decrease job stress and raise job satisfaction. In addition, there was unique difference in quality of job stress compared to Korean reference job stress value. Regular examination of job stress is required for quality assurance and quality improvement of endoscopy unit.

Key Words: Endoscopy, Job Stress, Job Satisfaction
Retrospective Multicenter Study for Complication of Endoscopic Ultrasound Guided Pathologic Diagnosis

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Backgrounds and Aims: The endoscopic ultrasound guided fine needle aspiration (EUS-FNA) is used most commonly in the endoscopic ultrasound guided tissue diagnosis methods in order to obtain tissues around gastrointestinal tract. EUS-FNA is relatively safe but reported to cause some complications. There has been no systematic report about complications in Korea. The aims of this study are investigating complications of endoscopic ultrasound guided tissue diagnosis.

Methods: In this retrospective multicenter study, we collected clinical data of the patient who underwent endoscopic ultrasound guided tissue diagnosis from 2009 to 2012 in Korea only for diagnostic purpose. The complications analyzed in this study included pancreatitis, hemorrhage, infection, cancer seeding and perforation. We’ll also investigate the risk factors related with complications by conducting a matched case-control study.

Results: We analyzed 4097 cases from 15 hospitals in Korea. Any complication developed in 3.1% (128/4097) cases. Most common complication was the mild pancreatitis (49.2%). There was no death related to the procedures.

Conclusions: This study showed complication of EUS-FNA developed in low rate and EUS-FNA is a safe procedure without serious complication. Risk factors related with this procedure are being on the analysis. This study was supported by Gastrointestinal Endoscopy Research Foundation of Korea Olympus Grant 2013.

Key Words: EUS-FNA, Complication, Pancreatitis

A Prospective Comparison of EUS-Guided FNB with FNA for Diagnosis of Pancreatic Solid Masses

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Objectives: Endoscopic ultrasound (EUS)-guided fine needle aspiration (EUS-FNA) is the standard method for obtaining cells from solid pancreatic masses for cytologic evaluation; however, diagnostic yield and accuracy are limited. The EUS-guided fine needle biopsy (EUS-FNB) provides histologic samples that overcome cytologic limitations. We prospectively compared the diagnostic utility of EUS-FNB and EUS-FNA.

Methods: Between February 2012 and 2013 May, consecutive patients with solid pancreatic mass lesions were randomized to undergo EUS-FNB using biopsy needle (Echotip ProCore; Wilson-Cook Medical, Winston-Salem, NC) or EUS-FNA using conventional needle (Echotip, Wilson-Cook Medical). Pancreatic masses were sampled using EUS-FNB or EUS-FNA with a 22- or 25-gauge needle. The specimen was analyzed by on-site cytology with Diff-Quick stain, cytology with Papanicolaou stain and histology with IHC under on-site evaluation.

Results: No significant differences in patient demographics and pancreatic tumor characteristics were observed between the FNB (58 patients) and FNA (58 patients) groups. Compared to the FNA group, the FNB group had a significantly lower mean number of needle passes for diagnosis (1.5 vs. 2.2, p<0.001) and the proportion of patients in whom a diagnosis was achieved on the first pass was significantly greater in the FNB than the FNA group (70.7% vs. 63.2 %; p<0.001, respectively). In addition, the diagnostic accuracy of on-site cytology with Diff-Quick stain was significantly higher in the FNB group (93.1% vs. 72.4%, p=0.003). However, no significant differences were detected in cytology with Papanicolaou stain, histology and combination of on-site cytology with Diff-Quick stain, cytology with Papanicolaou stain and histology (p=0.798) between the FNB and FNA groups, respectively.

Conclusions: The EUS-FNB device was superior for obtaining adequate specimens for on-site diagnosis using a lower number of needle passes.

Key Words: EUS, FNA, Pancreas
Comparative Study of EUS-Guided Placement Using Traditional Gold and Newly Designed Platinum Fiducials for SBRT

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Background/Aim: Traditionally, EUS-guided fiducial placement is performed by using 19-gauge FNA needles because of wider diameter of traditional gold fiducials. Recently, new, thin platinum-based fiducial compatible with a 22-gauge FNA needle was developed. The current study is aimed to compare two types of fiducials in terms of the technical success, safety, visibility, and migration.

Methods: Between January 2011 and March 2013, 70 consecutive patients with unresectable pancreatic cancer who underwent EUS-guided fiducial placement and stereotactic body radiotherapy were included. Traditional gold fiducials (TFs) (3-mm length and 0.8-mm diameter) and newly designed platinum-based fiducials (PFs) (5-mm length and 0.4-mm diameter) were compared. Main outcome measurements included technical difficulty, safety, visibility, and fiducial migration rate.

Results: A total of 209 fiducials were successfully deployed: 106 TFs by using 19-gauge needle and 103 PFs by using 22-gauge needle. The mean number of fiducials placed was significantly different in both types of fiducials (2.92 for TFs vs 3.03 for PFs, \(p=.048\)). Technical difficulty was encountered more frequently during placement of TFs compared with placement of PFs (16.7% for TFs placement and 0% for PFs placement, \(p=.025\)). One patient (1.3%) developed a mild pancreatitis 1 day after the placement of gold fiducials. The median visibility score was not significantly different between two types of fiducials (2.00, interquartile range[IQR] 2.00-2.00 for TFs vs 2.00, IQR 2.00-2.00 for PFs, \(p=.972\), respectively). Fiducial migration rate was significantly lower in the PFs group than in the TFs group (0.9% vs 7.5%, \(p=.035\)).

Conclusions: Compared with TFs, placement of the PFs through a 22-gauge needle seems to be technically easier and shows a lower rate of migration. Visibility between the fiducial (TFs vs PFs) groups appear similar.

Key Words: EUS, Fiducial, Pancreatic cancer, Stereotactic body radiotherapy

New Fully Covered Metal Stent for Lumen Apposition in EUS Guided Drainage/Access: Animal Study

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Background and Aim: EUS-guided transenteric drainage of peripancreatic fluid collection or of the biliary tree, including the gallbladder (GB) is a well-established procedure. However, conventional stents still have a chance of migration or leakage that can lead to serious complications. We developed a new fully covered self-expandable metal stent (FCSEMS) for lumen apposition with a conventional stent delivery system as an effective and easy procedure and report the results of an animal study.

Method: A newly designed, FCSEMS with folding anchoring flanges for lumen apposition was assembled on a conventional stent delivery system as an effective and easy procedure and report the results of an animal study.

Method: A newly designed, FCSEMS with folding anchoring flanges for lumen apposition was assembled on a conventional stent delivery system. A cholecystogastrostomy tract was created under EUS guidance, and the stent was deployed across the lumen under EUS, fluoroscopic, and endoscopic guidance in six pigs. Contrast was injected into the GB through the stent to confirm the absence of leakage. Cholecystoscopy (CCS) was performed immediately. The stent was removed at 4 weeks, and CCS was performed again after stent removal. Technical success, complications, and removability were evaluated.

Results: The stent was successfully inserted and deployed into the GB through a transgastric approach under EUS guidance without complications in all six pigs. Contrast injection demonstrated the absence of leakage. Cholecystoscopy with enhanced endoscopy was performed successfully in all animals after stenting. All stents were intact and were removed successfully at 4 weeks. GB firmly adhered to the stomach with an intact cholecystogastric tract on necropsy and histopathology.

Conclusions: Transenteric drainage and endoscopic intervention using a novel FCSEMS for lumen apposition under EUS guidance was feasible on the animal study. Further study is warranted.

