LGI-1

Clinical Outcomes of Capsule Endoscopy in Obscure Gastrointestinal Bleeding: A 10-Year Single Center Experience

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Aim: Capsule endoscopy (CE) was introduced in 2003 and has been used for the past 10 years in Korea. CE has become the preferred method for examination of the small bowel in most situations. Especially, CE is currently recommended as the first-line modality in the evaluation of obscure gastrointestinal bleeding (OGIB). Therefore, the aim of this study was to evaluate the clinical outcomes of CE in OGIB for 10 years.

Materials and Methods: From March 2003 to September 2014 in Soonchunhyang University Hospital, 684 patients were received CE. Among these patients, 284 patients (41.5%) that were examined with CE due to OGIB were enrolled. We retrospectively reviewed the medical records of the patients.

Results: The mean age for entire study was 54.3±17.3 years and male patients were 64.8% (184/284). Overt obscure GI bleeding and occult obscure GI bleeding (occult OGIB) was 84.5% (240/284) and 15.5% (44/284), respectively. Of occult OGIB, only fecal occult blood test positivity was 38.6% (17/44). Patients who receive transfusion were 27.4% (78/284) and mean transfusion units were 0.82±1.76 (range 1~14 units). Most common CE diagnosis was inflammatory mucosal lesion (118/284, 41.5%). Positive CE diagnosis occupied 79.6% (226/284). Most patients who underwent CE received conservative treatment (260/284, 91.4%), followed by endoscopic treatment (12/284, 4.2%), surgical treatment (7/284, 2.5%) and specific medical treatment (5/284, 1.8%).

Conclusions: In a 10-year single center date, most common diagnosis according to CE results was inflammatory mucosal lesion. And significant lesions had been detected in approximately 80%. CE is a non-invasive and useful diagnostic tool with high overall detection rate.

Key Words: Capsule endoscopy, Obscure gastrointestinal bleeding, Clinical outcomes

LGI-2

Influence of Re-Review Capsule Endoscopy on the Detection of Abnormal Lesions

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Background: Interpretation of capsule endoscopy is laborious task requiring high attention and long reading time. This can lead to miss many significant abnormal findings. So far, the impact of re-review of capsule endoscopy on the detection of abnormal lesions or final diagnosis was not evaluated. In this study we aimed to compare the detection rate of abnormal findings in capsule endoscopy among different review methods.

Methods: We performed 20 video capsule endoscopies (VCE) for obscure GI bleeding or small bowel tumor. Low experienced endoscopist (VCE < 50) interpretated capsule endoscopy first, and the same endoscopist or another low experienced endoscopist re-reviewed the same video. Each finding was reviewed by high experienced endoscopist (VCE > 100) and compared with each other about the detection rate of abnormalities and final diagnoses.

Results: Re-review of video capsule endoscopy added significantly more information for abnormal findings (detection rate was improved by 20~30%), but the final diagnosis was not changed.

Conclusion: Re-reviewing capsule endoscopy added more information for patients, even though the final diagnosis was not changed in this study. We suggest that re-review must be considered in ambiguous clinical situations even after performing capsule endoscopy before proceeding other invasive or expensive examinations.

Key Words: Re-review, Capsule endoscopy, Detection rate
The Role of CT as a First-Line Diagnostic Method in Patients with Obscure Gastrointestinal Bleeding

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Background and Aims: Capsule endoscopy (CE) is currently recommended as a first-line method in the evaluation of obscure gastrointestinal bleeding (OGIB). However, computed tomography (CT) provides results easily and rapidly, and evaluates small bowel strictures and extraluminal disease, not detected by CE. In limited medical resources under the current situation in Korea, we evaluated the role of CT as a first-line diagnostic method in patients with OGIB.

Patients and Methods: We retrospectively analyzed records from the database at Soonchunhyang University hospital on 2105 patients with gastrointestinal bleeding between May 2003 and April 2013. Finally, 160 patients with OGIB who received CT as a first-line method during this period were divided into two groups, the therapeutic impact group and the non-therapeutic impact group, by whether definitive treatment (operation or radiologic intervention) was performed according to CT results.

Results: Of a total of 160, the therapeutic impact group included 29, and the non-therapeutic impact group included 131. Definitive treatment according to CT results was performed in 18.1% [operation, n=19 (65.5%); radiologic intervention, n=10 (34.5%)]. In univariate analysis for comparison with the therapeutic impact group and the non-therapeutic impact group, the therapeutic impact of CT was affected by transfusion unit (≥ 3 units), hemoglobin level (< 8 g/dL), and history of both end-stage renal disease and liver cirrhosis. In multivariate analysis, transfusion unit (≥ 3 units) was a significant predictor (OR 5.81, 95% confidence interval 1.5~22.5, p<0.011).

Conclusions: The clinical significance of CT is emphasized by the fact that definitive treatment was determined by results of CT in about one-fifth of patients with OGIB who received CT as a first-line diagnostic method. Especially, in OGIB patients with blood transfusion more than 3 units, CT might be considered as a first-line method.

Key Words: Obscure gastrointestinal bleeding, Computed tomography, First-line method

Does the CT Enterography Really Lead to Improvement of Diagnostic Yield than Conventional CT in Obscure GI Bleeding?

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Objective: The aim of the present study was to evaluate the diagnostic yield of conventional computed tomography (CT) and CT enterography (CTE) in identifying the source of obscure gastrointestinal bleeding (OGIB) and to investigate the types of diseases that CTE can detect better.

Methods: From May 2005 to February 2014, all patients with OGIB who underwent conventional CT or CTE and additional capsule endoscopy (CE) or single balloon enteroscopy (SBE) at the Seoul St. Mary’s Hospital were included. A total of 186 patients were eligible to this study. Among them, 76% underwent conventional CT (n=142), 24% underwent CTE (n=44). The final diagnosis was made according to CE or SBE finding (reference standard) and categorized as vascular, inflammatory, neoplastic and other lesions. Clinical data were obtained by reviewing the medical records from our registry database of CE and SBE.

Results: There was no significant difference in the proportion of patients regarding gender, age, Hb level, comorbidity, type of bleeding (occult or overt) and NSAID/Aspirin history between CT and CTE group. Of the 186 patients, final diagnosis was made according to CE only (n=95), SBE only (n=61) and both CE and SBE result (n=30). Diagnostic yield of above modalities was 70.5%, 81.9%, 86.6% respectively. The overall diagnostic yield of conventional CT and CTE was 24.6% (35/142) and 43.1% (19/44) (OR=2.25, 95% CI 1.106~4.595, p=0.02). The diagnostic yield of conventional CT and CTE group according to categorized diagnosis was 28% (7/25) and 37% for vascular lesion, 59% (13/22) and 71% (5/7) for neoplastic lesion, 18% (8/44) and 9% (1/11) for others lesions, which shows no significant difference. However, as to inflammatory lesion, CTE showed significantly higher diagnostic yield (43% (7/16) vs 83% (10/12), p=0.03).

Conclusion: CTE showed higher diagnostic yield in patients with OGIB than conventional CT. Increased diagnostic yield on inflammatory lesion of CTE may related to such outcome.

Key Words: Conventional computed tomography, CT enterography, Obscure gastrointestinal bleeding
Optimized Endoscopic Submucosal Dissection with Snaring for Colorectal Tumors: A Prospective Randomized Study

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Background/Aims: Endoscopic submucosal dissection (ESD) seems to be more effective than ESD with snaring (ESD-S) for complete resection of colorectal neoplasia. However, ESD is technically difficult and time consuming. Optimization of ESD-S may overcome these drawbacks.

Methods: From January 2014 to August 2014, 53 patients with colorectal neoplasia were randomized to receive either ESD (27 patients) or optimized ESD-S (26 patients). All procedures were performed by an endoscopist (J.S.B). In ESD group, the procedure was performed by standard method. In optimized ESD-S group, deep mucosal incision of oral side of lesion was performed to stabilize snare and the diameter of tightened snare was used to decide minimum degree of submucosal dissection. The primary outcome was procedure time for total ESD and submucosal dissection. The secondary outcomes were endoscopic resection rate and procedure-related complication rate.

Results: Failure of planned resection method was noted in five (18.5%) in ESD group. Therefore, 22 lesions in ESD and 26 lesions in ESD-S were analyzed. Total ESD time and submucosal dissection time in optimized ESD-S group was significantly shorter than in the ESD group (36 ± 16 vs. 27 ± 13, p=0.037 and 36 ± 16 vs. 24 ± 12, p=0.006; respectively). The complete resection rate in the ESD group was slightly higher than in the optimized ESD-S group, but the difference was not significant (95.5 % vs. 84.6 %, respectively; p=0.357). 8.3% perforations (1 in ESD and 3 in optimized ESD-S, p=0.614) occurred during the procedures, which were treated successfully by endoscopic treatment and/or antibiotics.

