Paradoxical Reaction to Midazolam in Patients Undergoing Endoscopy Under Sedation

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**Background and Study Aims:** Paradoxical reactions (PR) can severely impede or even prevent the performance of endoscopy. Despite this clinical significance, there have been few studies of PR during endoscopy under sedation. Patients and

**Methods:** Subjects of this prospective study were 4140 adult outpatients undergoing endoscopy under sedation with midazolam and pethidine. Before the procedure, patients completed a self-administered questionnaire about possible risk factors for PR. After the procedure, endoscopists described whether PR occurred during endoscopy and whether flumazenil was administered in cases of PR. For patients who experienced PR, their procedure reports and endoscopic images were reviewed and the outcome of endoscopy were compared using European Society of Gastrointestinal Endoscopy (ESGE) quality control recommendations according to flumazenil administration status.

**Results:** The incidence of PR was 1.4% (59/4140). In multivariate analyses of the 3541 patients with previous experience of endoscopy under sedation, unsuccessful sedation in previous endoscopy, upper endoscopy, higher dose of midazolam, and lower dose of pethidine were identified as independent risk factors for PR. Among patients receiving flumazenil for PR, procedures were successfully completed in 91.7% of cases. The quality of endoscopy measured by ESGE recommendations was significantly higher and total procedure time was significantly longer in patients receiving flumazenil than in patients not taking flumazenil.

**Conclusions:** For patients with risk factors for PR, use of propofol as an alternative to midazolam or active use of pethidine with a concomitant dose reduction of midazolam could be helpful. Administration of flumazenil might be favorably considered in cases of PR.

**Key Words:** Paradoxical response, Midazolam, Endoscopy

The Study of the Timing of Flumazenil Injection and Patient Satisfaction During Sleeping Endoscopy

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**Background/Aims:** To reduce patient’s anxiety and discomfort, sedation endoscopy with benzodiazepine and opioid is frequently performed. Flumazenil has been used after the completion of endoscopy for faster recovery time and patient’s safety. We evaluated patient satisfaction after sedative endoscopy according to the timing of flumazenil injection Methods Two hundred subjects undergoing concurrent colonoscopy and upper endoscopy under sedation with midazolam and meperidine for health check-up were enrolled. We randomly administered 0.3mg flumazenil either immediately or 15 minutes after the endoscopic procedure. When they were safely awakened from sedation in a recovery room, a post-procedural questionnaire about patient satisfaction and memory of the procedure was performed. A follow-up telephone interview was conducted in the next day in order to survey patient satisfaction, amnesia and willingness to undergo future endoscopy.

**Results:** 182 patients were included in the study. The two groups were similar in baseline parameters, midazolam dose and total procedure time. Flumazenil injection timing did not affect the duration of the stay in the recovery room between two groups. However, patients in 15 minute injection group were more satisfied with sedative endoscopy and less recall the unpleasant endoscopic procedure than patients in immediate injection group according to the post-procedural survey. However, at the next day telephone survey, there was no difference regarding sedation satisfaction, additional sleeping time, antegrade amnesia and willingness to undergo future endoscopy between the two groups.

**Conclusion:** This study showed that delayed flumazenil injection after sedative endoscopy increase patient satisfaction without increasing the recovery room stay time. However, flumazenil injection timing did not have influence on the patient satisfaction, antegrade amnesia and willingness to future endoscopy in the next day after sedative endoscopy.

**Key Words:** Flumazenil, Midazolam, Colonoscopy, Patient Satisfaction
**Others-3**

**Oral Phloroglucin as Premedication for Esophagogastroduodenoscopy: Open-Labeled Prospective Randomized Comparative Study**

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**Background/Aims:** Cimetropium bromide (Algiron) is a frequently-used IM and IV drugs in Korea. This is the inhibitor of gastrointestinal contraction and is used as premedication for esophagogastroduodenoscopy. However, Cimetropium bromide cause pain and pre-procedure anxiety due to injection. Phloroglucin (Flospan) is an oral liquid medicine developed as an alternative to Cimetropium bromide. This inhibits bowel movement, gastric secretion and causes less pain and anxiety. Finally, patients contraindicated to anticholinergics may use Phloroglucin. The purpose of this research is to evaluate the efficacy of phloroglucin as a premedication for esophagogastroduodenoscopy in comparison with Cimetropium bromide.

**Methods:** From March through September 2012, 136 people who underwent esophagogastroduodenoscopy were prospectively enrolled. We assessed a total procedure time (from insertion to removal), a total motility score (the sum of stomach and duodenal motility number and amplitude; counted at antrum and duodenal 2nd portion for 30 sec, respectively), the amount of air bubbles and foam (graded on a 4-point scale) and a patient’s questionnaire about discomfort during and before procedure (anxiety, nausea, abdominal pain, further retesting).

**Results:** Cimetropium bromide has significantly lower total motility score (1.71 vs. 2.54, p=0.043). However, there was no significant difference between the groups for the total procedure time (4 mins 22 secs vs. 4 mins 27 secs, p = 0.728), the amount of air bubbles and foam (0.75 vs. 0.87, p=0.247) and nausea, abdominal pain during procedure, further retesting comments (3.26 vs. 3.12, p=0.164; 0.99 vs. 0.95, p=0.406, respectively). Furthermore, Cimetropium bromide group has much more anxiety before procedure than phloroglucin group (1.79 vs. 0.69 p=0.002).

**Conclusions:** Cimetropium bromide shows more effectiveness in motility inhibition. But, Phloroglucin is not inferior to Cimetropium bromide in total procedure time, the preparation before esophagogastroduodenoscopy and patient’s discomfort during examination. Furthermore, Phloroglucin is superior in pre-procedure anxiety. Therefore, Phloroglucin may be used as alternative to Cimetropium bromide in premedication of esophagogastroduodenoscopy.

**Key Words:** Peroral premedication, Phloroglucin (Flospan), Cimetropium bromide (Algiron)

**Others-4**

**An Adequate Level of Training for Technically Competent Endoscopic Mucosal Resection of Colorectal Polyps**

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**Aims:** There are little data about training level to achieve technical competence for endoscopic mucosal resection (EMR) of colorectal polyps. This study aimed to obtain the baseline data regarding technical competence for colon EMR by experienced colonoscopists and to investigate the amount of training necessary for acquisition of technical competence for colon EMR in trainees.

**Patients and Methods:** Baseline data about colon EMR performance (240 colon EMR procedures in 154 patients for 12 weeks) were obtained from three colonoscopists who had experienced more than 2,000 colon EMR before this study. Trainees enrolled in this study were three second-year gastroenterology fellows who had experienced more than 150 cases of diagnostic colonoscopy before this study. The success rate of individual colon EMR procedure by trainees was defined if (1) en bloc resection, a qualitative indicator, was obtained and (2) EMR time, a quantitative indicator, was within two times of median EMR time by experienced colonoscopists. Acquisition of technical competence for colon EMR by trainees was defined if the success rate of colon EMR became 80% or higher.