Key Words: EUS-Guided drainage, Fully covered metal stent
Diagnosis | Treatment | Outcome
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**The Use of Small Bowel Capsule Endoscopy in Iron Deficiency Anemia**

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**Background & aim:** Small bowel capsule endoscopy (SBCE) is a useful diagnostic modality in small bowel disorders. IDA (Iron deficiency anemia) alone is one of the indications for referral to SBCE, world widely. However, the role of SBCE in IDA is still limited. There are limited data on the diagnostic yield for IDA, and little is known about the clinical impact and long-term outcome. The aim of this study was to assess the usefulness of SBCE in patients with IDA alone and long-term outcome.

**Methods:** Retrospective review of one center’s database of SBCE over ten-year period was carried out. IDA patients without GI symptoms, known previous diagnosis, or overt GI bleeding who underwent SBCE were included. We defined diagnostic yield (DY) as the proportion of patients with clinically significant SBCE findings (P2 lesion). Patients with “suspicious” or “uncertain” SBCE findings (eg, P0 or P1 lesions) were not taken into account in calculation of the DY.

**Result:** 191 SBCEs were identified: obscure GI bleeding (OGIB) in 81 patients (42%). The patients of overt OGIB and IDA with occult OGIB were 89% (n=72), 11% (n=9), respectively. A total of 9 patients had SBCE for IDA as the sole indication. The diagnostic yield of SBCE for IDA was 55.6% (n=5/9) including multiple ulcer (n=3), angiodysplasia (n=1), small bowel tumor (n=1). (Table 1). 44% (n=4) had resolution of anemia. But 44% (n=4) were lost to follow up. The patient with small bowel tumor (Non-Hodgkin lymphoma) was died in spite of chemotherapy. Among the patients with multiple ulcers, two of three was Crohn’s disease. They were improved of anemia with treatment of Crohn’s disease and oral iron supplement.

**Conclusions:** In our study, the DY of SBCE for IDA with occult OGIB was 55.6% and the commonest finding was multiple ulcers. Even though our study involves a small patient population, there were small bowel tumor, Crohn’s disease. It could be useful to consider SBCE in work up of IDA with occult OGIB.

**Key Words:** Capsule endoscopy, Iron deficiency anemia

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**Rate and Predictive Factors of Rebleeding after Negative Capsule Endoscopy for Obscure Gastrointestinal Bleeding**

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**Background and Aims:** This study was designed to investigate the long-term outcomes in patients with obscure gastrointestinal bleeding (OGIB) and negative capsule endoscopy (CE) results and to identify the risk factors that are associated with rebleeding.

**Patients and Methods:** We reviewed the medical records related to 579 consecutive CE performed from March 2003 to February 2013, focusing our attention on patients with recurrence of obscure bleeding and negative CE. Evaluating the patient follow-up, we analyzed the recurrence rate of obscure bleeding in patient with a negative CE. Rates of rebleeding during follow-up were calculated, and risk factors associated with rebleeding were assessed through an univariate and multivariate analysis.

**Results:** Ninety eight of 579 (16.9%) CE studies resulted negative in patient with OGIB. Of the 98 enrolled patients (median age 53 years, range 17-86 years), 58 patients (59.1%) were male. The median duration of follow-up was 7.5 months. During follow-up, recurrence of obscure bleeding was observed only in 8 out of 98 negative CE patients (8.2%); 3 out of 8 with obscure overt bleeding and 5 out of 8 with obscure occult bleeding. The overall rebleeding rate was 8.2%. The older age (> 60 years) is independent risk factors of rebleeding after a negative CE (OR = 7.464, 95% CI: 1.044 - 53.384, p=0.045). Other risk factors such as onset of bleeding type (melena or hematochezia), anticoagulation therapy, subsequent blood transfusion, comorbidity were not associated with a risk of rebleeding.

**Conclusions:** Patients with OGIB and negative CE have a slightly potential risk of rebleeding. Therefore, close observation is needed and further complementary diagnostic investigations could be considered in the elderly with OGIB and negative CE results.

**Key Words:** Negative capsule endoscopy, Obscure gastrointestinal bleeding, Rebleeding, Old age
What Is the Optimal Timing of Capsule Endoscopy in Obscure GI Bleeding Patients?

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Background and Aim: Capsule endoscopy is essential examination for diagnosis of small bowel bleeding. But diagnostic yield of capsule endoscopy is 38% to 83% in obscure overt GI bleeding. For an accurate diagnosis of cause of obscure GI bleeding, the time to perform capsule endoscopy is the most important factor. This study is to investigate the diagnostic yield, rate of therapeutic intervention and prognosis according to timing of capsule endoscopy in the obscure overt GI bleeding patients.

Methods: We conducted a single center, retrospective study at Korea University Medical Center Anam Hospital from April 2008 to April 2013. Patients who were negative result of initial upper endoscopy and colonoscopy were enrolled. We divided the patients into two groups: those who had performed capsule endoscopy within 2 days of last overt GI bleeding (≤2-day group) and after 2 days of last overt GI bleeding (>2-day group). We compared the diagnostic yield, rate of therapeutic intervention, hospital day and rate of re-bleeding between the two groups. We defined positive finding as active bleeding or any cause of small bowel bleeding.

Results: 102 capsule endoscopies were performed to evaluate obscure overt GI bleeding during the period. Among them, 81 patients were included and 21 patients who lacked of medical records were excluded. Diagnostic yield was 75% in ≤2-day group and 45% in >2-day group (p=0.022). Therapeutic intervention was done in 45% of the ≤2-day group and 14% of >2-day group (p=0.006). The average day of hospital stay was 5.7 days in ≤2-day group and 7.9 days in >2-day group (p=0.021). Re-bleeding rate between the ≤2-day group and >2-day group was not significantly different.

Conclusions: Early capsule endoscopic examination within 2 days of last overt GI bleeding may improve the diagnostic yield and rate of therapeutic intervention and length of hospital stay.

Key Words: Capsule endoscopy, Obscure GI bleeding

Learning Curve for Endoscopic Submucosal Dissection of Gastric Neoplasms

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Background and Aim: Endoscopic submucosal dissection (ESD) is a widely accepted method for the treatment of early gastrointestinal neoplasm. We investigated the learning curve of ESD performed by a single endoscopist focusing on developing the performance of dissection, shortening the procedure time, and preventing complications.

Methods: Records of 120 consecutive ESD procedures performed by a single endoscopist with an ESD knife from December 2007 to April 2013 were collected. For analysis of the learning curve, total procedures were divided into four periods, each comprising 30 sequential ESD procedures. Adjusted procedure time (min) was calculated as specimen area [long length (mm) x short length (mm)] ÷ procedure time. Assessed parameters were the en bloc resection rate, complete resection rate, duration and speed of procedure time, and related complications.

Results: Adjusted overall procedure time was 27.1 ± 13.7 mm²/min. There were significant differences in the adjusted overall procedure time from the first (19.9±11.0) to the third (30.3±11.8) quarter (p=0.01) and to the fourth (35.8±15.7) quarter (p<0.01), and from the second (21.1±8.3) to the third quarter (p=0.04) and to the fourth quarter (p<0.01). The total procedure time became faster and steady after the first 60 cases.

Conclusions: ESD for gastric neoplasms can be performed with a steady speed after the experience of 60 ESD procedures with proper clinical outcomes. Further studies with different endoknives will be required for ESD operators as a reference.