Conclusion: Optimized ESD-S reduced the procedure time for ESD and submucosal dissection of colorectal tumors. The endoscopic resection rate was similar between two methods without increasing procedure-related complications.

Key Words: Endoscopic submucosal dissection, Simplified endoscopic submucosal dissection, Colorectal neoplasia

Combination of NBI, Chromoendoscopy and Endoscopic Ultrasonography to Predict Deep Submucosal Invasion in Scheduled ESD

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Objectives: Distinguishing deep submucosal (SM) invasion from superficial SM invasion in early colorectal cancer is important to determine the appropriate therapeutic strategies. Traditionally, magnification colonoscopy using chromoendoscopy and vascular pattern assessment using narrow band imaging (NBI) have been utilized. However, endoscopic ultrasonography using mini probe (EUM) is not used well because of the specialist equipment required and technical difficulty. The aim of this study was to evaluate the efficacy of combination of NBI, chromoendoscopy and EUM to predict deep SM invasion of early colorectal cancer.

Methods: From March 2013 to June 2014, a total of 50 early colorectal cancer were analysis. All patients underwent magnifying chromoendoscopy (MCE) and NBI of the colorectal lesion during colonoscopic examination. If either MCE and NBI suggested deep SM invasion, we additionally performed EUM. If EUM suggested deep SM invasion, we finally decided deep SM cancer.

Results: A total of 50 lesions in 48 patients were included in the final analysis. There were 28 intramucosal cancers, 22 submucosal cancers: 5 superficial (sm1) and 17 deep (sm 2-3) cancer. Diagnostic sensitivity, specificity positive predictive value (PPV) and negative predictive value (NPV) of MCE were 88.2, 81.8, 71.4, and 93.1% for deep SM cancer. Diagnostic sensitivity, specificity, PPV and NPV of NBI were 88.2, 84.8, 75.0, and 93.3% for deep SM cancer. The overall accuracy of MCE and NBI to differentiate deep SM from non-deep SM cancer were 84.0 and 86.0%. In combination with EUM, the diagnostic sensitivity, specificity, PPV and NPV were 94.1, 90.9, 84.2, and 96.7% for deep SM cancer. The overall accuracy for assessing deep SM invasion was 92.0% (46/50)

Conclusions: The overall accuracy of determination of deep SM invasion was considerable high in patients with combined EUM. Therefore, EUM may be considered additional diagnostic options to predict deep SM invasion of early colorectal cancer.

Key Words: Early colorectal cancer, Magnifying endoscopy, Narrow-band imaging, Endoscopic ultrasonosound, Endoscopic submucosal dissection
LGI-7

Detection of Colorectal Neoplasm Using Promoter Methylation of Stool DNA

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Objective: Colorectal cancer (CRC) screening using stool DNA is known to be yielded good detection rate, recently. The aim of this study was to determine the utility of detection method for colorectal advanced adenoma (AA) and CRC using Secreted frizzled related protein 2 (SFRP2), tissue factor pathway inhibitors 2 (TFPI2), N-Myc Downstream-Regulated Gene 4 (NDRG4) and Bone morphogenetic protein 3 (BMP3) promoter methylation.

Methods: The methylation status of SFRP2, TFPI2, NDRG4 and BMP3 promoters in bisulfate modified stool DNA was investigated in a blinded manner with methylation specific PCR (MSP) from 40 endoscopically diagnosed healthy controls, 36 patients with AA and 35 patients with CRC.

Results: Methylated SFRP2, TFPI2, NDRG4 and BMP3 were detected in 60.0%, 31.4%, 68.8% and 40.0% of the CRC samples and 27.8%, 27.8%, 27.8% and 33.3% of the AA. The sensitivities of combined study, using four markers for the detection of CRC and AA, were 94.3% and 72.2%. The specificity was 72.2%

Conclusions: Our results demonstrated that SFRP2, TFPI2, NDRG4 and BMP3 promoter methylation in stool samples had high sensitivity and low specificity for the detection of CRC. Stool DNA test using these markers is not useful for CRC screening due to low specificity.

Key Words: Colorectal cancer, Advanced adenoma, Stool DNA

LGI-8

Novel Image of Mitochondria of Colon Cancer Tissues by Probe Based Multiphoton Microscopy

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Background and Aims: Multiphoton endomicroscopy is the recently updated technique for endoscopy and virtual image and optical sectioning. However optimized probe has not been established for multiphoton endomicroscopic image. Therefore we developed novel probe for mitochondria and applied for colon neoplasm tissues. In cancer cell, abnormally increased mitochondrial replication is related mitochondrial dysfunction and Warburg effect.

Methods: We used newly developed multiphoton probe for mitochondria imaging which are made using benzofuran derivative (BFP, maximal multiphoton fluorescence at 570 nm, Figure 1). Fresh mucosal tissues of colonic adenoma and adenocarcinoma were obtained from endoscopic biopsy. Multiphoton probe BFP for mitochondria was stained for tissues and imaging performed using multiphoton microscopy.

Results: BFP shows high enhancement factor upon binding mitochondria, good selectivity, cell permeability, and can readily detect mitochondria in human tissues by multiphoton microscopy. Mitochondria were detected in human colon mucosa tissues. Calculated mitochondria area were increased in adenocarcinoma tissues compared to normal mucosal tissues.

Conclusions: Newly developed multiphoton probe for mitochondria are usable to image human live colon tissues.

Key Words: Multiphoton microscopy, Colon cancer, Tissue, Probe, Mitochondria
Factors Related with Colonic Perforations in Patients Receiving SEMS Insertion for Malignant Colorectal Obstruction

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Background/Aim: Although colonic perforation is dreadful complications associated with stenting, data dealing this topic is sparse. The aim of this study was to investigate clinical outcomes of colonic perforation and factors related with its occurrence in patients undergoing self-expanding metal stents (SEMS) for malignant colorectal obstruction.

Methods: From April 2004 to May 2014, 489 patients with malignant colorectal obstruction in whom SEMS insertion was attempted were enrolled in Severance and Gangnam Severance hospital. All of the procedure was performed under endoscopic and fluoroscopic guidance.

Results and Conclusions: The technical success rate was 90.6%, and the clinical success rate was 80.6%. Perforation occurred in 33 (6.7%) patients. In univariate analysis, location of obstruction (sigmoid colon [9.4%] vs non-sigmoid colon [4.7%], p=0.038), aim of stenting (palliative [8.6%] vs preoperative [3.0%] group, p=0.019), post stenting ballooning (yes [9.1%] vs no [1.3%], p=0.018) were significantly associated with colonic perforation. In multivariate analysis, sigmoid colonic location (odd ratio [OR], 2.856, 95% CI, 1.342-6.080], palliative stenting (OR 3.831, 95% CI 1.412-10.391), and post stenting ballooning (OR 8.228, 95% CI 1.827-37.050) were independently associated with occurrence of perforation. All of the patients with perforation (n=33) received emergency surgery and 5 (15%) patients died within 1 month of perforation. This is the first study investigating factors related with colonic perforation for patients with malignant colorectal obstruction in whom SEMS insertion was attempted. Sigmoid colonic location, palliative aiming stenting, and post stenting ballooning were independently associated with occurrence of perforation in these patients.

Key Words: SEMS, Colon, Perforation, Stent

The Therapeutic Effect of Irreversible Electroporation in Colon Cancer Animal Model

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Background: Irreversible electroporation (IRE) is a promising novel technique for the ablation of tumors. IRE has an advantage over other ablation technique in its mechanism to remove undesired cells by affecting the cell membrane without thermally destructing blood vessels, nerves and the surrounding tissues. Studies regarding the clinical application of IRE have been performed in humans, as well as in animals, for organs such as the liver, kidney, prostate, etc. and IRE is now accepted as a novel anti-cancer ablation modality. The aim of this study was to evaluate the therapeutic effect of IRE in colon cancer animal model for the first time.

Method: The Caco2 cells (ATCC) were cultured. Male nude mice (Immunodeficient (CAnN. Cg-Foxn1 nu/CrljBgi) 5-7 weeks old, Orient inc., Korea) were introduced. Caco2 cells were each visually injected at 1.0 x 10⁷ cells/ml into both flakes (one for control, the other for IRE). We performed in vivo IRE procedures in the tumors of nude mouse model. Electrical pulses were applied to the tumor of nude mouse using a DC generator at 2 kV/cm amplitude, 20-50 pulses, 100 μs length, with 1mm separation between two needle type electrodes. We analyzed the tissues with H&E staining and TUNEL assay immediately afterwards, and then 10 hours.