**Results:** Experienced colonoscopists showed average EMR time of 75 sec in <10 mm polyp and 94 sec in ≥10 mm polyp, 750 colon EMR procedures in 410 patients (62.8 ± 10.6 years, M:F=279:131) were performed by three trainees between Feb 2010 and Dec 2010. Sessile and pedunculated polyps were 676 and 74 cases. The average size of polyps was 7.8 ± 2.5 mm. The overall EMR time, en bloc resection rate and complication rate were 153 ± 109.5 sec (141.3 ± 104.7 sec in <10 mm polyp, 188.5 ± 119.1 sec in ≥10 mm polyp), 95.6% (717/750) and 6.8% (51 cases), respectively. The average EMR time by trainees decreased significantly as the experience accumulated (<p=0.001). En bloc resection rate improved significantly dur-
Aims: There is little known about Eastern endoscopists’ clinical attitude towards endoscopic ultrasound (EUS) in their practices especially in the region where endoscopic treatments are more adopted for early gastrointestinal malignancy. We performed an survey to provide a current profile of Korean endoscopists’ clinical attitude toward EUS.

Patients and Methods: A self-administered questionnaire was presented to the endoscopists throughout the Korea participated in the 4th EndoFest symposium of the Korean Society of Gastrointestinal Endoscopy on March 24, 2012. Main Outcome Measurements are opinion about the necessity of EUS in the assessment of the gastrointestinal diseases and perceived barriers to widespread of EUS.

Results: The data was analyzed from 214 (31.4%) responses. The rates of positive response of opinion (the portion of agreement and strongly agree) that EUS is necessary for the evaluation of gastrointestinal diseases were subepithelial tumor (94.9%), early rectal cancer (83.6%), and invasive procedure (6.6%).

Conclusions: This is the first Korean study to address the attitudes towards EUS in the evaluation of gastrointestinal diseases.

Key Words: Endoscopic Ultrasound, Survey

Others-6

Predictive Factors of Atelectasis Following Endoscopic Resection

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Background/Aims: The endoscopic resection is effective treatment technique in upper gastrointestinal lesions, but there are possibilities of several complications such as bleeding and perforation. In general, endoscopic resection is frequently performed under the sedation. It has been known that sedation could cause atelectasis. Therefore, the aims of this study were to investigate the frequency and predictive factors of atelectasis associated with endoscopic resection.

Method: Three hundred forty five patients who underwent endoscopic resection of upper GI tract between March 2009 to September 2012 were included. Baseline characteristics and clinical data was collected from medical records. For identifying atelectasis, we compared the chest radiography taken before and after endoscopic procedure.

Result: Among the patients, 69 patients (20%) were newly developed atelectasis after endoscopic procedure but there was no severe adverse event that required prolongation of hospital days or intensive therapy. Atelectasis was not influenced by patient’s gender, age, height, weight and smoking history, but associated with increase in BMI (p=0.044). About the patient’s underlying disease, only diabetes mellitus showed a significant association with atelectasis (odd ratio, 1.24; CI, 1.02~1.50).

Conclusion: Although severe adverse event was not accompanied, the incidence of atelectasis following endoscopic resection was not inconsiderable. Our study shows that BMI, DM, endoscopic procedure time and total amount of infused propofol are associated with the development of atelectasis following endoscopic resection.

Key Words: Atelectasis, EMR, ESD

Others-5

Endoscopists’ Clinical Attitude Towards Endoscopic Ultrasound for the Evaluation of Gastrointestinal Diseases

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Aims: There is little known about Eastern endoscopists’ clinical attitude towards endoscopic ultrasound (EUS) in their practices especially in the region where endoscopic treatments are more adopted for early gastrointestinal malignancy. We performed an survey to provide a current profile of Korean endoscopists’ clinical attitude toward EUS.

Patients and Methods: A self-administered questionnaire was presented to the endoscopists throughout the Korea participated in the 4th EndoFest symposium of the Korean Society of Gastrointestinal Endoscopy on March 24, 2012. Main Outcome Measurements are opinion about the necessity of EUS in the assessment of the gastrointestinal diseases and perceived barriers to widespread of EUS.

Results: The data was analyzed from 214 (31.4%) responses. The rates of positive response of opinion (the portion of agreement and strongly agree) that EUS is necessary for the evaluation of gastrointestinal diseases were subepithelial tumor (94.9%), early rectal cancer (83.6%), and invasive procedure (6.6%).

Conclusions: This is the first Korean study to address the attitudes towards EUS in the evaluation of gastrointestinal diseases.

Key Words: Colorectal polyp, EMR, Technical Competence
Efficacy of Submucosal Injecting Endo-Ease (0.4% Sodium Hyaluronate) to Improve Usefulness Rate in the Endoscopic Resection

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Background and Aims: Endoscopic resection for gastrointestinal neoplasia has been steadily increasing. A submucosal injecting solution makes a long-lasting submucosal lifting and assists to define the lesion, thus reduces perforation, the most important complication of ESD. We evaluated whether submucosal injection of newly developed Endo-EaseTM (0.4% sodium hyaluronate, UNIMED pharm., INC, Seoul, Korea) improves the formation and maintenance of mucosal lifting compared with injection of normal saline and assessed the usefulness and safety.

Method: We performed a prospective open label study from May 2011 to September 2012. The patient who need endoscopic resection for gastric or colorectal neoplasms at two referral hospitals (Samsung Medical Center, Kangbuk Samsung hospital) were enrolled. The primary outcome was usefulness rate (the percentage of the lesions which need for 0~1 additional injection) of the en bloc complete resection. Additionally, we assessed ease of endoscopic resection, volume of solution, and time of endoscopic resection.

Result: A total 169 patients (gastric: 73, colorectal: 96) were included. 37 gastric neoplasms and 51 colorectal neoplasms were enrolled in Endo-EaseTM group. Usefulness rate was significantly higher for Endo-Ease™ group than for the control group: 89.19% versus 58.33%, for gastric neoplasm, 98.04% versus 68.89%, for colorectal neoplasm (p<0.001). Ease of mucosal resection as the secondary outcome was higher than control group statistically. (p<0.001). A total injected volume was smaller than the control group (p<0.05), but there was no significant intergroup differences in terms of the time required for endoscopic resection (gastric: p=0.6440, colorectal: p=0.1710).

Conclusions: The use of Endo-Ease™ as submucosal injecting solution could reduce the need for additional injections and improve ease of mucosal resection, volume of injecting solution without increasing complication rates. Thus, Endo-Ease™ could be used as submucosal injection solution usefully in endoscopic resection of gastrointestinal neoplasia.