Key Words: Endoscopic submucosal dissection, Learning curve, Gastric neoplasms
Miscell-11

**Generation of Pain after Endoscopic Submucosal Dissection for Early Gastric Neoplasms**

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**Background/Aims:** ESD has been used as the curable local treatment for early gastric carcinoma. There were some reports about complications of ESD such as bleeding and perforation. However, there is a lack of data about the development of pain which might lower compliance and afflict the patients after ESD. Thus, we investigated the incidence and the clinicopathologic risk factors associated with pain after ESD.

**Methods:** This was a prospective, randomized control study. Between 2011 and 2013, 203 patients were diagnosed as gastric neoplasms and underwent ESD at Gangnam Severance Hospital. Among them, 21 patients were received test with 150 mL of 0.1 mol/L hydrochloric acid infusion for investigating the mechanisms of pain after ESD. The severity of symptoms were assessed by a 10 cm VAS at 3 hours and day after ESD and also during acid infusion test. To investigate the effect of acid suppression on pain after ESD, the subjects were randomized to receive PPI before or after ESD.

**Results:** The incidence of pain after ESD was 52.7 %. The female gender, younger age, lower location, larger tumor size and longer procedure time tended to be associated with development of pain after ESD. Among 21 patients who were received acid infusion test, the subjects developing dyspeptic symptoms was 47.6 %. The proportion of subjects experiencing pain after ESD was significantly greater in patients with dyspeptic symptoms than without dyspeptic symptoms by acid infusion. The patients who were generated pain, 3hr were significantly more in group which was received PPI after ESD than before ESD.

**Conclusions:** The pain symptoms generation after ESD was significantly greater in patients who were developed dyspeptic symptoms by acid infusion. The subjects with pain after ESD were significantly lower when the gastric acid was suppressed through PPI infusion, suggesting that hypersensitivity to acid is one of the important mechanisms of the generation of pain symptoms in ESD patients.

**Key Words:** ESD, Pain, Proton pump inhibitor

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Miscell-12

**Enhancing Bactericidal Effect against H. pylori and Ameliorating Toxic Effect by Pre-Treatment of Chitosan in PDT**

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**Background and Aims:** Endoscopic light could be used as an energy source for photodynamic therapy (PDT) due to its killing effect against *Helicobacter pylori* (*Hp*). PDT is achieved by a photodynamic reaction based on the use of light sensitive molecule called photosensitizers (PS). Methylene blue (MB) is a representative PS but can cause genotoxic effect to DNA of human cells. To decrease this genotoxic effect, authors investigated the study to minimize the dose of MB in PDT by pre-treatment of chitosan.

**Patients and Methods:** The standard strain of *Hp*, 26695, was purchased from the Korean Culture Type Collection (KCTC, Taeyeon, Korea) for a test strain. *Hp* was cultured at 37 °C in a standard microaerobic (5% O2, 10% CO2 and 85% N2 gas) atmosphere. After pre-incubation for 15min with or without low molecular chitosan (50KDa, Sigma Chemical Co, St. Louis, MO, USA) along with different concentration of MB (Sigma Chemical Co, St. Louis, MO, USA). Endoscopic white light source from endoscopy were irradiated for 5, 10 and 15min. To detect DNA injury, alkaline gel electrophoresis was done from harvested *Hp* after treatment with Endonuclease III (NEB, Ipswich, MA, USA).

**Results:** Bacterial killing effect was measured by counting viable cells after PDT. In control group, the number of viable cells was maintained constantly. In the group treated with 0.02mg/ml MB alone for 15min, bacteria decreased approximately 10 fold. The group that treated with 0.02mg/ml MB with 0.005% chitosan showed 100 fold reductions. In the group treated with 0.04mg/ml MB alone for 15min, bacteria decreased about 100,000 fold. The group treated with 0.04mg/ml MB with 0.005% chitosan, showed 1,000,000 fold reductions. Bactericidal effect substantially increased with the 0.005% chitosan.

**Conclusions:** Bactericidal effect by MB with pre-treatment of chitosan under endoscopic light might be more effective than by only MB. Furthermore, it might ameliorate the genotoxic injury by decreasing the dose of MB.

**Key Words:** *Helicobacter pylori*, Photodynamic therapy, Endoscope, Chitosan, Methylene blue
Optimal Number of Needle Passes by Endoscopic Ultrasound Guided Fine Needle Aspiration for Obtaining Adequate Diagnosis

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Background and Aims: The optimal number of endoscopic ultrasound guided fine needle aspiration (EUS-FNA) needle passes is not established. Previous study showed that at least 7 passes into pancreas and miscellaneous lesions, and 5 passes into lymph nodes are needed. So, we aimed to determine optimal number of EUS-FNA needle passes required to obtain a correct diagnosis.

Patients and Methods: A prospective study was performed on sixty six patients who received EUS-FNA between September 2011 and August 2013. First, 3 needle passes were performed and if adequate diagnosis was not acquired, additional needle passes were performed.

Results: Lesions from patients were divided to 4 categories; pancreatic solid lesions, pancreatic cystic lesions, solid mass of hollow viscus and lymph node. Of 66 patients (33men, mean age 59 years), pancreatic solid lesions were 23, pancreatic cystic lesions were 23, pancreatic cystic lesions were 12, solid mass of hollow viscus were 12 and lymph node were 19. The mean number of EUS-FNA passes was 3.52 (range: 3-7). The cases which succeeded to obtain adequate material were 81.1% (54/66). The sensitivity and specificity for 1 needle pass were 67.3% (61.1% in pancreas solid lesions, 80% in pancreas cystic lesions, 70% in solid mass of hollow viscus and 63.6% in lymph node) and 76.4% (60%, 100%, 100% and 75%). The sensitivity and specificity for 2 needle passes were 81.6% (77.8%, 90%, 70% and 90.9%) and 88.2% (90%, 100%, 100% and 87.5%). And the sensitivity and specificity for 3 needle passes were 83.6% (83.3%, 90%, 70% and 90.9%) and 88.2% (90%, 100%, 100% and 87.5%). When more than 3 passes were made, the sensitivity did not increased.

Conclusions: At EUS-FNA, 3 needle passes methods are enough to achieve a sensitivity more than 80%. The more number needle passes did not achieve higher sensitivity. Therefore, 3 more needle passes was not necessary for diagnosis of pancreatic and other gastrointestinal and perigastrointestinal lesions.

Key Words: EUS-FNA, Pancreas, Lymph node

Incremental Value of Cell Block Preparation over Conventional Smear Alone in the Evaluation of EUS-FNA

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Background/aim: Endoscopic ultrasound-guided fine needle aspiration (EUS-FNA) can be performed in order to achieve a definite pathological tissue diagnosis of pancreatic solid mass. To investigate the usefulness of cell block preparations in EUS-FNA, we evaluated the added value of cell block preparation over conventional smear alone.

Methods: Between March 2011 and January 2013, retrospectively 61 patients were retrospectively evaluated who underwent EUS-FNA for pancreatic solid mass. Diagnostic values were compared between combination of cell block and conventional smear (CB-CS) and conventional smear alone (CS).

Results: Compared to conventional smear alone, combination of cell block and conventional smear increased sensitivity from 79% to 90% (p=0.001), accuracy from 83% to 93% (p=0.005). Specificity was 100% in both method. The negative predictive value increased from 42% to 61% (p=1.000).