Results: All mice were preserved during the experiment without significant complications. There was complete cell death within the IRE lesions without intervening live cells. Variable nucleic changes-pyknosis and karyohexis, and vacuolar degeneration were observed only within the IRE lesions. The framework of extracellular matrix and blood vessels were not affected by IRE. The apoptotic area and signals were increased in IRE groups comparing control groups in H & E stain and tunnel assay.

Conclusions: The present study demonstrated that IRE ablated colon cancer tissue very effectively through the induction of cellular apoptosis. This study suggests that IRE is the potential use of IRE in colon cancer.

Key Words: Irreversible electroporation, Colon cancer
LGI-11

Dose the Flavor of Candy Improve the Palatability during Colon Preparation Using PEG-Asc?

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Background and Aim: Polyethylene Glycol with ascorbic acid (PEG-Asc) has developed for low-volume and better taste. But, this still requires the moderate amount of volume and has brought discomfort of taste. There are lots of effort to further improve the tolerability. We aimed to investigate, in a prospective trial to solve these problems by adding various kinds of candy to PEG-Asc solution.

Methods: Single center, randomized study was performed during July to September 2014. Twenty patients per each group were enrolled. All patients received colonoscopy using split-dose PEG-Asc preparation method, then group A and B add various kinds of candy: Group A: 20 subjects (PEG-Asc group), Group B: 20 subjects (PEG-Asc plus menthol candy group) and 20 Group C: subjects (PEG-Asc plus cherry candy group). In the PEG-Asc plus candy group, patients were provided 10 candy drops and instructed to suck on a candy while drinking the split-dose PEG-Asc solution. We used the Boston Bowel Preparation Scale for evaluation of bowel cleansing. To investigate the compliance, a questionnaire was performed before colonoscopy.

Results: There were no significant differences between three groups in the aspect of cecal intubation time and total examination time. In the compliance, the score of abdominal fullness and nausea were lower and palatability was better in PEG-Asc plus candy group. However, in the aspect of the preparation quality, there were no significant differences between three-groups. Even though, all of parameters showed no significant differences between candy groups, taste was better in cherry candy group than menthol candy group.

Conclusions: The candy drops improve the compliance and taste of PEG-Asc, but not associated with bowel cleansing effect. However, flavored candy would enhance the palatability compared with non flavored candy.

Key Words: Polyethylene glycol, Ascorbic acid, Bowel preparation, Candy

LGI-12

Improving Bowel Preparation Quality by Using Simethicone with Polyethylene Glycol Plus Ascorbic Acid

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Background and Aim: Low-volume PEG-Asc has been proved to be similarly safe and effective as traditional 4 L PEG. However, PEG-Asc produce lots of bubble and endoscopists feel discomfort during colonoscopy. The study on adding anti-forming agent such as simethicone with PEG-Asc methods are lacking. The aim of this study was to compare PEG-Asc and PEG-Asc with simethicone in the aspect of bowel preparation quality and compliance of endoscopist.

Methods: Single center, randomized, observer-blinded study was performed from July 2014 to September 2014. Total 200 out-patients were prospectively enrolled. We used the Boston Bowel Preparation Scale and Bubble score for evaluation of bowel cleansing. To investigate the compliance of endoscopists, a questionnaire for water shooting count and withdrawal time was performed.

Results: One hundred patients received PEG-Asc and 100 patients received PEG-Asc with simethicone. There were no significant differences between 2 groups in the aspect of completion of preparation, cecal intubation time, success rate and overall preparation quality. In consideration of better preparation quality, the PEG-Asc with simethicone group showed superior cleansing results over the PEG-Asc group (6-9 Boston scale score: 100% vs 82%, 3 bubble score: 95% vs 55%, p<0.05).

From the perspective of practitioners, PEG-Asc with simethicone group was less suffer from bubble which disturbed the lens. The mean count of water shooting for cleansing lens was significantly lower and withdrawal time of colonoscope was less in PEG-Asc with simethicone group compared to PEG-Asc group (6 vs. 0.8, 15.02 ±10.10 vs. 17.83±14.80min, p<0.05).

Conclusions: According to our data, PEG-Asc plus simethicone has comparably effective and better tolerable for endoscopist. Therefore, a combination of PEG and simethicone appears to be a standard method for bowel preparation.

Key Words: Bowel preparation, Polyethylene glycol, Ascorbic acid, Simethicone
LGI-13

Polyethylene Glycol Plus Ascorbic Acid for Colon Preparation: Is It Safe in Patients with Impaired Renal Function?

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Background: Polyethylene glycol (PEG) is the most commonly used agent for colon preparation for colonoscopy under impaired renal function. But, there were few studies comparing the changes after using the PEG plus ascorbic acid for colonoscopy, in patient with impaired renal function. In this study, we compared the safety and efficacy in patients with chronic renal failure, between 2 liter PEG plus ascorbic acid and standard 4 liter PEG.

Methods: We performed a retrospective review of prospectively collected data on colonoscopy in patients with impaired renal function (eGFR < 60 mL/min/1.73 m²). Patients referred for colonoscopy were divided to two groups: 2 liter PEG plus ascorbic acid (n = 61) and 4 liter PEG (n = 80). Safety was assessed by comparison of the laboratory changes before and after bowel cleansing. Electrolytes (sodium, potassium, chloride, calcium, magnesium, and phosphate) and laboratory findings were compared between two groups. Quality of bowel preparation, patient acceptability, and influence of clinical factors were also analyzed.

Results: There was an increase in sodium levels with baseline in both the groups [PEG plus ascorbic acid group: -0.96 (-1.70 to -0.22), p = 0.012; PEG group: -0.81 (-1.42 to -0.21), p = 0.009]. Other electrolyte levels were not shown significant difference after administration of PEG plus ascorbic acid or PEG. Increase of BUN level in PEG group was showed [-1.70 (-4.55 to 0.80); p = 0.012]. Neither eGFR nor creatinine level had an influence on the preparation by administration of PEG or PEG plus ascorbic acid. Successful cleansing was mostly achieved in the both groups.

Conclusions: Our analysis showed the safety of the PEG plus ascorbic acid in patient with impaired renal function. No serious adverse event or significant changes of laboratory finding were not observed following its administration, compared with 4 liter PEG. PEG plus ascorbic acid could be a safe choice for colonoscopy under impaired renal function.

Key Words: Colonoscopy, Polyethylene glycol, Ascorbic acid, Renal failure

LGI-14

The Safety and Effectiveness of Polyethylene Glycol 2 Liter Plus Ascorbic Acid in Patients with Liver Cirrhosis

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Background: The Patients with liver cirrhosis have a greater risk for ascites, electrolyte imbalance, and hemodynamic change than those with a healthy liver. The bowel preparation for colonoscopy is an important issue, under chronic disease. In this study, we compared the safety of two bowel cleansing agents in patients with liver cirrhosis; 2 liter PEG plus ascorbic acid and 4 liter PEG.

Methods: We performed a retrospective review of prospectively collected data on colonoscopy in patients with liver cirrhosis. Patients were divided to two groups: 2 liter PEG + ascorbic acid (n = 56) and 4 liter PEG (n = 61). Safety were assessed by comparison of the clinical factors, laboratory findings and severe side effect after bowel cleansing.

Results: The laboratory finding and body weights were not showed significant change between the two groups (Table 1). By subgroup analysis, patients with compensated or decompensated cirrhosis were no increased the risk of electrolyte imbalance and Child-pugh score did not influence the outcome after bowel-cleansing. Successful cleansing was mostly achieved in the both groups.

Table 1. Values in the PEG with Ascorbic Acid and PEG, Pairwise Compared before and after the Bowel Preparation for Colonoscopy

<table>
<thead>
<tr>
<th></th>
<th>Value before intake</th>
<th>Value after intake</th>
<th>Mean difference(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEG + ascorbic acid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>137.2 ± 2.5</td>
<td>137.8 ± 2.8</td>
<td>-0.60 (-1.29 to 0.81); p = 0.097</td>
</tr>
<tr>
<td>Potassium</td>
<td>4.0 ± 0.5</td>
<td>3.9 ± 0.6</td>
<td>NS</td>
</tr>
<tr>
<td>Chloride</td>
<td>104.1 ± 4.9</td>
<td>105.1 ± 3.7</td>
<td>-0.86 (-1.75 to -0.18); p = 0.017</td>
</tr>
<tr>
<td>BUN</td>
<td>13.0 ± 6.5</td>
<td>11.9 ± 6.3</td>
<td>NS</td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.89 ± 0.31</td>
<td>0.85 ± 0.32</td>
<td>NS</td>
</tr>
<tr>
<td>Weight change PEG</td>
<td>61.7 ± 11.1</td>
<td>61.1 ± 11.1</td>
<td>NS</td>
</tr>
</tbody>
</table>

Conclusions: Our analysis showed the safety of the PEG plus ascorbic acid in patient with liver cirrhosis. It could be a safe choice for colonoscopy under liver cirrhosis.