Key Words: ESD, Endo-Ease, sodium hyaluronate, usefulness rate

Effectiveness of EUS for Therapeutic Decision Making for Endoscopic Submucosal Dissection in Early Gastric Cancer

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Background and Aims: There are few prospective reports on the relation between the tumor invasion depth staging of endoscopy and endoscopic ultrasonography (EUS). Therefore, the role of EUS in early gastric cancer (EGC) depth evaluation is still unclear. We conducted a study to evaluate the accuracy of EUS for depth of invasion of EGC in comparison to conventional endoscopy and the effectiveness of adding EUS for the selection of proper management.

Patients and Methods: We prospectively enrolled 393 endoscopic EGCs from 380 consecutive patients and performed EUS between July 2007 to April 2010. The endoscopic T classification was classified as mucosal, submucosal and indeterminate cancers based on surface nodularity, stiffness, and fold morphology. The EUS T staging was classified as mucosal, submucosal and advanced cancers based on invasion layers. The staging accuracy of each method was compared with the pathological staging of the resected specimen. The effectiveness of adding EUS was evaluated using treatment algorithm according to results of conventional endoscopy and EUS.

Results: The overall accuracies of the conventional endoscopy and EUS were 71.8% (242/337) and 70.0% (271/393), respectively. Proper management rates by conventional endoscopy were 88.1% (223/253) in mucosal cancers, 64.3% (36/56) in indeterminate cancers, 44.9% (38/84) in submucosal cancers and 75.6% (297/393) in all cases. Surgery was needed in 50 cases (12.7%) after endoscopic resection and unnecessary surgery was performed in 46 cases (11.7%). After adding EUS, therapeutic plans were changed in 28.2% (111/393) of cases: The percentages of proper management by adding EUS were 81.4% (206/253) in endoscopic mucosal cancers, 50.0% (28/56) in indeterminate cancers, 52.4% (44/84) in submucosal cancers and 70.7% (278/393) in all cases. Surgery was needed in 12 cases (3.1%) after endoscopic resection and unnecessary surgery was performed in 103 cases (26.2%). After adding EUS, the percentages of proper management decreased in endoscopic EGCs, especially in endoscopic mucosal and indeterminate cancers.

Conclusions: Adding EUS did not increase the proper manage-
EUS-Guided Needle Procedure in Gastric Subepithelial Tumors: Factors Associated with Higher Diagnostic Yield

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Background: EUS-guided needling is an indispensable procedure for tissue diagnosis of gastric subepithelial tumors (SETs). Studies evaluating the factors associated with higher diagnostic yield of gastric SETs are limited. Objective: Significant factors for confirmative cytodiagnostic pathology of gastric SETs in large case series.

Methods: Records of patients with gastric SETs >2 cm in size who underwent EUS-guided needling were retrieved by reviewing the consecutively collected database from Nov. 2005 to May 2012. Variables included patient age, sex, tumor size and location, EUS echo-features, needling procedural features, and final cytodiagnostic pathology. Cytodiagnostic pathology results were categorized as diagnostic or non-diagnostic. A diagnostic was defined as sufficient samples for cytodiagnostic evaluation, and/or a specific diagnosis by immunohistochemical staining (c-kit, CD34, actin/desmin, S-100). A non-diagnostic was defined as: (1) a needle sample from which suspicious cellular materials was obtained, but quantity not sufficient for confirmator analysis, or (2) a scanty insensitive sample. Logistic regression analysis was performed to assess factors that were associated with higher diagnostic yield.

Results: A total of 152 patients underwent EUS-guided needle procedures. Tumor size was 40.5±29.5 mm and 57.2% was located in the gastric upper thirds. 19G trucut needle was used in 61.8% of gastric SETs. Sampling with 19G trucut needle was a significant factor associated with higher diagnostic yield (p<0.001). GIST cytopathology showed higher diagnostic sampling than non-GIST SETs in 22G FNA (68.8% vs. 14.3%, p=0.001).

Conclusion: A confirmative cytodiagnostic pathology diagnosis was obtained in 61.8% of gastric SETs. Sampling with 19G trucut needle was significantly associated with higher diagnostic yield in multivariate logistic analysis.

Key Words: Endosonography, Biopsy, Fine-needle, Stomach, Gastrointestinal Stromal Tumors

Endoscopic Ultrasound-Guided Fine Needle Aspiration Biopsy for Solid Liver Masses

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Introduction: Percutaneous liver biopsy remains the gold standard for histopathological evaluation of solid liver masses. However, percutaneous approach may be limited in some conditions. Although endoscopic ultrasound-guided fine needle aspiration biopsy (EUS-FNB) has been established as a safe and accurate method for the histological diagnosis for extramural neoplasms such as pancreatic mass and lymphadenopathy, it has only limited data for liver masses. The aim of this study was to evaluate the clinical impact of EUS-FNB for liver masses.

Methods: Total 21 patients (7 uncharacterized liver masses, 6 metastatic liver masses, 5 intrahepatic cholangiocarcinomas, and 3 hepatocellular carcinomas) were enrolled in this study. Inclusion criteria were liver masses that were poorly accessible or contraindicated to percutaneous approach, nondiagnostic after percutaneous biopsy, or combined with pancreatic or biliary malignancies. Obtained specimen was divided into three segments for the on-site examination, cytologic examination, and histologic examination.

Results: In all patients, on-site cytopathologic examination revealed adequate cellularity of specimen. The mean number of needle pass for adequate cellularity was 1.1 (range 1 to 2). Histologic examination with immunohistochemical stain and histopathological confirmation were possible in 90.5% (19/21). Final diagnoses were 8 cholangiocarcinomas, 6 metastatic adenocarcinomas, 3 hepatocellular carcinomas, and 2 neuroendocrine carcinomas. No procedure-related complications were occurred.
Conclusions: EUS-FNB of liver masses provided cytologic and histologic evaluation and was safe and reliable modality for histopathological diagnosis. EUS-FNB may be considered as alternative to percutaneous liver biopsy, especially when percutaneous approach is contraindicated, not accessible or not diagnostic.

Key Words: Endoscopic ultrasonography, Fine needle aspiration biopsy, Liver mass

Others PL-11

Midazolam with Meperidine and Dexmedetomidine vs Midazolam with Meperidine for Sedation during ERCP

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Background and Study Aims: The combination of midazolam and opioid has been widely used as standard sedative regimen for endoscopic retrograde cholangiopancreatography (ERCP). Given the recent idea that dexmedetomidine may exert a synergistic effect in combination with midazolam, we compared the sedative effect and adverse events between midazolam-meperidine-dexmedetomidine (MD) and midazolam-meperidine (MM) during ERCP.