Conclusion: Analysis of EUS-FNA specimens with combination of conventional cytological smear and cell block may give higher diagnostic yield than cytological smear alone. Additional cell block may increase sensitivity and negative predictive value in the analysis of EUS-FNA specimen without decreasing specificity.

Key Words: EUS, FNA, Pancreas, Cell block
Comparison of Diagnostic Efficacy and Safety between 22-Guage EUS-FNA and FNB Needle for Pancreatic Cancer

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Background/Aims: The advantage of EUS-guided fine needle biopsy (EUS-FNB) over EUS-guided fine needle aspiration (EUS-FNA) is that it enables the acquisition of histologic core tissues and additional diagnostic study such as immunohistochemical staining (IHC). On-site cytopathologic evaluation is one of the important factors determining diagnostic efficacy of EUS-FNA, but there are still many centers in which on-site cytopathologic evaluation is not available. We conducted this study to compare diagnostic efficacy and safety of 22-G FNB (ProCore, Cook Medical, USA) to those of 22-G FNA for pancreatic cancer without on-site cytopathologist.

Methods: The Patients who underwent EUS-FNA or FNB for pancreatic cancer diagnosis with 22G needle between September 2011 and December 2012 were reviewed retrospectively in Seoul National University Hospital. Among them we enrolled patients whose final diagnosis was confirmed as pancreatic cancer. Diagnostic efficacy and safety were compared between FNA and FNB group.

Results: A total of 130 patients were enrolled. Mean age was 62.9 years, and mean mass size was 3.4 cm in EUS. 69 FNA (53.1%) and 61 FNB (46.9%) were performed. Age, sex, mass size, needle pass number, and puncture route (trans-duodenal or gastric) were comparable between two groups (p>0.05). Sensitivities of FNA and FNB were 75.4% and 85.2%, and there was no statistically significant difference (p=0.16). Sensitivities of FNA and FNB were comparable in trans-duodenal puncture (73.9% vs 70.6%, p=1.0). FNB showed higher sensitivity (90.9%) than FNA (76.1%) in transgastric puncture, but it was not statistically significant (p=0.059). Specificities were 100% in both groups. There was no procedure-related complication.

Conclusions: 22-G EUS-FNA and FNB showed comparable efficacy and complication rate for diagnosis of pancreatic cancer. Sensitivity of FNB showed higher tendency than that of FNA in transgastric puncture, but it was not statistically significant.

Key Words: Endoscopic Ultrasound Guided Fine Needle Aspiration, Pancreatic Neoplasms, Diagnosis

Randomized Trial Comparing 22 and 25 Gauge Core Biopsy Needles for EUS-FNA of Solid Pancreatic and Peripancreatic Mass

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Background and Aims: A new core biopsy needle was developed to enable the acquisition of core specimens for histologic analysis. There are limited data on the differences in diagnostic accuracy and histology core yield between a 22-gauge (PC22) and 25-gauge core biopsy needle (PC25). This prospective study compared the difference in diagnostic accuracy between a PC22 and PC25 when performing EUS-guided sampling.

Patients and Methods: A total of 68 patients with solid pancreatic or peripancreatic masses were enrolled and 35 patients were randomized to the PC22 group and 32 to the PC25 group. The differences in diagnostic accuracy, technical success rate, yield of core tissue and complication rate were evaluated.

Results: There was no difference in diagnostic accuracy (100% vs. 96.8%, p=.47), technical success rate (88.6% vs. 93.8%, p=.67), yield of visible core (97% vs. 90%, p=.26) and complication rate (5.7% vs. 0%, p=.49) between PC22 and PC25, respectively. Yield of histologic core showed a tendency towards the PC22 group (62.9% vs. 40.6%, p=.06), although the difference was not statistically significant.

Conclusions: EUS-guided FNB with PC22 and PC25 showed the similar diagnostic accuracy. Our study results showed a significant trend towards a better yield of histologic core for PC22.

Key Words: 22-Gauge, 25-Gauge, Fine needle biopsy, Endoscopic ultrasound, Pancreas mass
Usefulness of EUS in Patients with High and Intermediate Probability for Choledocholithiasis, But a Negative CT Scan

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Background and Aims: Endoscopic ultrasonography (EUS) is a minimally invasive technique with low morbidity and proven efficacy in the diagnosis of choledocholithiasis. We aimed to investigate the usefulness of EUS in patients with clinically suspected choledocholithiasis but a negative CT scan.

Method: Between March 2008 and August 2013, 111 patients with clinically suspected choledocholithiasis and no evidence of CBD stones according to MDCT underwent EUS. Choledocholithiasis were confirmed by endoscopic retrograde cholangiography (ERCP) and clinical data were retrospectively collected. In addition, the risk of choledocholithiasis was assessed by applying the ASGE guideline.

Result: EUS accuracy for common bile duct stones were 90.1% (sensitivity 97.8%, specificity 57.1%, positive predictive value 90.7%, negative predictive value 85.7%). In patients with high and intermediate probability of choledocholithiasis according to ASGE classification, the detection rate for CBD stones did not differ between two groups (85.7% vs. 78.9%). On multivariate analysis, presence of CBD stone on EUS (OR 83.6, CI 10.5-666, p<0.01) and clinical diagnosis of cholangitis (OR 7.0, CI 1.1-43.2, p=0.37) were strong predictive factors for choledocholithiasis. However, CBD dilation on EUS (OR 2.4, CI 0.5-11.8), presence of pancreatitis (OR 6.6, CI 0.9-45.2), gender (OR 0.5 CI 0.1-2.2), fever (OR 1.6, CI 0.2-11.1) and ASGE probability for choledocholithiasis (OR 1.4, CI 0.2-7.8) were not significant factors.

Conclusion: EUS is recommended additional diagnostic method for CBD evaluation despite of recent improvements of MDCT. And EUS finding of CBD stone is useful predictor for diagnosis of choledocholithiasis with negative CT scan, regardless of ASGE probability of choledocholithiasis.

Key Words: EUS, ASGE, Choledocholithiasis

Outcomes of EUS-Guided Transmural Gallbladder Drainage with a SEMS in Patients Unsuitable Cholecystectomy

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Background and Aims: Recently, EUS-guided transmural gallbladder drainage (EUS-GBD) has been reported as an alternative method for managing acute cholecystitis in high risk patients, but little is known about the long-term outcomes in terms of stent patency, and clinical progress. This study was aimed to investigate the long-term safety and efficacy after EUS-GBD.

Patients and Methods: A total of 63 patients with acute cholecystitis who were unsuitable for cholecystectomy were underwent EUS-GBD using a self-expandable metal stent (SEMS). The procedural outcomes, recurrence of acute cholecystitis, and clinical progress were recorded prospectively in single tertiary referral center.

Results: Successful gallbladder puncture was achieved in all 63 patients (100%), with the successful completion of metal stent placement in 62 patients (98.4%, as an intention-to-treat analysis). The clinical success rate of EUS-GBD was 98.4% (61 of 62, as a per-protocol analysis). Post-procedure adverse events included duodenal perforation (n=1, 1.6%), bile peritonitis (n=1, 1.6%), and self-limited pneumoperitoneum (n=2, 3.2%), all of which resolved with conservative treatment. During follow-up after stent placement (median 262 days, range 70-1130 days), 56 patients were evaluated as per protocol. Late adverse events developed in four patients (7.1% [4/56] as per protocol), including spontaneous distal migration (n=2), and stent occlusion (n=2). Fifty-four patients (96.4%) had no recurrence of acute cholecystitis. The rate of re-intervention was 3.5% (2/56). The median period of stent patency and survival time (range) were 244 days (70-1130) and 262 days (70-1130), respectively.