Key Words: Colonoscopy, Polyethylene glycol, Ascorbic acid, Liver, Cirrhosis
LGI-15

Polyethylene Glycol Plus Ascorbic Acid is Equally Effective as Picosulfate for Bowel Preparation for Colonoscopy

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Introduction: Optimal colon cleansing is essential for the efficacy and safety of endoscopic evaluation for colon. However, consumption of large volumes of bowel preparation agent, bad taste and potential adverse effects prevent patients from colonoscopy. The aim of our study is to evaluate the efficacy and safety of two novel agents for bowel preparation.

Methods: We performed a prospective, endoscopist blind, single center, randomized controlled trial comparing PEG-3350 plus ascorbic acid (Coolprep®) with 10mg bisacodyl tablet versus sodium picosulfate (Picolight®) with 10mg bisacodyl tablet. The primary object is to evaluate the bowel cleansing effect of two regimens using a modified Ottawa scale and Aronchick scale. Patient tolerability and safety of the bowel preparation were assessed via a questionnaire.

Results: A total of 200 patients were randomized to receive either Coolprep (n = 98) or Picolight group (n = 102). Both group showed similar efficacy of bowel cleansing based on the modified Ottawa (Coolprep 4.01±2.29 vs Picolight 3.86±2.47, p=0.62) and Aronchick scale (Coolprep 1.96±0.70 vs Picolight 1.89±0.70, p=0.42). Adverse event such as headache was higher in Coolprep group. However, nausea was more common in picolight group. Patient-reported acceptability and tolerability for each item examined on the questionnaire was significantly greater for Coolprep compared with Picolight group (p<0.0001).

Conclusions: Both regiment showed similar bowel preparation efficacy. However, patient tolerability was higher in Coolprep group.

Key Words: Bowel preparation, Coolprep, Picolight

LGI-16

Optimal Strategy of Endoscopic Diagnosis for Pediatric Gastrointestinal Graft versus Host Disease

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Aim: Acute graft-versus-host disease (GVHD) presents with non-specific symptoms, therefore a diagnosis of GVHD requires histologic confirmation. However, the best diagnostic strategy for gastrointestinal (GI) GVHD is a matter of debate. Our aim in this study is to compare the relative contribution of the endoscopic appearance and biopsies from upper and lower endoscopy in children with suspected acute GVHD.

Method: This study was designed as single-center retrospective study. We reviewed medical records of all of the patients with suspected GI GVHD who had endoscopic evaluation within first 100 days after stem cell transplant between January 2012 and March 2014 in Seoul national university children's hospital.

Results: Fifteen patients were included and total count of endoscopic procedure was 20. The most common symptoms prompting endoscopic evaluation were diarrhea (100%), and vomiting (85%). GVHD was diagnosed in 16 of 20 patients (80%). Eleven of 20 (55%) patients had simultaneous upper and lower endoscopy, sensitivity and negative predictive values of GVHD for the upper endoscopic biopsy were 77.8% and 50%, whereas lower endoscopic biopsies were 88.9% and 66.7%. Two patients were confirmed as GVHD by upper endoscopy, but they had coincidental cytomegaloviral colitis and typhlitis. Endoscopic finding of at the site of diagnosed GVHD was normal about 29-50% (Stomach 50%, Duodenum 29%, colon 40%, rectosigmoid 29%)

Conclusion: Lower endoscopic biopsy is more sensitive for diagnosis of acute GI GVHD in children. We recommend flexible sigmoidoscopy as a first diagnostic tool for GVHD. If there was no evidence of GVHD on the sigmoidoscopy with high index of suspicion, full colonoscopy and upper endoscopy should be considered.

Key Words: Acute graft versus host disease, Children, Endoscopy
LGI-17

The Effect of Sigmoidoscopic Enema for Treatment of Severe Constipation in Children

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Background: Severe constipation is usually troublesome medical problem in child, because usual medical therapy for constipation and enema might not be tolerable unlike adult. However, there has been no study about enema through the sigmoidoscopy in child. Therefore we evaluated the effect and complication of enema through the sigmoidoscopy in child.

Patients and Methods: Fifty-five patients were identified with sigmoidoscopic enema for treatment of severe constipation between May 2011 and August 2014. Severity of constipation before the sigmoidoscopic enema was graded with severity of symptoms. The effectiveness of sigmoidoscopic enema and complication after enema were reviewed. The response to enema was defined with defecation amount; minimal vs good.

Results: Children were 37 and adults were 18. The mean age of adults was 73.0 ± 12.2, and children was 6.3 ± 3.8 years old. The adults had combined diseases such as heart disease 3 (16.7%) and diabetes mellitus were 7 (38.9%). However, there was no underlying disease in children. There was no significant difference in the effect of sigmoidoscopic enema; minimal 4 (22.2%), good 14 (77.8%) in adults vs minimal 2 (5.4%), good 35 (94.6%) in children (p<0.082). Ischemic colitis as a serious complication occurred in 5 patients (27.8%) in adults group, but no complication in children group (p<0.002).

Conclusion: Sigmoidoscopic enema might be effective and safe treatment for the children’s severe constipation, but prospective randomized study will be needed.

Key Words: Sigmoidoscopic enema, Ischemic colitis, Constipation

LGI-18

The Impact of Patient Education with Smart Phone Application on the Quality of Bowel Preparation for Colonoscopy

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Background and Aims: Colon cancer is the 3rd most commonly diagnosed cancer in South Korea. The standard method for evaluating the colon is the Colonoscopy procedure. Proper bowel preparation is essential for successful examination. A sub-optimal bowel preparation can lead to compromised exams with missed polyps, an increase in procedure time, and aborted exams. Few studies have evaluated the use of smart phone applications as a means of educating and improving the quality of bowel preparation. Therefore, we created a smart phone application for patients to use as a preparation guide before undergoing a colonoscopy.

Patients and Methods: A total of 69 patients (M:F=53:16, median age 42.2 (23-55) years-old) who were scheduled to undergo a screening colonoscopy in a health examination center were enrolled in this study. The study was conducted as a prospective endoscopist-blinded, controlled design. Participants were divided into two groups, the first was asked to use a new smart phone application that we had newly developed that educates the user on colonoscopy preparation (Smart group, N=12) the second received the existing verbal and written instructions (Control group, N=57).

Results: The quality of bowel preparation, assessed using The Boston Bowl Preparation Scale (BBPS) did not significantly differ between the Smart group and Control group. (7.42±1.2 vs. 7.18±0.8; p=0.414 by t-test). No significant differences were found between the 2 groups in insertion time, withdrawal time and work-up time. In addition, patient numbers who had polyps differ not significantly differ between the 2 groups (0.17±0.3 vs. 0.25±0.4; p=0.540 by t-test).

Conclusions: Early data is showing no significant difference between the Smart group and the Control group. Smart phone applications might replace the written paper instruction, soon. More collected data is needed to show the exact impact of bowel preparation with smart phone applications.

Key Words: Colonoscopy, Bowel preparation, Smart phone Application, Colonic neoplasm
LGI-19

YouTube as a Source of Patient Information on Colon Cancer

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Background & Aims: In recent years, YouTube has become an important platform for sharing healthcare information. The aim of this study was to investigate the quality of YouTube videos on colon cancer and to characterize the available information.

Methods: A YouTube search was performed using the keywords “colon cancer” and “colon cancer symptom”. Three researchers analyzed the videos for source, length, number of views, number of likes, and days since upload. A usefulness score was used to categorize the videos into “useful”, “slightly useful”, “not useful”, “inappropriate”, or “useful only for medical personnel”. Additionally, a comprehensiveness score (0~10) was evaluated, as well as audio quality (1~3) and video quality (1~3).

Results: After filtering about 1,935,000 potential videos, 84 videos were included for analysis. 29 videos (34.5%) were “useful”, 30 videos (35.7%) were “slightly useful”, 10 (11.9%) were “not useful”, 5 (6.0%) were “inappropriate” and 10 (11.9%) were “useful only for medical personnel”. Among the 29 “useful” videos, 24 videos (82.8%) were uploaded by medical professionals or medical websites. On the other hand, among the 5 “inappropriate” videos, 4 videos (80%) were uploaded by independent civilians. A correlation was found between the usefulness score and comprehensiveness score (Spearman’s rank correlation co-efficient = 0.581, p<0.001). There was no correlation between usefulness score and the number of views, the number of likes, or the length.

Conclusion: Although YouTube has a substantial amount of useful information about colon cancer, it seems that viewers do not have easy access to useful videos. Therefore, a system for filtering upload source or quality appear to be necessary.