Patients and Methods: A total of 110 American Society of Anesthesiologist (ASA) physical class I-III patients, aged 20-80 years and scheduled for ERCP, were prospectively included. Patients were randomly assigned, in a double-blind manner, to MD (n= 53) or MM (n= 57) group. All patients received intravenous (IV) bolus dose of midazolam (0.06mg/kg; 30% reduction of the recommended dose for patients aged ≥65) and meperidine (50mg; 25mg for patients aged ≥65). Dexmedetomidine (1μg/kg · hr) IV continuous infusion (MD group) or the same volume of normal saline (MM group) was added. Sedation level was assessed using the Ramsay Sedation Scale (RSS) and the demand for additional sedatives was recorded. Hemodynamic and respiratory changes were also assessed.

Results: Successful sedation ratio (% of procedures when RSS was maintained at ≥3 consistently without additional sedative/analgescics) were 75.5% and 36.8% in MD and MM group, respectively (P <0.001). In the MD group, the reduction in relative risk for ‘failure of successful sedation’ was 56% (95% CI, 30%-72%) and the number of patients that needed to be treated (NNT) was 2.85 (95% CI, 1.92-5.56) to observe one additional successful sedation. Lower additional (p = 0.003) and total dose (p = 0.003) of midazolam were required in MD group than in MM group. In addition, patients in MD group showed lower pain scores (p = 0.001) and higher satisfaction scores (p = 0.001) than those in MM group. Desaturation occurred more frequently in MM group than in MD group (11 vs. 1, p = 0.003).

Conclusions: The addition of dexmedetomidine to midazolam-meperidine regimen provides better sedative efficacy and safety profile during ERCP, compared with midazolam-meperidine regimen. (ClinicalTrials.gov Identifier: NCT01404689)

Key Words: ERCP, Sedation, Dexmedetomidine, Midazolam

Others PL-12

Prediction of Malignancy with Endoscopic Ultrasound in Branch Duct Type of Intraductal Papillary Mucinous Neoplasm

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Aims: The purpose of this study was to evaluate our scoring system of endoscopic ultrasonography (EUS) in predicting malignancy in branch duct type IPMN, thus providing a guideline of surgical resection more reliable to a clinician.

Method: We performed retrospective and multicenter study of patients who were diagnosed as BD-IPMNs with postoperative pathologies and underwent endoscopic ultrasound (EUS) within 3 months before surgery at eight hospitals in Korea from Aug 2002 to Dec 2011. We applied EUS scoring system (table 1) to predict malignancy defined as carcinoma in situ and invasive carcinoma. We compared ROC areas by known risk factors of malignancy and by Sendai criteria with that by our EUS scoring system.

Result: Eight four patients (M:F 55:29, Age 64.7±7.1) were classified into 68 benign BD-IPMNs and 16 malignant IPMNs. Presence of symptoms, level of CA 19-9, size of cyst, presence of mural nodule, dilatation of main duct, and septal thickening were related with malignant BD-IPMN. Our scoring system showed 75.0% sensitivity and 94.1% specificity with cut-off at seven. This system (AUC 0.939, 95% CI 0.884 -
0.994) showed more accurate prediction than Sendai criteria (AUC 0.581, 95% CI 0.537-0.625) (p<0.001). It was also more accurate than prediction with dilatation of duct, size of cyst, presence of septal thickening and mural nodule.

Table 1, EUS Scoring System

<table>
<thead>
<tr>
<th>EUS Scoring System (0-10)</th>
<th>Pancreatic Cyst size</th>
<th>Height of mural nodule</th>
<th>Main duct dilatation</th>
<th>Septal thickening</th>
<th>Patulous orifice</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Cyst ≤ 10 mm</td>
<td>≤ 5 mm</td>
<td>No</td>
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<td>No</td>
</tr>
<tr>
<td></td>
<td>10 &lt; Cyst ≤ 20 mm</td>
<td>≤ 5 mm</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>20 &lt; Cyst ≤ 30 mm</td>
<td>5 ≤ Height &lt; 10 mm</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Cyst &gt; 30 mm</td>
<td>Height ≥ 10 mm</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Conclusion:** Our EUS scoring system can predict the malignancy of BD-IPMN more accurately than Sendai criteria and other risk factors of malignancy including presence of mural nodule and size of cyst.

**Key Words:** Intraductal Papillary Mucinous Neoplasm, Sendai Criteria, Endoscopic Ultrasound, Mural Nodule

**Others PL-13**

**Suction vs. Non-Suction Method with Optimal Number of To-and-fro Motion in EUS-Guided FNA for Pancreatic Masses**

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**Background/Aims:** EUS-FNA is the standard of care for diagnosing pancreatic masses. According to the preference of operator, EUS-FNA with suction (S) or without suction technique (capillary sampling method, CS) has been used. The aim of this study was to compare the samples obtained by EUS-FNA with S and CS for diagnostic yield of malignancy, optimal number of to-and-fro motion (TAF), and blood contamination.

**Methods:** The diagnostic yield of malignancy and amount of blood contamination in pancreatic masses at each sample according to EUS-FNA with S or CS / different number of TAF (10, 15, 20, and 25) were measured. Visual assessment during EUS-FNA was used for stopping rule for EUS needle passes (25 TAF, fourth pass and different site with 20 TAF, fifth pass) following 3 needle passes (10, 15, and 20 TAF).

**Results:** Two hundred patients with pancreatic (n=194) or peripancreatic masses (n=6) were prospectively enrolled in this single-blinded randomized, controlled trial. There were 873 passes made (419 with S, n=102 and 454 with CS, n=98). Mean number of needle passes was statistically different between S and CS (4.1 with S vs. 4.6 with CS, p=.005). No statistical difference in the diagnostic yield of malignancy (95%, 75/79 in S vs. 88%, 72/82 in CS, p=.16) was seen. However, the proportion of inadequate specimens was statistically different (23 with S [5.5%] vs 63 with CS [14%], p=.000). In terms of optimal TAF, no difference in diagnostic yield of malignancy of 10, 15, 20, 25 TAF with S was seen (90%, 71/79 vs. 85% 67/79 vs. 90%, 71/79 vs. 83%, 40/48, p=NS). Significant blood contamination in EUS-FNA with S was 4 (4%) in 10 TAF, 3 (3%) in 15 TAF, 8 (8%) in 20, and 2 (4.2%) in 25 TAF (p=NS). The diagnostic yield of malignancy of 10, 15, 20, 25 TAF with CS was 61% (50/82), 74% (61/82), 74% (61/82), and 73% (48/66), respectively (p=.07). Significant blood contamination of CS was 2 (2.4%) in 10 TAF, 0 in 15 TAF, 4 (5%) in 20 TAF (p=NS).