Conclusions: Given the low recurrence rate of cholecystitis and long-term safety in high surgical risk patients with acute cholecystitis, EUS-GBD with single-step placement of a SEMS may provide a definitive treatment in a select group of patients.

Key Words: EUS, Cholecystitis, Gallbladder, Drainage
Comparison of Sleepiness, Dizziness according to Timing of Flumazenil Administration in Sedative Endoscopy with Midazolam

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Background: Flumazenil is a benzodiazepine antagonist. Previous studies showed that use of flumazenil after sedative endoscopy with midazolam shorten the recovery time, but there is no data on timing of flumazenil administration. We assessed the timing of flumazenil in outpatient receiving midazolam sedation.

Method: From 2012 August to 2013 June, 43 participants with midazolam sedation for endoscopy were prospectively included. They were randomized to receive either flumazenil immediately (immediately group) or 30 minutes later after the procedure (delayed group). Four hours after the endoscopy, each patient was interviewed by telephone to assess the primary end point, sleepiness and dizziness.

Table 1. Primary Outcome

<table>
<thead>
<tr>
<th>Group</th>
<th>1 (n=24)</th>
<th>2 (n=19)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sleepiness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the time of discharge</td>
<td>3</td>
<td>4</td>
<td>0.451</td>
</tr>
<tr>
<td>30 min-1 hours after discharge</td>
<td>2</td>
<td>1</td>
<td>0.695</td>
</tr>
<tr>
<td>1-2 hours after discharge</td>
<td>3</td>
<td>2</td>
<td>0.841</td>
</tr>
<tr>
<td>Duration of sleepiness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 hour</td>
<td>8</td>
<td>3</td>
<td>0.190</td>
</tr>
<tr>
<td>1-2 hours</td>
<td>4</td>
<td>3</td>
<td>0.938</td>
</tr>
<tr>
<td>3-4 hours</td>
<td>0</td>
<td>1</td>
<td>0.255</td>
</tr>
<tr>
<td>5-7 hours</td>
<td>0</td>
<td>1</td>
<td>0.255</td>
</tr>
<tr>
<td>Dizziness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At the time of discharge</td>
<td>7</td>
<td>11</td>
<td>0.058</td>
</tr>
<tr>
<td>30 min-1 hours after discharge</td>
<td>5</td>
<td>10</td>
<td>0.030</td>
</tr>
<tr>
<td>1-2 hours after discharge</td>
<td>2</td>
<td>0</td>
<td>0.198</td>
</tr>
<tr>
<td>Duration of dizziness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 hour</td>
<td>4</td>
<td>8</td>
<td>0.065</td>
</tr>
<tr>
<td>1-2 hours</td>
<td>3</td>
<td>3</td>
<td>0.757</td>
</tr>
</tbody>
</table>

Result: 43 participants were analyzed, 24 in immediate group and 19 in delayed group. The baseline characteristic showed no difference between two groups. There was no difference in sleepiness between immediately group (54.1%) and delayed group (47.3%). However, there was a difference in dizziness between immediately group (29.1%) and delayed group (57.8%) (p=0.03) (Table 1).

Conclusion: This study showed that the immediately group showed significantly lesser dizziness compared with delayed group. Our results indicate that flumazenil should be given immediately after the procedure.

Key Words: Endoscopy, Midazolam Sedation, Flumazenil

The Optimal Level Of Sedation in Gastric Endoscopic Submucosal Dissection: Minimal versus Moderate Sedation

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Background: Endoscopists often use moderate to deep sedation during endoscopic submucosal dissection to minimize patient movement. Moderate to deep sedation, however, has a risk of adverse events including post-procedure aspiration pneumonia. We therefore aimed to determine the optimal level of sedation during endoscopic submucosal dissection.

Methods: The clinical data of 430 patients with 496 lesions who underwent endoscopic submucosal dissection (ESD) for gastric lesions between May and December 2012 were prospectively collected and reviewed. All patients were sedated with either propofol infusion or dexmedetomidine infusion. The target level of sedation was moderate in 218 patients and minimal in 212 patients.

Results: In cases of sedation with propofol infusion, the infusion rate in the minimal sedation group was lower than that in moderate sedation group (22.89±17.34 μg/min/kg vs. 88.07±44.01 μg/min/kg, p<0.001). In patients sedated with dexmedetomidine, the infusion rate in the minimal sedation group was lower than that in the moderate sedation group (0.76±0.61 μg/hr/kg vs. 1.14±0.62 μg/hr/kg, p=0.001). The incidence of bleeding or perforation did not differ between groups. Aspiration pneumonia, however, was more common in the moderate sedation group than in the minimal sedation group (6.4% vs. 1.4%, p=0.008).

Conclusions: The development of aspiration pneumonia could be decreased without impairing endoscopic submucosal dissection outcomes by using minimal sedation. We suggest minimal sedation as the target level of sedation for gastric endoscopic submucosal dissection.

Key Words: Minimal sedation, Moderate sedation, ESD, Aspiration pneumonia
The Safety and Effectiveness of Midazolam in Cirrhotic Patients Undergoing Endoscopic Variceal Ligation

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Background and Aims: Esophageal variceal ligation (EVL) is the established treatment for acute esophageal variceal bleeding. Unlike other therapeutic endoscopic procedure, sedation is generally not used in a cirrhotic patient for fear of hepatic encephalopathy (HE). However, a successful procedure might not be guaranteed due to uncontrolled and/or delirious behavior. In this study, we evaluated safety and effectiveness of midazolam in a cirrhotic patient undergoing EVL.

Patients and Methods: The medical records of 320 cirrhotic patients who underwent EVL between October 2005 and December 2012 were reviewed retrospectively. The main outcomes were treatment success and adverse drug reaction (ADR) that might be related with sedation. Also, risk factors for development of HE were pursued.

Results: Midazolam was used in 151 patients and not in 161 and baseline characteristics were similar. The rates of treatment success were not differ in both groups (95.8% vs. 96.2%, p=0.001). Although the incidence of ADR didn’t differ (46.2% vs. 55.0%, p=0.115), development of HE (6.6% and 0%, p=0.001) and desaturation (23.2% vs. 7.7%, p=0.001) were more common in the midazolam group. A patient from the midazolam group died due to uncontrolled bleeding. There were a total of 10 cases of HE. With logistic regression, ECOG score ≥ 2 turned out to be associated with ADR (OR=2.69, 95% CI 1.68-4.29, p≤0.001). However, age, body mass index, Child-Pugh classification and variceal grade were not related.

Conclusion: Because midazolam was associated with ADR including HE in a cirrhotic patient undergoing EVL, it should be used with extreme caution including appropriate intra- and post-procedural monitoring, especially when the ECOG score of a patient is not less than 2.

Key Words: Endoscopic variceal ligation, Midazolam, Liver cirrhosis, Sedation

Comparison of Recovery Time after Using Remifentanil Alone versus Midazolam and Meperidine for Colonoscopy

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Background/Aims: Although the combination of midazolam and meperidine has been widely used for colonoscopy, their relatively longer recovery time compared to the brief duration for colonoscopy procedure can delay patient’s discharge time. Remifentanil, ultra-short acting opioid, shows very short offset time. Authors assumed that using remifentanil alone for colonoscopy would significantly shorter recovery time compared to that after using the combination of midazolam and meperidine.