Key Words: Colon neoplasm, YouTube

LGI-20

Effect of Magnetic Endoscopic Imaging (ScopeGuide®) by Novice Endoscopists during Colonoscopy

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Background: In accordance with colorectal cancer screening programs, screening colonoscopy is commonly performed. There are several methods that improves performance of colonoscopy by trainees. This study aimed to evaluate the efficacy of magnetic endoscopic imaging(MEI) in improving performance of colonoscopy and detecting polyp or adenoma.

Methods: Consecutive patients referred for a screening colonoscopy between July 2014 and August 2014 were included. At first, a random sample was selected for MEI group - examined with the use of MEI. Conventional group was selected in consideration of sex and age of MEI group. Endpoints were rate and time of cecal intubation(CI), polyp detection rate(PDR) and adenoma detection rate(ADR). The number, size and location of polyps were recorded.

Results: 120 patients underwent screening colonoscopy. The MEI group and conventional group were each 60 patient. Baseline characteristics were similar in both groups in terms of sex and age. PDR (43.3% vs 45.0%, p=0.854) and ADR (31.7% vs 23.3%, p=0.307) were not significantly different between the two groups. The number of a sorted by size and location of polyps was not significantly different between the two groups. CI rate of the MEI group was higher than that of the conventional group (86.7% vs 71.7%, p=0.043). CI time of the MEI group was shorter than that of the conventional group. (Median 10:27 [IQR 6:32-19:01] vs 16:18 [9:46-22:31], p=0.008).

Conclusion: MEI is beneficial to CI when novice endoscopists perform colonoscopy. However, MEI does not improve PDR and ADR.

Key Words: Magnetic endoscopic imaging, Novice endoscopist, Cecal intubation, Polyp detection rate, Adenoma detection rate
**LGI-21**

**Comparison of Carbon Dioxide and Standard Air Insufflation Performed by Endoscopic Novice during Colonoscopy**

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**Background:** Carbon dioxide (CO2) insufflation during colonoscopy can decrease procedure time, abdominal pain and discomfort after procedure. However, its effectiveness by endoscopic novice remains unknown. The aim of this study was to compare the effectiveness of CO2 and standard air insufflations performed by endoscopic novice during colonoscopy.

**Methods:** Patients referred for colonoscopy were randomized to receive either CO2 or air insufflation during the procedure. Both the colonoscopist and patient were blinded to the type of gas used. All procedures were performed by nine endoscopic novices whom had each individually performed less than fifty colonoscopies. Cecal intubation rate, insertion and withdrawal times during the procedure, and the post procedure symptoms including abdominal bloating and pain were compared between two groups. Abdominal bloating and pain were assessed by using a numeric rating scale (NRS).

**Results:** A total of 150 patients were randomized with 76 in the standard air group and 74 in the CO2 group. Baseline characteristics were not different between both groups in terms of age, sex and body mass index. Cecal intubation rate in the CO2 group was higher than in the standard air group (83.8 % vs 69.7 %, p=0.042). Mean insertion time in the CO2 group was shorter than in the standard air group (15.03 minute vs 18.22 minute, p=0.016). The NRS scores of abdominal bloating and pain after procedure showed no significant differences between the two groups.

**Conclusion:** CO2 insufflation used by endoscopic novice during colonoscopy showed shorter and better cecal intubation rates than standard air insufflation.

**Key Words:** Colonoscopy, Carbon dioxide, Air, Insufflation, Novice

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**LGI-22**

**Endoscopic Management and Clinical Outcomes of Malignant Colorectal Polyps**

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**Background:** Endoscopic management of colorectal polyps containing adenocarcinoma is increasing in nowadays due to colorectal cancer screening programs. Aim of this study was to evaluate the safety and efficacy of endoscopic resection of malignant colorectal polyps.

**Method:** Patients who underwent endoscopic resection for malignant colon polyps from August 2001 to July 2014 in Ajou university hospital of Korea. The data were retrospectively reviewed. Clinical outcomes such as complete resection rate, recurrence rate, complications were analyzed.

**Result:** A total of 155 polyps in 150 patients were analyzed in this study. 146 lesions were resected by snaring polypectomy including EMR and 9 lesions by ESD. High risk polyps were defined as having tumor invasion in the margin or uncertain margin; poor differentiation; or lymphovascular invasion. Low risk polyps did not have any of these 3 histological signs. The complete resection rate was 70.3% (109/155) and proportion of high risk polyp was 38.7% (60/155). The recurrence rate was 3.3% (4/122) which was affected by complete resection status (p=0.004) and risk of polyps (p=0.013).

**Table 1. Relationships between Recurrence and Complete Resection Status, Risk of Polyps**

<table>
<thead>
<tr>
<th>Recurrence after polypectomy</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrence after polypectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes (n=90, 73.8%)</td>
<td>90 (100.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>No (n=32, 26.2%)</td>
<td>28 (87.5%)</td>
<td>4 (12.5%)</td>
</tr>
<tr>
<td>Risk of polyps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-risk (n=80, 67.8%)</td>
<td>80 (100.0%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>High-risk (n=42, 32.2%)</td>
<td>38 (90.5%)</td>
<td>4 (9.5%)</td>
</tr>
<tr>
<td>Total</td>
<td>118 (96.7%)</td>
<td>4 (3.3%)</td>
</tr>
</tbody>
</table>

**Conclusion:** Endoscopic polypectomy could be adequate and effective treatment for patients with malignant colorectal polyps, especially low-risk polyps.

**Key Words:** Malignant colorectal polyp, Endoscopic polypectomy, Clinical outcomes
LGI-23

Comparative Analysis of Conventional Radiotherapy-Induced and Cyberknife-Induced Radiation Proctitis in Prostate Cancer

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Background: Radiation proctitis is one of the complications with radiation therapy for pelvic tumor. It is related with the radiation dose and may be linked to the extent of irradiated normal tissues. Cyberknife therapy allows real-time organ position and motion corrections during delivery, shaping the hypofractionated dose volume to the target organ, and less damage of surrounding tissue. We conducted comparative analysis of radiation proctitis induced by conventional radiotherapy (CR) and cyberknife (CK) in prostate cancer.

Methods: One hundred and six patients with prostate cancer taken CR (54) or CK (52) were collected during January 2010 to July 2013 at Gyeongsang National University Hospital, and their medical records were reviewed retrospectively.

Results: The frequency of radiation proctitis was 16.6% (9/54), 19.2% (10/52) in CR and CK groups, respectively (p=0.803). The duration of treatment was longer (47.1±12.5 vs. 8.8±1.6 days, p=0.000) and total radiation dose was higher (6592.2±1044.5 vs. 3750±0.0 cGy, p=0.000) in CR than CK group. Among the patients with radiation proctitis, the radiation dose per fraction was higher (149.6 ± 50.2 vs. 447.0 ± 133.0, p=0.000), the length of proctitis was shorter (12.9±2.3 vs. 6.9±0.3 cm, p=0.035), and serious hemorrhage required hemostasis was more frequent (22.2% vs. 80%, p=0.023) in CK than CR group. There was no significant difference in proctitis-free interval after completion of therapy (295.4 ± 79.4 days in CR group, 372.8 ± 86.9 days, p=0.400) between CK and CR group.

Conclusion: The frequency of radiation proctitis was similar between CR and CK treatment in prostate cancer. CK-induced radiation proctitis was less extensive, but required more frequently hemostatic treatment, compared to CR-induced proctitis.

Key Words: Radiation proctitis, Conventional radiotherapy, Cyberknife treatment

LGI-24

The Observation of Human Colon Cancer Tissue with Sub-Micrometer Resolution Using Scanning Ion Conductance Microscopy

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Background: The scanning ion conductance microscopy (SICM) is a scanning probe microscopy technique that uses ionic current. SICM can acquire the surface morphology of biological soft materials, and it can image of not only live single cell but also extracellular matrix structures in tissue level without sample preparation. The capacity for high resolution surface imaging allows SICM to be used in the wide range of application in tissue diagnosis. In this study, we compared SICM topographical images between normal tissues and cancer tissues of colon for the first time.

Methods: A cancer and normal tissue, taken from human colon were used for the study. A small piece of colonic tissue was mounted on a petri-dish with an adhesive, cyanoacrylate instant glue (Henkel Co. U.S.). The tissue was kept in 1 x PBS (phosphate buffer saline) and its surface morphological images were obtained using commercial SICM (NX-Bio; Park Systems Corp, Korea). A glass nano-pipette with approximately 100 nm opening at the end was used for the SICM imaging. The approach-retract scanning (ARS) mode of SICM was used for a non-destructive imaging.