**Conclusion:** No difference in the diagnostic yield of malignancy between passes with S and CS was seen. However, EUS-FNA with S was superior to EUS-FNA with CS for pancreatic or peripancreatic masses in terms of mean number of passes and the proportion of inadequate specimen. No difference in the diagnostic yield of malignancy and significant blood contamination of 10, 15, 20, 25 TAF with S or CS were seen.

**Key Words:** EUS, EUS-FNA, Suction, Pancreatic masses

**Others-14**

**Comparison of EUS-FNB Needle with EUS-FNA Needle as a Historical Control for Diagnosis of Pancreatic Solid Masses**

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**Objectives:** EUS-FNA is the current standard of method for sampling pancreatic solid masses, but cytologic analysis has several limitations for diagnostic accuracy. To overcome the cytology, biopsy needles have been developed to obtain histologic samples during EUS. The aim of this study was to compare EUS-FNB needle with EUS-FNA needle as a historical control for diagnosis of pancreatic solid masses.

**Methods:** Between March 2012 and September 2012, 38 pa-
patients underwent EUS-FNB using biopsy needle (Echotip ProCore; Cook Endoscopy, Bloomington, IN), and between July 2011 and February 2012, 42 patients underwent EUS-FNA using conventional needle (Echotip, Cook Endoscopy) as a historical control for diagnosis of pancreatic solid masses. After one pass using 22 (transgastric pass) or 25 G (transduodenal pass) needle, specimen was divided three segments. Air-dried smears with first segment were stained with Diff-Quick stain and immediately reviewed by cytopathologist to ascertain sample adequacy and onsite diagnosis. Three maximum passes were performed until onsite diagnosis established. If on-site diagnosis was not established within 3 passes, the procedure was terminated with adequate cellularity with up to 5 passes. Second or third segment of each pass specimen prepared for Papanicolaou stain or histologic analysis.

Results: An on-site diagnosis was established higher in FNB group (89.5% vs 61.9%, p=0.005). The median number of passes for adequate tissue acquisition was significantly lower in FNB group (1.47 vs 2.02, p=0.012) but, median number of passes required to establish on-site diagnosis was no difference (1.26 vs 1.38, p=0.484). There were no significant difference in the rate of diagnosis using cytology (94.7% vs 85.7%, p=0.269) and histology with immunohistochemical stain (81.6% vs 78.6%, p=0.781) between FNB and FNA, respectively. The rates of diagnosis of triple approach which cytology and histologic assessment with rapid on-site cytopathologic evaluation in FNB and FNA were also no significant difference (97.4% vs 92.9%, p=0.617).

Conclusions: The EUS-FNB needle was more effective to achieve on-site diagnosis and showed comparable overall diagnostic rate using the lower number of needle passes in comparison with FNA needle. In this respect, EUS-FNB needle is considered to be more useful in absence of on-site cytopathologist.

Key Words: Endoscopic ultrasonography, Fine needle biopsy, Fine needle aspiration

Others-15

Comparison of Diagnostic Accuracy and Safety between 22-Gauge EUS-PNA and FNB Needle for Pancreatic Solid Lesion

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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. In a multicenter cohort study, performing EUS-FNB with 19-gauge (G) needle (ProCore, Cook Medical, USA) was feasible and safe for histopathologic diagnosis but technical difficulties were encountered when transduodenal biopsy was performed. To overcome this limitation, a 22-G EUS-FNB needle (ProCore, Cook Medical, USA) was developed. We conducted this study to compare diagnostic accuracy and safety of 22-G FNB to those of 22-G FNA for pancreatic solid lesion.

Methods: The Patients who got 22-G FNA or FNB procedure for pancreatic solid lesion between October 2011 and July 2012 were reviewed retrospectively. Among them we enrolled patients whose final diagnosis was confirmed. Diagnostic accuracy and safety were compared between FNA and FNB group.

Results: Eighty three patients were enrolled and at each group one patient got FNA or FNB twice. 41 FNA (48.2%) and 44 FNB (51.8%) were performed. Two group showed similar diagnostic accuracy (80.5% vs 79.5%, p=0.91) and no procedure related complication was observed. There were 73 malignant tumor except neuroendocrine carcinoma (85.9%), 7 neuroendocrine tumor (8.2%), 4 autoimmune pancreatitis patients (4.7%). In malignant tumor except neuroendocrine carcinoma patients 40 FNA and 33 FNB were performed. Diagnostic accuracies of FNA and FNB were 80.0% and 84.8%. No difference was observed in diagnostic accuracy statistically (p=0.59). In 6 neuroendocrine tumor (NET) patients FNB was performed. Immunohistochemical staining (IHC) was done for 4 of them and all showed results compatible with NET. In all autoimmune pancreatitis (AIP) patients FNB was taken. IHC was performed for 2 of them and there was one positive patient.

Conclusions: 22-G EUS-FNA and FNB show similar diagnostic accuracy and complication rate for sampling of solid pancreatic lesion. It is also true when limited to malignant lesions. EUS-FNB can be helpful for diagnosis of NET and AIP.

Key Words: Endoscopic ultrasound, Fine needle aspiration, Pancreas, Diagnosis

Others-16

The Utility of EUS-Guided 22-Gauge Procore Needle Biopsies with the Capillary Sampling Method for Intra-Abdominal Masses

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Background and Aims: To evaluate a new type of 22-gauge histology EUS needles and to assess its diagnostic accuracy in patients with intra-abdominal mass lesions.
Methods: A total of 64 patients who underwent EUS-FNA between October 2011 and September 2012 were prospectively collected. EUS fine needle biopsy was performed using a newly developed 22-gauge Procore biopsy needles (EchoTip ProCore [ETP], Cook Medical, USA). After the lesion was penetrated with histology needles, the stylet was slowly removed, without suction and while, moving the needle to and fro motion (capillary sampling method) over 40 seconds. One to three needle passes were performed. The specimen was recovered in formalin and/or expressed onto a glass slide and fixed in alcohol by advancing the stylet through the needle. A final diagnosis of malignancy or benign was based on the definite surgical pathology or clinical follow-up including repeated imaging examinations.

Results: A total of 64 patients (38 males, mean age 56.3 years), each with a solid intra-abdominal mass lesion, were enrolled. Lesions were variously located, i.e. (pancreas, intra-abdominal lymph nodes, adrenal mass, gall bladder, ampulla of Vater mass, retroperitoneal solid mass and duodenal submucosal tumor). The mean size of the lesions was 29.3 mm. No technical failure during EUS-FNA was seen. Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy for the histologic diagnosis were 88.9%, 100%, 100%, 62.3% and 90.6%, respectively. No complications occurred during the procedure. The diagnostic yield of 22-G ETP needles was 91% (58/64). Among them 54/58 (93.1%) were histologically confirmed according to the specimen obtained during the first needle pass.