Methods: In patients who underwent colonoscopy with remifentanil alone (group-R, n=27) or combined midazolam and meperidine (group-MM, n=27), the recovery time (time to achieve Aldrete score 10 after colonoscopy, primary objective) and other conditions including patient’s pain, bispectral index (BIS), satisfaction and ability to recall the explanation about examination results given during colonoscopy procedure were determined.

Results: The recovery time (median [25-75%]) in group-R was significantly shorter than that in group-MM (0[0-10] vs. 30[15-30] min, p<0.001). Group-R showed significantly higher BIS-score (92[85-96] vs. 84[80-87], p=0.001) during colonoscopy, lower distress score (VAS 30 vs. 37mm, p=0.002) and greater number of patients able to recall the explanations given during and after colonoscopy (100 vs. 48% and 96 vs. 52%, all p<0.001) than in group-MM. The degree of pain, incidence of hemodynamic instability and respiratory depression did not show inter- group difference.

Conclusions: Remifentanil provides a faster recovery with more favorable patient’s satisfaction and patient-endoscopist communication than the conventional midazolam and meperidine does.

Key Words: Colonoscopy, Meperidine, Midazolam, Recovery time, Remifentanil
Propofol Combined with Fentanyl versus Propofol Monosedation for ERCP: A Prospective, Randomized Controlled Study

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Background: Propofol is a representative sedative agent during ERCP. But, Propofol as a sole agent may cause oversedation and can’t decrease pain during ERCP. We evaluated whether the combination sedation with propofol and fentanyl, pain reduction focused sedation, can be an applicable sedative method during ERCP.

STUDY DESIGN: Patients undergoing ERCP were randomized into 2 groups; combination group (n = 86) and control group (n = 89). We prospectively compare total dosage of drugs, recovery profiles, satisfaction score and side effects between two groups.

Results: The dosage of propofol was significantly lower in combination group compared to control group. There is no significant difference in endoscopist and patient satisfaction score. Also, combination group had better tendency of recovery profiles compared to control group (Table 1). Desaturation rate is very low in both group (2.87%) and all desaturations were corrected with temporary oxygen supply without the need of scope removal.

Table 1. Comparison of Drug Dosage, Recovery Profiles and Satisfaction Score between Two Groups

<table>
<thead>
<tr>
<th>Dosage of drugs</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Total</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propofol (mg), mean</td>
<td>158.84</td>
<td>129.44</td>
<td>143.89</td>
<td>0.007</td>
</tr>
<tr>
<td>Fentanyl (ug), mean</td>
<td>0</td>
<td>110.56</td>
<td>56.23</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Recovery time (min), mean</td>
<td>12.81</td>
<td>11.47</td>
<td>12.13</td>
<td>0.264</td>
</tr>
<tr>
<td>Aldrete score at 0 min, mean±SD</td>
<td>7.66±1.38</td>
<td>8.03±1.32</td>
<td>7.85</td>
<td>0.071</td>
</tr>
<tr>
<td>Aldrete score at 5 min, mean±SD</td>
<td>8.9±1.07</td>
<td>9.16±0.92</td>
<td>9.03</td>
<td>0.085</td>
</tr>
<tr>
<td>Aldrete score at 15 min, mean±SD</td>
<td>9.6±0.62</td>
<td>9.75±0.46</td>
<td>9.68</td>
<td>0.075</td>
</tr>
<tr>
<td>Endoscopist satisfaction, mean (of 100 points)</td>
<td>88.43</td>
<td>88.97</td>
<td>88.7</td>
<td>0.778</td>
</tr>
<tr>
<td>Patient satisfaction, mean (of 100 points)</td>
<td>89.17</td>
<td>90.61</td>
<td>89.9</td>
<td>0.469</td>
</tr>
</tbody>
</table>

Conclusions: Propofol combined with fentanyl is not inferior to propofol monosedation in satisfaction score. Sedation focused on pain reduction with fentanyl and propofol can reduce required dose of propofol and decrease the risk of oversedation while ensuring the quality of sedation.

Key Words: ERCP, Sedation, Propofol, Fentanyl

Predictive Factors for Irritability during Conscious Sedative Endoscopy: Prospective Observation

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Background and Aim: Irritability of patients during conscious sedative endoscopy makes the procedure difficult, longer, and even dangerous. We wondered whether patients’ hysterical characteristics or transient mood may affect the irritability. In the present study, we aimed to investigate the risk factors for irritability during conscious sedative endoscopy in terms of psychological view.

Method: We enrolled 129 patients from December 2012 to February 2013 in a health examination center; 64 irritable patients and 65 stable patients. Irritability during insertion was classified into 5 grades, and grade III and IV group were defined as irritable group: 0, no response; I, small movement; II, moderate movement; III, huge movement; IV, fight against procedure. Before starting endoscopy patients submitted consent form and questionnaire sheet for evaluating hysterical score (Structured Clinical Interview for DSM-IV Axis II Disorders and Myers-Biggs Type Indicator) and mood scores (Symptom checklist-90-revised). Insertion was done when Richmond Agitation-Sedation Scale score was -2 to -4. We also investigated the co-morbidity and alcohol history which can affect the efficacy of midazolam. This study was registered in CRIS: KCT0000621.

Results: The hysterial score of the irritable group was slightly higher than the stable group (7.9 ± 3.2 vs. 6.5 ± 3.1; p=0.016). Anxiety score was slightly higher in irritable group also (51.3 ± 10.7 vs. 47.2 ± 9.6; p=0.021). However, all scores in both groups were within normal range. Alcohol drinking showed correlation with irritable group (40/64 vs. 26/65; p=0.011). In multivariate analysis, all three factors, higher hysterical score, higher anxiety score, and heavy alcohol drinking were related with irritability independently.

Conclusion: This pilot study revealed that patients’ characteristics, transient mood status, and habitual alcohol drinking can affect the irritability during conscious sedative endoscopy.

Key Words: Sedation, Endoscopy, Irritability
Comparision of the Effectiveness of Oral Phloroglucin with Cimetropium Bromide as a Premedication for Upper Endoscopy

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Background: Suppression of GI peristalsis during GI endoscopy commonly requires intravenous or intramuscular injection of antispasmodic agents. However, these agents sometimes cause unexpected adverse reactions. Phloroglucin, administered orally, was expected to reduce pain and discomfort better than intravenous or intramuscular injection of antispasmodic agents. This study examined the effectiveness of oral phloroglucin for suppressing peristalsis, patient’s compliance, and complications and compared it with administration of intravenous or intramuscular cimetropium bromide.

Methods: This was a randomized, investigator-blind, prospective comparative study. The 172 patients were randomized into 2 groups according to the medication administered prior to upper endoscopy: oral phloroglucin (n = 86), and cimetropium bromide (n = 86). The number of peristalsis events at the antrum and duodenal second portion was assessed for 30 seconds. The degree of peristalsis was assessed using visible scores (range 0-2) at the antrum and duodenal second portion was assessed for 30 seconds. The degree of peristalsis was assessed using visible scores (range 0-2) at the antrum and duodenal second portion (0- no peristalsis, 1- slight peristalsis but no obscured vision, 2- severe peristalsis with obscured vision).

Results: A significantly higher number (0.49 vs. 0.08, p < 0.001) and degree (1.14 vs. 1.00, p = 0.001) of gastric peristalsis events was seen in phloroglucin than in cimetropium bromide, but this number was less than one in both groups and the difference was not clinically significant. No significant difference was found in the number (1.79 vs. 1.63, p = 0.569) and degree (1.21 vs. 1.15, p = 0.342) of duodenal peristalsis events. The incidence of mouth dryness was significantly higher with cimetropium bromide than that of phloroglucin (50% vs. 15.1%, p < 0.001).