Results: We can image the surface morphologies and 3d reconstruction of normal colon and colon cancer tissue were observed. In normal colonic mucosal surface, we can identify epithelial layers with striated borders and irregular network of mucosa area. When we zoom in epithelial layers we also found intestinal crypts and possible goblet-like cells. The image of cancer tissue, however, shows lack of regular striated borders which we found in normal tissue. The diverse cell structures and fiber like networks were also detected as about 5.0 μm and 1.0 μm size respectfully.

Conclusions: High resolution 3D topographical information could provide many new abnormal patterns of cancer tissues compared to normal tissues. This result indicates that SICM imaging could be developed to provide diagnostic evidence for cancer tissue in future.

Key Words: Scanning ion conductance microscopy, Colon cancer
LGI-25

Comparison between Colonoscopy and Fecal Immunochemical Occult Blood Test for National Colon Cancer Screening Program

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Background and Aims: Given the increasing rate of colorectal cancer (CRC), fecal immunochemical test (FIT) is being used as initial screening for CRC detection in Korea. The aims of the study were to assess the validity of the FIT and compared with the efficacy of adding one time only colonoscopy.

Patients and Method: A retrospective multicenter population based study of average-risk asymptomatic patients who received FIT and colonoscopy for national cancer screening program between 2012~2013 were enrolled. The primary outcome were CRC detection rate, FIT positive rate, sensitivity, specificity as well as detection of advanced adenoma and age distribution of adenoma of the FIT and colonoscopy were evaluated.

Results: A total of 1,039 patients tests were provided with a FIT and colonoscopy were included in the analysis. FIT showed 9 positive results (0.86%) with detecting 1 case of advanced cancer, 1 case of early cancer and 2 cases of adenoma low-grade dysplasia. Among them, 3 patients of CRCs (0.2%) and 18 patients of advanced adenomas (1.7%) were detected by colonoscopy. Sensitivity and specificity of FIT for CRC were, respectively, 66.6% and 99.3%. By adding one time colonoscopy, CRC, advanced adenoma and adenoma detection rate rise up to 30.7%. Majority of age group enrolled in national cancer screening program was between 55 to 64 years of age (36.6%) and detection of adenoma was about 3 times higher in male compare to female.

Conclusions: Our study showed FIT alone showed low detection rate of CRC with absence of finding any advanced adenoma. We suggest combing one time only colonoscopy during life time can be effective method to detect CRC as well as advanced adenoma and provide better treatment for patient.

Key Words: Colorectal cancer, Fecal occult immunochemistry test, One time colonoscopy

LGI-26

Increased Risk of Development of Advanced Colorectal Neoplasm in Metabolically Abnormal and Obese Subjects

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Backgrounds and Aims: Obesity and metabolic abnormality (MetA) are important risk factor for colorectal cancer and adenoma. The aim of this study was to evaluate the relationship between MetA, obesity and development of advanced colorectal neoplasm (ACRN) among Koreans.

Methods: 70,428 Koreans from an occupational cohort underwent colonoscopy and measurement of ACRN risk factors. We investigated odds ratio (OR) for ACRN, in metabolically healthy obese (MHO) subjects, metabolically abnormal non obese subjects (MANO) subjects and metabolically abnormal obese (MAO), using metabolically healthy non obese (MHNO) group as a reference.

Results: There was no increased the risk of development of ACRN, in the MHO group (OR 0.96, 95% CI 0.65-1.42, p=0.844) and in the MANO groups (OR 0.98, 95% CI 0.82-1.17, p=0.841), respectively. Whereas, the risk of development of ACRN was increased in the MAO group (OR 1.28, 95% CI 1.07-1.54, p=0.008). In the male subjects, the development of ACRN was increased in the MAO group (OR 1.43, 95% CI 1.15-1.78, p=0.001). However, this association was not found in the female subjects (OR 1.12, 95% CI 0.76-1.65, p=0.560)

Conclusion: MAO subjects were associated with increased the risk of development of ACRN, especially in the male group.

Key Words: Metabolically abnormal, Obesity, Advanced colorectal neoplasm, Male
LGI-27

Analysis on Incidence and Distribution of Colon Polyp in Younger Patients during Last 10 Years
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Background/Aims: Colorectal carcinoma is one of the most common causes of cancer-related deaths in the world. Although the anatomic distribution of colon polyp could affect the efficacy of colorectal cancer screening modality, the location of occurring colorectal adenomas and its association with patient’s age have been controversial. The aim of this study was to assess anatomic distribution and histologic finding of colon polyp according to patient’s characteristics.

Methods: The 2,409 patients were retrospectively enrolled in this study between March 2012 and September 2013, in an academic tertiary center. Right side adenoma was defined as adenomas from the cecum to the splenic flexure. We compared prevalence, distribution, pathology of colon polyp and patients’ characteristics.

Results: Overall 1711 polyps from 626 patients were analyzed. The ratio of right colon adenoma increased with age. Proximal adenoma was found in 48 patients (5.5%) of younger age. The ratio of right side colon polyp in younger patients increased compared to the study of a decade ago. In younger patients, right colon adenoma occurred more in patients with fatty liver or high body mass index.

Conclusions: Proximal adenoma incidence increased in younger patients compared to previous studies. We have to consider reduce the age of colorectal cancer screening and careful right colon investigation. Incorporating factors such as fatty liver or obesity could be considered for colonoscopic recommendation in younger age.

Key Words: Colon polyp, Anatomic distribution, Colorectal cancer screening

LGI-28

A Prospective Study Comparing Cold Forcep Polypectomy Using NBI Endoscopy vs Cold Snare Polypectomy in Colorectal Polyps
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Background and Aims: Although cold forceps polypectomy (CFP) is commonly used for removing diminutive colorectal polyps (DCPs; ≤5mm), a previous study report that cold snare polypectomy (CSP) is superior to CFP for the endoscopic removal of DCPs with regard to completeness of polypectomy. However, completeness is expected to be increased with CFP when correct targeting and strict investigation of the residual tissue are performed. The primary aim of this study was to compare the histologic polyp eradication rate of CSP with that of CFP using narrow band imaging (NBI) endoscopy.

Methods: This was a randomized controlled, non-inferiority trial at a tertiary referral hospital. A total of 380 patients were screened and 133 consecutive patients having eligible polyps were enrolled in this study. CFP was used to resect DCPs until no polyp tissue was visible by NBI endoscopy. To evaluate histologic eradication of polyps, two or more additional biopsies were taken from the base and edges of the polypectomy site. The primary non-inferiority endpoints were histologic eradication of polyps, with non-inferiority margin of -10%.

Results: A total of 231 DCPs were available for assessment. A size more than 3 mm was in 129 (55.8%) polyps. Most polyps evaluated were tubular adenomas (n=172, 74.5 %). The rate of histologic eradication was 90.5% in the CFP group and 93.0% in the CSP group (difference 2.5%, 95% CI -9.67 to 4.62). Polyp size, histology, location and the time taken for polypectomy were not different between two groups. Failure rates of tissue retrieval was higher in CSP group than CFP group (6.8 % vs. 0%, p=0.001).

Conclusions: In this study approximately 90% of all diminutive polyps were completely resected using CFP and NBI endoscopy, showing non-inferiority compared with the CSP. CFP appears to be adequate for the resection of the majority of diminutive polyps if no residual tissue is visible by NBI endoscopy (ClinicalTrials.gov number: NCT02201147).

Key Words: Cold forceps polypectomy, Cold snare polypectomy, Colorectal polyps
The Rates and Risk Factors for Colonoscopic Polypectomy Bleeding: A Retrospective Observational Study

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Background: Post polypectomy bleeding is the most frequent complication after colonoscopic polypectomy. The aim of this study is to investigate the rate and risk factor associated with post polypectomy bleeding.

Methods: 7944 colonoscopic polypectomies with 2401 patients from May 2013 to March 2014 included in this retrospective observational study. Patient conditions, polyp characteristics, and procedure techniques were evaluated as potential risk factors. Post polypectomy bleeding was classified as "overall" and "significant".

Results: Of the 2401 patients, 98 patients developed overall bleeding, and 36 patients developed significant bleeding. Multivariate logistic regression analysis revealed the risk factors for both overall and significant bleeding as number of resected polyps (overall: OR 1.08, 95% C.I 1.022 - 1.138; significant: OR 1.11, 95% C.I 1.033 - 1.199), intraprocedural bleeding (overall: OR 2.80, 95% C.I 1.618- 4.838; significant: OR 2.49, 95% C.I 1.032 - 5.989), and the use of antiplatelet agent (overall: OR 2.53, 95% C.I 1.333 - 4.819; significant: OR 2.72, 95% C.I 1.036 - 7.167). Polyp size was associated with overall PPB (OR 1.03, 95% C.I 1.004 - 1.047), but not associated with significant PPB.

Conclusion: Polyp size, number of resected polyps, intraprocedural bleeding and the use of antiplatelet agent were the independent risk factors for post polypectomy bleeding.