Conclusions: EUS-guided biopsy of various types of intra-abdominal mass lesions using the new type of 22-G ETP needles with capillary sampling method showed both feasibility and an appropriate diagnostic yield in a single needle pass.

Key Words: Endoscopic ultrasound, Fine needle aspiration, Solid mass

The Comparative Study of EUS-Guided FNA Using 22G and 25G Needle for Solid Pancreatic or Peripancreatic Masses

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Background: Endoscopic ultrasound-guided fine-needle aspiration (EUS-FNA) is an effective modality for obtaining tissue and has a central role in pancreatic/peripancreatic solid mass evaluation. However, there is uncertainty about which needle size is optimal. We aimed to compare the diagnostic accuracy of the 22-gauge (22G) and 25-gauge (25G) needles in obtaining cytologic diagnosis and macroscopic sample quality.

Methods: From March 2007 to May 2012, a total of 300 patients (148 in the 22G group and 152 in the 25G group) were included. EUS-FNA was performed by single endosonographer without an on-site cytopathologist. Number of needle passes was determined by the endosonographer by judging the quality of obtained sample, such as cellularity and blood contamination. A single, blinded cytopathologist retrospectively evaluated each set of slides.

Results: The sensitivity, specificity, positive predictive value, and negative predictive value of FNA were 84%, 100%, 100%, and 18%, respectively, for the 22G group, and 95%, 100%, 11%, respectively, for the 25G group. Among macroscopic sample qualities, cellularity was not different in two groups. However, blood contamination of 25G group was significantly fewer than that of 22G group (5.3% vs. 11.5%, p=0.045). Because of fewer blood contamination, the number of needle passes of 25G group was lower than that of 22G group (1.5 vs. 3.1, p=0.001). However, the accuracy of 25G group was higher than 22G group (94.7% vs. 84.4%, p=0.004), even though the number of needle passes was lower. On the cytopathologic analysis, blood contamination was fewer in 25G group than in 22G group (2.8% vs. 10.2%, p=0.001). However, the cellularity was not different in the two groups (p=0.064).

No complication was noted in the 25G group, and one case of minor bleeding occurred in the 22G group.

Conclusions: This comparative study shows that EUS-FNA with a 25G is superior to 22G for tissue sampling. Even though the number of needle passes was lower, FNA using the 25G was more sensitive as compared to the standard 22G. It suggests that 25G causes fewer traumas than 22G.

Key Words: EUS-guided FNA, 25-gauge needle, 22-gauge needle, Solid Pancreatic masses, Comparative Study

Initial EUS Evaluation for Detecting Mural Nodules in BD-IPMN of the Pancreas

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Background/Aim: A mural nodule is a strong predictive factor for malignancy in branch-duct (BD) intraductal papillary mucinous neoplasm (IPMN) of the pancreas. Endoscopic ultrasound (EUS) is the most accurate imaging modality for the detection of mural nodules. The aim was to evaluate whether initial EUS evaluation is necessary for the detection of mural nod-
ules in all patients with BD IPMNs.

Patients And Methods: We reviewed retrospectively the medical records of all 104 patients with BD IPMN diagnosed by EUS at National Cancer Center, Korea from January 2004 to December 2011. Of these, 13 patients (12.5%) had mural nodule (MN+ group) and 91 patients (87.5%) had not (MN- group). The clinical presentation, EUS and laboratory findings, treatment and outcome of MN+ group were compared with those of MN- group.

Results: Patients in MN+ group showed significantly larger size of cyst on EUS (24.1 ± 8.3 mm vs. 16.2 ± 8.0 mm, \( p = 0.001 \)), main pancreatic duct dilatation (3.3% vs. 30.8%, \( p = 0.004 \)), and higher value in a level of serum CA 19-9 (67.8 ± 109.4 U/mL vs. 17.5 ± 27.0 U/mL, \( p = 0.012 \)), than those in MN- group. No significant difference was found in the maximal lesion diameter measurement between EUS and other imaging modality such as CT (\( p = 0.670 \)) or MRI (\( p = 0.751 \)). No mural nodule was found in patient with cyst < 15 mm in size, no dilatation of main duct and normal CA 19-9 level. During a median follow-up period of 29.1 months, cysts that grew more than 5 mm was observed in 1 patients (7.7%) of MN+ group and 2 patients (2.2%) of MN- group, respectively. Seven patients (6.7%) received pancreatic resection and 4 received EUS-guided fine-needle aspiration. Among them, 2 patients were proven to have ductal adenocarcinoma on pathologic examination and both had MN.

Conclusion: Our results suggest that initial EUS evaluation for the detection of mural nodule may be unnecessary in BD IPMN patient with < 15 mm, no dilatation of main duct and normal CA 19-9 level. Further study is needed for the role of EUS in the initial evaluation of BD IPMN.

Key Words: EUS, Mural nodule, IPMN, Branch duct

Effectiveness of Contrast-Enhanced Harmonic Endoscopic Ultrasound for Evaluation of Pancreatic Cancer

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Purpose: Distinguishing pancreatic cancer from others pancreatic mass remains challenging with current imaging techniques. This prospective study aimed to evaluate the accuracy of contrast-enhanced harmonic endoscopic ultrasound for pancreatic malignancy (CEH-EUS).

Patients and Methods: Between November 2010 and August 2012, a total of 69 patients with suspected pancreatic solid mass on CT scan were prospectively examined using endoscopic ultrasound (EUS). After an intravenous bolus injection of 2.4 mL of a second-generation ultrasound contrast agent (SonoVue), CEH-EUS was then performed with a electronic radial echoendoscope GF-UE260-AL5 (Olympus, Tokyo, Japan) and Aloka Prosound ALPHA10 processor (Aloka, Tokyo, Japan). In 37 out of 69 patients, EUS-guided fine needle aspiration (EUS-FNA) was done, while 32 patients diagnosed finally by means of computed tomography, magnetic resonance imaging (MRI), specimen obtained by gastroduodenoscopy, ascitic cytology, liver biopsy or follow-up for at several months.