Conclusion: Oral phloroglucin can be used as an antispasmodic agent during upper endoscopy with similar antispasmodic efficacy and fewer side effects when compared to cimetropium bromide.

Key Words: Upper endoscopy, Phloroglucin, Cimetropium bromide

The Impact of No Suction during EUS-FNA on the Specimen Quality for Same Solid Lesions: A Prospective Randomized Trial

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Background and Aims: Endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) has become widely accepted as an effective modality for the diagnosis of lesions in the gastrointestinal tract and mediastinum as well as other adjacent organ sites. Although various techniques have been described to optimize accuracy and quality of EUS-FNA specimens, there were debates to apply suction during EUS-FNA for obtaining adequate specimen. We conducted to compare two different techniques of EUS-FNA using either no suction or suction in same solid lesions.

Patients and Methods: As a prospective randomized trial, we consecutively enrolled 138 patients who were referred for EUS-FNA for solid mass lesions between June 2012 and August 2013. Four punctures were performed for target lesion with randomized alternative sequence of each two passes of needle using either no suction or suction. Sample quality such as adequacy, cellularity and bloodiness and diagnostic yield by accuracy, sensitivity, and specificity for malignancy were compared between both techniques.

Results: Among 138 lesions, 86 were pancreatic masses, 34 were lymph nodes, 18 were other lesions as follows: extrahepatic bile duct (n=10), liver masses (n=5), esophagus (n=1), gallbladder (n=1), and periampullary mass (n=1). There was no difference between the specimens obtained with no suction and suction with regard to the adequacy, cellularity, and bloodiness. No suction acquired more adequate specimens comparing to EUS-FNA with suction in first pass of needle (73.9% vs 55.1%, p = 0.032). In first two passes of needle, no suction demonstrated higher rate of sensitivity for malignancy (80.7% vs 61.0%, p = 0.025) and diagnostic accuracy (81.2% vs 65.2%, p = 0.05) comparing to suction.

Conclusions: Although this prospective randomized trial showed no differences in quality of specimens and diagnostic yield between EUS-FNA with no suction and suction, first pass of needle with no suction is important to acquire adequate specimen.

Key Words: EUS-FNA, No suction, Adequacy, Accuracy, Malignancy
Evaluation of the Forward-Viewing Endoscopic Ultrasound
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**Background:** A forward-viewing linear endoscopic ultrasound (FV-EUS) was introduced to compensate the oblique-viewing EUS (OV-EUS) and to potentially expand the therapeutic applications of EUS.

**Objective:** To evaluate feasibility and efficacy of a FV-EUS in diagnostic and therapeutic EUS procedures compared to standard OV-EUS.

**Design:** Prospective, randomized, crossover study.

**Setting:** A tertiary-care, academic medical center.

**Patients and Interventions:** Consecutive Fifty-one patients with pancreatobiliary and upper gastrointestinal subepithelial lesions were prospectively enrolled in the study. All patients underwent both FV-EUS and OV-EUS simultaneously. The sequence in which the techniques employed was randomly assigned. The EUS visualization was done by a novice endosonographer and image quality of specific lesions was scored by an expert endosonographer. Any indicated fine-needle aspiration (FNA) or intervention was performed using the both echoendoscopes by an expert endosonographer.

**Results:** Both echoendoscopes had similar visualization time and image quality. In general, visualization time was inversely related to the diameter of specific lesions. In subepithelial lesions of stomach and duodenum, the visualization time (98.8±62.2 vs 139.0±66.6, p=0.008) and image quality (4.1±1.3 vs 3.3±1.7, p=0.02) were significantly superior with FV-EUS.

The EUS-guided FNA of pancreatic mass with FV-EUS were successful in seven patients (87.5%).

**Conclusion:** FV-EUS appears easier to access the gastrointestinal subepithelial lesions than conventional OV-EUS. Our experience with FV-EUS for evaluation of pancreatobiliary diseases and intervention seems to be comparable to conventional OV-EUS.

**Key Words:** EUS, Forward-view, Pancreatobiliary, Subepithelial tumor, FNA

Clinical Usefulness of Color Doppler and Contrast-Enhanced Harmonic EUS for Assessment of Visceral Vascular Diseases
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**Background and Aims:** Mesenteric arteries are easily accessible with EUS due to its proximities to the gastrointestinal tract. We evaluated the clinical usefulness of the color Doppler and contrast-enhanced harmonic EUS (CEH-EUS) in diagnosing visceral vascular diseases and in assessing morphological and hemodynamic characteristics required for optimized patient management.

**Patients and Methods:** EUS was performed in 12 patients with clinically suspected visceral vascular disease, as determined by computed tomography (CT) scan between February, 2012, and March, 2013. Conventional B-mode, color Doppler and CEH-EUS was done to evaluate vascular status of celiac artery (CA), superior mesenteric artery (SMA).

**Results:** CT scan imaging suggested arterial dissection in nine patients; arterial stenosis or occlusion in two patients and peri-arterial soft tissue cuffing in one patient. EUS accurately identified all the visceral vascular lesions of 11 patients and one patient with suspected SMA dissection on CT imaging was proven to be normal by EUS. EUS also identified one undefined dissection not detected on abdominal CT. EUS examination revealed vascular intimal flap in five patients, and blood flow within the true lumen and thrombi within the false lumen in eight patients. In addition, the stenotic area could be calculated using color Doppler EUS. Two patients underwent surgical thrombectomy and angioplasty due to total occlusion of SMA on color Doppler and CEH-EUS.

**Conclusions:** The combination of color Doppler and CEH-EUS may be a promising diagnostic modality to assess the splanchnic artery without exposure to radiation. Moreover, EUS is a useful tool to determine the appropriate treatment options for patients with isolated mesenteric artery dissection.

**Key Words:** EUS, Diagnosis, Doppler ultrasonography, Contrast enhancement, Mesenteric arteries
Clinicopathologic Factors Influence the Accuracy of High Frequency Catheter EUS for Superficial Esophageal Carcinoma

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Background: Currently, EUS is the most accurate method for staging esophageal carcinoma. Additionally, EUS using a high-frequency catheter probe accurately distinguishes between mucosal and submucosal esophageal cancers, but there are few reports on clinicopathologic factors that can influence the accuracy of EUS. The aim of this study was to assess the accuracy of EUS conducted with a high-frequency (20 MHz) catheter probe for determining the depth of superficial esophageal carcinoma (SEC), and to identify clinicopathologic factors that influence the accuracy of EUS for differentiating mucosal and submucosal lesions.

Methods: A total of 126 patients with endoscopically suspected SEC, who underwent EUS and curative treatment at Pusan National University Hospital during 2005-2013, were enrolled. We reviewed the medical records of 126 patients and compared EUS findings with histopathologic results according to the clinicopathologic factors.

Results: A total of 114 lesions in 113 patients were included in the final analysis. EUS assessment of tumor invasion depth was accurate in 78.9% (90/114) patients. Accuracy did not differ according to histologic type, tumor differentiation, tumor location, or macroscopic shape. However, accuracy significantly decreased for tumors ≥3 cm in size (p=0.002). Overestimation and underestimation for the invasion depth was found in 11 lesions (9.6%) and in 13 lesions (11.4%), respectively. In multivariate analyses, tumor size ≥3 cm was the only factor significantly associated with EUS accuracy (p=0.031), and was specifically associated with underestimation of true invasion depth.