Key Words: Colonoscopy, Polypectomy, Bleeding, Risk factor

Endoscopic Clipping and Conservative Treatment in Patients with Diverticular Bleeding: A Comparative Study

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Background/Aim: Most diverticular bleeding is self-limited. However, approximately 3-5% of them can be manifested with severe bleeding, and then it can cause lethal outcomes. The aim of this study is to compare various clinical factors and the rebleeding rate between the two groups, endoscopic clipping and conservative treatment group.

Methods: Forty patients diagnosed diverticular bleeding in a tertiary referral hospital between 2005 and 2014 were analyzed retrospectively. Patients were classified into two groups: endoscopic clipping group (group A, n=28) and conservative treatment group (group B, n=12). The endoscopic clipping was done when active bleeding or vessel exposure was existed, and the conservative treatment was done when there were only presumptive lesions of bleeding. Rebleeding was defined as the revisit of the same patient for a recurrent diverticular bleeding after discharge.

Results: In both groups, the distribution of diverticulum was right colon dominant and there was no significant difference (Group A vs. B; 75% vs. 75%). There was no significant difference in comorbidities. Aspirin taking rate was significantly higher in group B (58.3%, 7/12) than group A (21.4%, 6/28) (p=0.032). In multivariate analysis, there were no significant differences in the other clinical factors between both groups, except aspirin taking history (p=0.032). In both groups, rebleeding rate also was no significant difference between both groups and was 14.3% in group A and 8.3% in group B.

Conclusions: The aspirin taking history was a factor related to the diverticular bleeding. Although the rebleeding rate was not associated with the endoscopic hemoclipping treatment in the primary bleeding episode, however, with the removal of risk factors like aspirin, the choice of the treatment might be considered the aspect of the bleeding.

Key Words: Endoscopic clipping, Diverticular rebleeding, Aspirin
LGI-31

The Efficacy of the Novel Tissue Grasper-Clips Technique for Large Sigmoid Colon Perforations in Experimental Simulation Model

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Background/Aims: Sigmoid colon perforations are difficult to handle because of excess mobility. Therefore, the aim of study was to evaluate the efficacy of the twin grasper-clips technique for large sigmoid colon perforations.

Methods: This study was a randomized and controlled study. A total of 35 full-thickness defects were created in ex vivo porcine sigmoid colon specimens. An endoscopist performed conventional endoclip technique (endoclip group) or the twin grasper-clips technique (twin group).

Results: In endoclip group (n=20), the mean number of clips (3.8 ± 0.8, 4.8 ± 0.8, 6.0 ± 1.6, and 8.4 ± 2.1, p=0.001) and closure time (5.3±1.8, 7.6±0.5, 9.9±3.3, and 13.9±4.1 min, p=0.001) were significantly difference between 1.5, 2.0, 2.5, and 3.0cm defects. In twin group (n=15), the mean number of clips (4.0±1.0, 5.0±0.7, and 5.4±1.1, p=0.101) and closure time (7.7±0.6, 8.3±1.9, and 9.1±2.7 min, p=0.506) were not significant difference between 2.0, 2.5, and 3.0cm defects. In 3cm defects, the mean number of clips and total closure time were significant smaller and relatively faster in twin group than endoclip group.

Conclusion: The twin grasper-clips technique seems to reduce the use of endoclips and relatively faster than conventional technique in large sigmoid perforations.

Key Words: Perforation, Closure, Sigmoid, Colon

LGI-32

Novel Technique for Identification of Colonoscope Shape Using Ultrathin Shape Sensor: A Pilot Study

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Background and Aim: During colonoscopy, procedural completion, accuracy, comfort, and safety are important factors. Uncontrolled looping of the colonoscope shaft during insertion can cause abdominal pain and could lead serious complications. Scope guided endoscopy using ultrathin shape sensor can reduced unnessessory tactile pressure or torque. The aim of this study is to simulate 3D structure of colonoscope using ultrathin shape sensor.

Methods: We conducted a prospective pilot study. Three-dimensional (3D) shape of the colonoscope shaft was obtained by using ultrathin shape sensor of fiber Bragg gratings. It detects strains and bending angles and provides real-time continuous 3D imaging of the colonoscope without radiation hazard. We reconstructed the shape of colonoscope and measured bending curvature and error of tip position.

Results: Total 10 patients was performed colonoscopy using ultrathin shape sensor. The results show that the shape sensor is reliable at a maximum bending curvature of 80mm-1. The average tip position error was 1.722±1.678mm, which corresponds to 1.50 ± 1.46% of the total length of the sensor. In this approach, the endoscopists performance may enhanced by providing using a kinetic model that provides information such as the shape of the scope, direction of the colon and forces.

Conclusions: Scope guided endoscopy using FBG sensor can be successfully used to display colonoscope configuration by reconstruction of the high curvature bending and low tip position error. This Flexible, thin and almost weightless shape sensor would be a novel technique for identification of colonoscope shape.

Key Words: Fiber optic sensors, Fiber bragg gratings, Colonoscopy
The Effect of Submucosal Fibrosis on Endoscopic Submucosal Dissection of Colorectal Tumors: A Pathologic Review

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Background and Aims: Endoscopic submucosal dissection (ESD) is now commonly performed as a treatment for colorectal tumors. However, little is known about the relationship between submucosal fibrosis and the outcome of the colonic ESD procedure. The aims of this study were to investigate the relationship between the degree of submucosal fibrosis in colorectal tumors and the outcomes of ESD for these tumors and to evaluate the risk factors for submucosal fibrosis.

Patients and Methods: We retrospectively reviewed the records of patients with colorectal adenoma or carcinoma who had undergone an ESD, during a 4-year period from January 2010 to December 2013. The resected specimens were histologically examined after Masson’s trichrome staining, and the severity of the submucosal fibrosis was classified as no fibrosis (F0), mild fibrosis (F1) or severe fibrosis (F2).

Results: Among a total of 173 cases (106 male, mean age 65.0 ± 10.2 years) enrolled, 46 incidences of complications (perforation 19, postcoagulation syndrome 21, bleeding 6) had developed. The severity of the fibrosis was identified as F0 in 33 cases, F1 in 78 cases and F2 in 62 cases. Multivariate analysis revealed that F2 fibrosis was significantly associated with the development of complications. Submucosal invasion and large tumor size (≥30 mm) were identified as independent predictors of F2 fibrosis.

Conclusions: Severe fibrosis is the most powerful risk factor for complications and can interfere with en bloc resections. The possibility of submucosal fibrosis should be considered, and the procedure should be cautiously performed in cases where the tumor diameter is greater than 30 mm and when submucosal cancer is suspected.

Key Words: Endoscopic submucosal dissection, Submucosal fibrosis, Colorectal tumor

A Second-Look Endoscopy after Endoscopic Submucosal Dissection for Left-Sided Colorectal Epithelial Neoplasm

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Background and Aims: Endoscopic submucosal dissection (ESD) is one of the curative endoluminal surgical procedures for colorectal epithelial neoplasms. Although second-look endoscopy (SLE) is frequently performed after gastric ESD, no reports have assessed the role of SLE in colorectal ESD. We investigated whether a SLE after ESD is effective in the prevention of delayed bleeding.

Methods: This study included 173 consecutive patients in whom 174 left-sided colorectal epithelial neoplasms were resected using ESD between March 2005 and December 2013. After removal of the lesion, preventive post-ESD-coagulation for all visible exposed vessels or prophylactic clip closure for ulcer was performed. In the patients who performed SLE, the post-ESD ulcers were categorized according to the Forrest classification: high-risk ulcer stigma (type I and IIa) and low-risk ulcer stigma. We classified patients into two groups on the basis of performing SLE and retrospectively compared delayed bleeding.

Results: SLE was performed in 97 (55.7%) lesions on the day following ESD. SLE revealed that the incidence of type IIb and III ulcer stigma was 38 (39.2%) and 59 (60.8%) respectively and there was no high risk ulcer stigma. One patient with IIb ulcer stigma performed prophylactic clipping without bleeding and one patient with IIIb ulcer stigma performed argon plasma coagulation as oozing bleeding from a margin of ulcer was occurred after air inflation. There was no delayed bleeding both in the SLE group and no-SLE group.

Conclusions: A SLE after left-sided colorectal ESD may contribute little to the prevention of delayed bleeding if preventive post-ESD-coagulation or clip closure is performed.

Key Words: Colorectal neoplasm, Endoscopic submucosal dissection
LGI-35

Recurrence Rate after Colorectal Endoscopic Submucosal Dissection: Influence of Histologic Lateral Margin Positivity

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Objective: To evaluate the recurrence rate after endoscopic submucosal dissection (ESD) of colorectal neoplasia (CRN) with involvement of lateral resection margin.