Discussion: Finally, 30 cases out of 37 of EUS-FNA were diagnosed with malignancy. 25 patients out of 30cases were confirmed by specimen of only EUS-FNA. A sensitivity and accuracy of EUS-FNA was 83%, 86% respectively. 45 out of 49 lesions (92%) with pancreatic malignancy were hypovascular mass, and 4 case (8%) were isovascular or hypervascular lesion on CEH-EUS findings, 24 cases out of 25 pancreatic malignancy (96%) confirmed by only EUS-FNA showed hypovascular pattern at CEH-EUS. Among total pancreatic cancers (49cases), 46 patients showed hypovascular pattern on CEH-EUS or confirmed only CEH-EUS. 3 patients had false negative results at EUS-FNA or CEH-EUS (1 diffuse large B-cell lymphoma, 1 neuroendocrine tumor, 1 pancreatic adenocarcinoma). The sensitivity and accuracy at EUS-FNA combined CEH-EUS for pancreatic malignancy were 97%, 94%, compared with corresponding value of 83%, 86% for only EUS-FNA.

Conclusion: CEH-EUS combined EUS-FNA may improve a sensitivity and accuracy of pancreatic malignancy diagnosis than only EUS-FNA.

Key Words: Contrast-enhanced harmonic endoscopic ultrasound, Pancreatic cancer, Sonovue, EUS-FNA
Prospective Evaluation of an Enhanced Guidewire Manipulation Protocol for EUS-Guided Biliary Drainage after Failed ERCP

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Background Objective: EUS-guided biliary drainage (EUS-BD) was introduced as an effective alternative to percutaneous transhepatic biliary drainage (PTBD) after failed ERCP. To date, little is known about a widely acceptable standard protocol for EUS-BD. To evaluate enhanced guidewire manipulation protocol for EUS-BD after failed ERCP.

Patients and Methods: Forty-five consecutive patients undergoing EUS-BD failed ERCP were enrolled. EUS-guided rendezvous or antegrade therapy with enhanced guidewire manipulation protocol and EUS-BD with transluminal stenting (EUS-BDS) were underwent. Technical success rate and adverse event rate of the current protocol for EUS-BD were prospectively analyzed.

Results: The overall technical success rate of EUS-BD in this study was 91% (41/45). Specifically, 34 (76%) of 45 patients were initially feasible for rendezvous (n = 20) and antegrade therapy (n = 14). 25 (56%) of 45 patients were eventually treated with rendezvous and antegrade therapy. The remaining 20 patients (44%) were managed by EUS-BDS in patients with duodenal invasion or failed antegrade therapy. The overall adverse event rate of EUS-BD was 11%. Compared with the previous EUS-BDS-based protocol, there was no difference (96.5% vs. 91%, p = .402) in the technical success and a significant difference (27% vs. 11%, p = .049) in overall adverse events of the current protocol.

Conclusions: The treatment algorithm with enhanced guidewire manipulation protocol for the EUS-BD reduced adverse events without sacrificing the technical success rate of EUS-BD. This may be considered a standard protocol for future randomized trials of EUS-BD and PTBD.

Key Words: EUS, ERCP, EUS-guided biliary drainage, PTBD
Materials and Methods: Ten healthy pigs were allocated to two groups: TO/MPLLN (n=5) and TU/SPLLND (n=5) groups. We performed ESD on the anterior wall of gastric high body (HBAW) and fundus via TO or TU route in each group. After ESD, lymph nodes (LN 1, 2, 3, 4sa, 4sb) were resected laparoscopically using multiport in TO/MPLLN and single port in TU/SPLLND group. The complete resection rate, operating time, tissue weight and size, and perforation rate for ESD, and completion rate and operating time for LN dissection were compared between groups.

Results: The operating time for ESD was shorter in TU group than TU group for both HBAW (9.2 ± 0.6 vs 16.2 ± 0.8 min, p<0.01) and fundus (19.4 ± 6.3 vs. 27.0 ± 3.6 min, p=0.04). There was no significant difference in the complete resection rates, tissue weight and size between two groups. The overall perforation rate was 80% (4/5, 2 during procedure and 2 post-operative) in TO/MPLLN group and 20% (1/5, post-operative) in TU/SPLLND group. There was no significant difference in the complete resection rate of overall LN and operating time for LN dissection between 2 groups. MPLLN group had a higher complete resection rate for LN 2 (80%) than SPLLND group (60%).

Conclusion: TU ESD had comparable performance to TO route, and showed a shorter operating time and lower perforation rate compared to TO route procedure. TU route could be feasible for safe ESD in the patients with the upper gastric body lesion. SPLLND was also comparable to MPLLN.

Key Words: ESD, Laparoscopic lymph node dissection, Porcine

Gastrojejunostomy by Natural Orifice Transluminal Endoscopic Surgery Using a Lumen-Apposing Stent in a Porcine Model

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Background: The present authorized palliative treatment for malignant gastric outlet obstruction (GOO) is surgical bypass or placement of self expandable metal stents. The representative limitation of the bypass surgery is the higher peri-operative morbidity, whereas the SEMS is the stent malfunction. We developed a safe and simple natural orifice transluminal endoscopic surgery (NOTES) technique for gastrojejunostomy using a fully covered, lumen-apposing metal stent via a porcine experimental model.

Methods: Eleven female Yorkshire pigs, weighing 22.1 kg to 25.1 kg, underwent gastrojejunostomy with a 4 cm length lumen-apposing metal stent under general anesthesia. After gastrotomy formation at the anterior wall of the stomach, the jejunum was drawn into the stomach with endoscopic alligator forcep. A jejunotomy was then performed in the gastric cavity using needle knife, followed by deployment of a lumen-apposing metal stent under fluoroscopic guidance. A dual-channel endoscope (Olympus® GIF-2T 240) was used during the procedure. And then, the first portion of the duodenum was resected by an endoscopic linear stapler via laparoscopy to create a model of GOO. Oral feeding was resumed at 24 hours after the procedure. Animals were euthanized at 1, 2, 4 weeks after the operation.

Results: Side-to-side gastrojejunostomy through NOTES was successfully completed in ten of eleven animals. One case failed due to jejunal perforation during jejunotomy. The mean gastrojejunostomy procedure time was 41 minutes (range 15–94 min). No pigs died before the planned sacrifice date. At the end of 4 weeks, two pigs exhibited significant weight gain with a maximum increase of 101% from their initial body weight. Histological examinations showed good submucosal apposition without evidence of necrotic changes in all ten experimental pigs.

Conclusion: Creating a gastrojejunostomy by NOTES using lumen-apposing metal stent seems to be a safe, feasible, durable, and reproducible method, as well as reduces procedure time compared to conventional surgery. The procedure requires further development of large-caliber stent and pure endoscopic endoluminal strategy for apposing and fixation small bowel to gastric wall for human application.

Key Words: Gastrojejunostomy, NOTES, Compression anastomosis, Metal stent

Laparoscopy Assisted Endoscopic Full-Thickness Gastric Resection (EFTGR) for Submucosal Tumor

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Background and Objective: Laparoscopic wedge resection using a linear stapler is widely accepted as a treatment for gastric submucosal tumor (SMT). Although this surgery is simple, no defined strategy exists to guide the surgeon in choosing the appropriate laparoscopic technique for an individual case on the basis of tumor characteristics such as location or size. To overcome
these limitation, laparoscopy assisted endoscopic full-thickness gastric resection (EFTGR) was developed. We present our experiences of the several case of EFTGR.