Conclusions: EUS using a high-frequency catheter probe generally provides highly accurate assessment of the SEC invasion depth. However, accuracy decreases for tumors ≥3 cm, suggesting that caution is warranted when selecting treatments for such tumors according to pretreatment EUS staging.

Key Words: Esophageal cancer, Endoscopic ultrasonography, Accuracy

EUS-Guided ProCore Needle Biopsy for Histologic Evaluation of Solid Liver Masses

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Background and Aims: Cytopathologic evaluation by endoscopic ultrasonography (EUS)-guided fine needle aspiration or biopsy can be performed for the solid liver masses, especially in left lobe. Histologic analysis with adequate tissue sampling may be crucial for differential diagnosis of solid liver masses. Recently ProCore needle was introduced for acquisition of tissue core during EUS-guided fine needle aspiration. The aim of this study was to evaluate the usefulness of the ProCore needle for histologic evaluation of solid liver masses.

Methods: Total 25 patients with solid liver masses were enrolled in this study. 22-gauge EchoTip ProCore needle (Cook medical Inc., Bloomington, USA) was used for EUS-guided fine needle biopsy. Transgastric needle puncture was performed with using stylet and negative suction during sampling.

Results: Tissue sample adequate for histologic evaluation combined with immunohistochemical stain was obtained in 80% (20/25). The median number of needle pass was 2 (interquartile range, 1 to 3). Histopathologic diagnoses were 8 cholangiocarcinomas, 6 metastatic adenocarcinomas, 3 hepatocellular carcinomas, and 3 neuroendocrine carcinomas. Nine solid liver masses that were poorly characterized and non-diagnostic in prior imaging and tissue sampling studies were diagnosed by EUS-guided histologic evaluation. No procedure-related complications were occurred.

Conclusions: ProCore needle was safe and useful for adequate tissue sampling and histopathologic analysis during EUS-guided fine needle biopsy for solid liver masses.

Key Words: Endoscopic Ultrasonography, Fine Needle Biopsy, Solid Liver Masses
Endoluminal Closure of Colon Perforation by Endoscopic Band Ligation: Technical Feasibility in an In-Vivo Canine Model

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Background/Aims: Recently, a great deal of literature reported high success rates of the closure of an acute iatrogenic colonic perforation with an endoclip. But, endoclipping has many limitations in various conditions of the perforation. Although some experience has been reported about endoluminal closure of bowel perforation with endoscopic band ligation, there is little evidence about safety and feasibility of that method. The aim of this study was to evaluate the technical feasibility and efficacy of endoluminal closure of colon perforation by use of an endoscopic band ligation (EBL) in an in-vivo canine model.

Methods: We performed a survival study that included 8 beagle dog, 12kg. Longitudinal 1.5 to 1.7 cm colon perforations were created by using endoscopic needle knife and isolated-tip knife. Perforation was subsequently closed by several times of EBL. After 48 hours of recovery, the animals were allowed to eat. All the animals received oral antibiotics before procedure and were carefully monitored clinically and laboratorially. After a follow-up of 2 weeks, the dogs were euthanized for pathologic examination.

Results and Conclusions: Endoscopic closure of colon perforation was successful in all animals. One animal developed complications, was euthanized 3 days later. 7 of 8 animals recovered well, without any clinical and laboratorial features of sepsis or peritonitis. Median time for closure with 1-2 bands was 3 minutes (range, 2.33 to 4.00) Result of necropsy did not show fecal peritonitis and pericolonic abscess formation at the site of perforation. There was no evidence of transmural dehiscence. Histopathology demonstrated that inflamed granulation tissue was filled in the submucosa and defects of muscularis propria were replaced by fibrosis. Endoscopic closure of 1.5 to 1.7 cm colon perforations with EBL was a simple, feasible, and safe alternative method for the management of colonic perforation.

Key Words: Colon perforation, Endoscopic closure, Endoscopic band ligation

The Comparison of Laparoscopic Wedge Resection and Hybrid NOTES in Treatment of Intraluminal Growing Gastric SET

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Background & Aims: The laparoscopic wedge resection have been applied for resection of the subepithelial tumor (SET) less than proper muscle layer. Removal of the SET may be difficult to identify using laparoscopic wedge resection alone and, the resection field is usually larger than that of Hybrid NOTES. We compared the treatment record of the hybrid NOTES and laparoscopic wedge resection in treatment of intraluminal growing SET.

Methods: From January 2008 to August 2012, 32 patients with intraluminal growing SET originated in proper muscle layer were included. 19 patients were treated with the laparoscopic wedge resection and 13 patients were conducted by hybrid NOTES.

Results: In laparoscopic wedge resection group, there were 9 cases of gastrointestinal stromal tumors (GIST), 4 cases of leiomyomas, 3 cases of schwannomas, and 3 cases of ectopic pancreas. In hybrid NOTES group, there were 11 cases of GISTs including 1 malignancy, 1 case of leiomyoma, and 1 case of schwannoma. Mean tumor size of laparoscope and hybrid NOTES groups was 26.0 mm (range 11-53 mm) and 19.9 mm (range 7-42 mm), respectively (p=0.096). Mean treatment duration of laparoscope and hybrid NOTES groups was 75.8 minutes (range 25-175 mins) and 84.2 minutes (range 55-150 mins), respectively (p=0.547). There were no significant difference of the tumor size and the treatment duration. All tumors were completely resected without intraoperative or postoperative adverse events. Mean safety margin was significantly small in hybrid NOTES compared with laparoscopic wedge resection (13.1 mm VS 24.8 mm, p=0.016). In hybrid NOTES group, mean resection size was significantly small compared with laparoscopic wedge resection group (33.0 mm vs 50.8mm, p=0.007).

Conclusion: Hybrid NOTES is a feasible minimally invasive procedure that can achieve smaller resection size, similar treatment duration, and en-bloc tumor resection compared with the laparoscopic wedge resection.

Key Words: Hybrid NOTES, Wedge Resection, Subepithelial Tumor
Development of Germanium Photodiode and 3D Integrated Circuit for Designing Endoscopic Implantable Gastric Pacemaker

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Background/Aims: Photodiode is a device for photo-detection and signal change such as radio-frequency wave. RF waves can be applied to wireless charging and data transmission. 3D integration with multiple layers can decrease the volume. We expect that development of high efficient photodiode and 3D integration can make smaller integrated chip for medical devices. We investigate the development of Ge Photodiode and 3D integration for endoscopic implantable gastric pacemaker.

Methods: GE P-I-N photodiode was constructed by selective multiple hydrogen annealing for hetero-exitax Ge growth on Si through SiO2. Mesa structure was patterned by reactive ion etching. 3D Integrated circuit was made of multiple layered SiO2 film with Ge. A SiO2 film was grown on a p-type 100 Si substrate at 1100 °C. The growth temperature was changed to 600 °C for the formation of the intrinsic Ge layer.

Results: The responsibility of Ge P-I-N photodiode was showed high efficiency and maximal responsibility to 640mA/W at 1550nm. Ge layer was made on SiO2 film with Ge for 3D Integrated circuit (Fig.).

Conclusion: Ge photodiode was showed high efficiency and good responsibility. Second Ge layer was constructed on SiO2 layer for 3D integrated chip. Further studies may be required to practical use.

Key Words: Integrated Circuit, Germanium, Photodiode, Gastric Pacemaker, Endoscopy