**Methods:** Seven patients with gastric SMT underwent EFTGR. First, both mucosal and submucosal layers around the tumor were circumferentially dissected using endoscopic submucosal dissection via intraluminal endoscopy. Then, endoscopic full-thickness (from the muscle layer to the serosal layer) incision was made on the above-mentioned submucosal incision under laparoscopic supervision, and a complete full-thickness incision was made laparoscopically from inside the peritoneal cavity. Finally, the gastric-wall defect was closed by hand.

**Results:** In all cases, the EFTGR procedure was successful for dissecting out the gastric SMT without any intraoperative or postoperative adverse events. In three of seven cases, the tumor was located in the upper gastric portion near the esophagogastric junction. The mean operation time was 133.71 ± 32.18 min. The estimated blood loss was negligible. The mean tumor size was 34.29 ± 24.11 mm. The final pathologic diagnosis of 6 cases was gastrointestinal stromal tumor (GIST) and 1 case was Schwannoma. The resection margin was clear in 6 cases. And the lower resection margin was close to the tumor in one case of GIST, but there was no evidence of recurrence in endoscopy and computed tomography at 9 months follow up after operation. The mean duration of hospital stay was 7 ± 1 days.

**Conclusions:** Laparoscopy assisted EFTGR procedure for SMT enabled to perform whole-layer excision. The EFTGR procedure for SMT may be performed safely with reasonable operation times, less bleeding, and adequate resection margin.

**Key Words:** Submucosal tumor, Endoscopic full-thickness gastric resection, Laparoscopy

**Others-25**

**Novel Endoscopic Gun Biopsy Device to Repeatedly Adjust Targeting Using Hydraulic Pressure: A Preliminary Model**

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**Background and Study Aims:** Endoscopic ultrasound guided fine needle biopsy makes it possible to diagnose using cytologic and histologic analysis. However, diagnosis accuracy of conventional aspiration or trucut biopsy is not satisfactory. Commercially available endoscopic guided biopsy device is inconvenient to remove the needle if targeting is failed. We have designed and modified a prototype gun biopsy device to repeatedly adjust targeting using hydraulic pressure in order to make up for this weak point.

**Methods:** We developed the gun biopsy device using solenoid magnetic field connected to hydraulic pressure system. Hydraulic pressure is to facilitate precise targeting and more powerful needling. Solenoid technique converged into the hydraulic pressure controlled by Brushless Direct Current (BLDC) motor creates coil magnetic field to release power.

**Results:** A gun biopsy device to repeatedly adjust targeting could be made using hydraulic pressure and solenoid technique. This new device was equipped to endoscopy and able to adjust length of needle repeatedly.

**Conclusions:** A preliminary model of repeatedly adjustable targeting biopsy device enables to precise targeting by regulating length of needle. Further studies of this device are warranted in vivo condition.

**Key Words:** Gun Biopsy, Hydraulic Pressure, Solenoid Technique

**Others-26**

**An Endoscopic Approach for Obesity Treatment: In Vitro and in Vivo Animal Experiment with an Endoscopic Suture Device**

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**Background:** Obesity is a major health problem worldwide. The primary treatment for obese patients is weight reduction, which can improve comorbidity. Procedure to reduce gastric volume has been widely used for surgical treatment of morbid obesity. An endoscopic approach to treat obesity may be less invasive than laparoscopy or surgery. We made an endoscopic suture device with suction cap for reducing stomach volume. The objective of this study is to evaluate the feasibility of an endoscopic suturing procedure for weight loss.

**Methods:** We performed two studies. A prototype suture device was created using needle, beads and suction cap. Whole ten stomachs were harvested from pigs weighing 30 to 40kg. A fresh porcine stomach was placed in the endoscopic training model. First, stomach was filled with water to measure its volume. This novel device was used to suture the fundus and body. After suturing, the thread was retracted to reduce the volume and was tied using the knotting device. After the suture procedure, water was reinjected to check the volume of the
stomach. And we performed five pig studies to evaluate safety and feasibility of this method.

Result: We performed ten in vitro experiments and five in vivo animal studies. Mean volume was 1873.5ml before the experiment, but the volume reduced to 1304ml after the end of experiment. We could confirm about 29.9% volume reduction. All of the stitches were securely sutured with full thickness. The study showed that suturing of full thickness using continuous closure device resulted in the decrease of volume. We performed 5 short term experiments in a porcine model. It is possible to reduce gastric volume in live porcine model, and pigs had been survived for 7 days before sacrifice without complication. There were no technical problems during the procedure. Endoscopic gastric reduction with our device is technically feasible on a live porcine model.

Conclusion: It is possible to achieve transoral endoscopic gastroplasty with an endoscopic continuous suture device.

Key Words: Obesity, Gastroplasty, Bariatric

Novel Method for Safe Endoscopic Suturing

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Background: Various endoscopic suture machines have been tried on endoscopic bariatric treatment. However, full thickness penetrating of gastric wall by suture needle brings about unexpected result such as damage of major vessel or adjacent organs. To secure safety and effectiveness of suture machine(Patent No : 10-2012-0044913) , we devised side suction cap and submucosal injection suture technique. We conducted in vitro study for effectiveness and safety of newly developed side suction cap of endoscopic suture machine with submucosal injection, and report result of the study.

Method: On group 1, only endoscopic suture using side suction cap (suction hole size: 12mm) was applied to antrum, body, fundus of extracted porcine stomach. We penetrated suckling tissue into the side cap by suture machine and checked either full thickness penetration or partial thickness penetration. On group 2, additional submucosal injection of target tissue was performed before suturing and same protocol of group 1 was applied. Submucosal injection solution used in this study was a mixture of hyaluronic acid and normal saline(ratio was 75mg/100ml), with 1ml of indigo carmine. We injected 3mL mixture solution in submucosa of target tissue using endoscopic injector needle. We analyzed results of same parameters of group 1.

Result: In group of applying side suction cap solely, partial thickness penetration ratio was 8/8 of antrum, 5/8 of body, 2/8 of fundus. In group of submucosal injection before endoscopic suturing, all suture were performed through partial thickness (8/8 of antrum, 8/8 of body, 8/8 of fundus).

Conclusion: Partial thickness endoscopic sutures were possible, when using side suction cap and submucosal injection technique. This method may be safe and helpful to guarantee the safety of suture device for endoscopic bariatric surgery

Key Words: Endoscopic Bariatric Treatment, Suture Machine, Side Cap, Submucosal Injection