Methods: We screened 485 colorectal lesions which underwent ESD between 2005 and 2013. We retrieved 272 lesions which were removed by en bloc manner and followed at least once after ESD. Lateral margin positive cases were designated as group A (n=40), and completely resected lesions as group B (n=232). We compared the recurrence rate between two groups and also conducted logistic regression analysis of factors related to lateral margin positivity.

Results: The tumor size was larger (43.5±22.7 vs 30.6±14.7 mm, p=0.001) and mean procedure time was longer (89.5±75.9 vs 54.4±51.6 minutes, p=0.007) in group A than in group B. There was no difference in perforation (5.0% in group A, 5.2% in group B; p=0.964), and delayed bleeding rate (2.5% in group A and 1.7% in group B; p=0.551). Mean follow-up duration was similar between two groups (21.3±16.7 months in group A, 25.1±19.5 months in group B; p=0.239). The recurrence rate was not different between two groups (2.5% in group A, 0.4% in group B; p=0.273). Multivariate logistic regression analysis revealed that only tumor size contributed to lateral margin positivity (odds ratio 3.60; 95% confidence interval 1.58-8.20, p=0.002).

Conclusion: Local recurrence rate was not increased in lateral margin positive cases than in histologic complete resection cases, if the lesions were removed by en bloc manner using ESD technique. Tumor size was associated with lateral margin positivity in colorectal ESD.

Key Words: Endoscopic submucosal dissection, Recurrence, Colon

LGI-36

Long-Term Outcomes of Endoscopic Submucosal Dissection for Colorectal Epithelial Neoplasms

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Background and Aims: Endoscopic submucosal dissection (ESD) is a useful and less invasive technique than surgical resection for colorectal epithelial neoplasms. It also provides a high en bloc resection rate. However, there were few studies about long term outcomes in colorectal ESD. The aim of our study was evaluate short- and long-term outcomes of colorectal ESD.

Patients and Methods: Between 2003 and 2013, 256 consecutive patients who underwent a colorectal ESD for colorectal epithelial neoplasms were enrolled. As short-term outcomes, rates of en bloc resection, en bloc plus R0 resection, and major complications were analyzed. As long-term outcomes, disease-free and overall survival were assessed in 136 patients.

Results: En bloc resection rate and en bloc plus R0 resection rate were 90.6% and 58.5%, respectively. Seventeen patients underwent additional colectomy due to histopathologically proven margin-positive cancer (lateral margin positive : 5 lesions, deep margin positive : 12 lesions). In patients with additional colectomy, 2 residual cancers (11.8%) were detected. Among 136 patients who were followed over 1 year, 77 patients underwent ESD for cancer; 58 cases had depth of invasion less than sm1 layer, 19 cases had depth of invasion more than sm2 layer. Local recurrence was detected in 1 lesion (1/136 patients, 0.007%) which had histopathologically proven deep submucosal invasion. Median follow-up duration were 40.1 months (range 12.3-120.3). The 3- and 5-year overall/disease-specific survivals were 98.5/97.8% and 100/99.3%, respectively.

Conclusions: Colorectal ESD for intraepithelial neoplasms provides favorable curability with successful en bloc resection. Short-term and long-term outcomes of colorectal ESD were also promising, although further longer follow-up studies are warranted.

Key Words: Colorectal epithelial neoplasms, ESD

The affiliation of Dr. Joo Young Cho was changed to <Digestive Disease Center, CHA Bundang Medical Center, CHA University, Seongnam, Korea> from November 1.
Outcomes of Endoscopic Submucosal Dissection for Large Colorectal Neoplasms: Protruding and Laterally Spreading Tumors

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Background and Aims: Endoscopic submucosal dissection (ESD) is an effective treatment modality even for the large laterally spreading tumors (LSTs) in the colorectum. However, the therapeutic outcome of ESD for the large protruding tumors has not been evaluated yet. We aimed to evaluate the outcomes of ESD for large colorectal tumors and compare therapeutic outcomes between protruding tumors and LSTs.

Methods: ESD was attempted for a total of 218 patients with 220 colorectal tumors \( \geq 30 \) mm in diameter (67 in protruding tumors and 153 in LSTs) from July 2007 to June 2014.

Results: Mean diameter, height and volume of the lesions were 43.8 ± 15.2 mm, 9.5 ± 7.0 mm and 13.6 ± 16.7 cm³, and the mean procedure time was 75.5 ± 58.1 minutes. Histology revealed that deep submucosal cancer was more frequent in protruding tumors than in LSTs (11.9% vs. 2.6%). The incidence of severe fibrosis in protruding tumors was significantly higher than that in LSTs (19.4% vs. 3.9%). En bloc resection rate was 76.1% (51/67) in protruding tumors and 92.8% (142/153) in LSTs. Complete resection rate was also significantly lower in protruding tumors than in LSTs (64.2% vs. 79.1%). Intraprocedural and postprocedural bleeding was more frequent in protruding tumors than in LSTs (22.4% vs. 2.6%; 6.0% vs. 0.7%, respectively). There was no significant difference in procedure time and perforation between the two groups. On multivariate analysis, gross morphology (protruding tumor; 95% CI 1.005-3.665, odds ratio 1.919) and the size of tumor (\( \geq 60 \) mm; 95% CI 1.094-5.668, odds ratio 2.490) were independent factors associated with incomplete resection for large colorectal tumors.

Conclusions: Complete resection rate of colorectal ESD is relatively lower in the large tumors having protruding morphology and/or larger size (\( \geq 60 \) mm).

Key Words: ESD, Protruding tumor, Laterally spreading tumor, Colorectal neoplasm

Learning Curve for Endoscopic Submucosal Dissection of Colorectal Tumors

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Background and Aims: The objective was to assess the learning curve for ESD of colorectal tumors.

Patients and Methods: In single referral center, ESD was performed for 686 colorectal tumors in 693 patients from October 2006 to June 2014. All procedure was carried out by four experienced endoscopists. The cases were grouped sequentially into five periods by each endoscopist (A,1-25; B,26-50; C,51-75; D,76-100; E,>100) and were analyzed retrospectively.

Results: Mean tumor sizes were A 26.8mm,B 25.9mm,C 32.5 mm, D 25.6mm and E 33.7mm in each consecutive periods \((p<0.001)\). Curative resection rates were 81%, 87%, 85.7%, 90.7% and 90.6%, respectively \((p=0.01)\). Complication rates were 9%,13%,9.2%,4% and 5.3%, respectively \((p=0.019)\). The median value of procedure time in each periods was 69min,54min,65.5min,52min and 65min \((p=0.019)\). Scatter diagram between the tumor size and procedure time, stratified by the consecutive periods, shows that the decline became less steeper(Figure).

Conclusions: As the endoscopists’ experience increased, the procedure time grew shorter for lesions of the same size and complication rate became lower. Based on the our analysis approximately 75 procedures should be carried out to acquire proficient skill with ESD for colorectal cancer.

Key Words: Colorectal tumors, Endoscopic submucosal dissection, Learning curve
LGI-39

Advantage of Endoscopic Mucosal Resection with a Cap (EMR-C) Compared with ESD for Rectal Neuroendocrine Tumors

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Background: Recently, rectal neuroendocrine tumors (NETs) are found more frequently during colonoscopy. Conventional EMR has a risk of incomplete resection because rectal NETs are submucosal lesion. So, there have been numerous reports of treatment strategy for rectal NETs: conventional EMR, EMR with a ligation device, EMR with a cap (EMR-C), ESD and so on. The aim of this study was to investigate the outcomes of EMR-C compare with ESD group for the resection of rectal NETs. In addition, we also compared the outcomes of EMR-C with ESD according to their size.

Methods: A total of 116 lesions in 114 patients with rectal NETs who resected with EMR-C and ESD were included in the study. This study was performed at Pusan National University Yangsan Hospital (PNUYH) between July 2009 and August 2014. We analyzed endoscopic complete resection rate, pathologic complete resection rate, procedure time and complications in the EMR-C group (n=65) and the ESD group (n=51). We also performed a subgroup analysis according to mass size.

Results: The mean tumor size were 4.62 ± 1.66 mm and 7.73 ± 3.14 mm in EMR-C group and ESD group, respectively (p<0.001). Endoscopic and histologic complete resection were 98.5% and 93.8% for EMR-C group, and 100% and 90.2% for ESD group. There were no differences in therapeutic outcomes between the two groups. But, the mean procedure time was longer in the ESD group (14.43 ± 7.26 min) than in the EMR-C group (3.83 ± 1.17 min) with a significant difference (p<0.001). In case of tumors less than 5 mm, EMR-C group had 100% rate of endoscopic complete resection and 96% rate of histologic complete resection without complication.

Conclusion: Considering ESD is time-consuming and difficulty procedure, EMR-C could be a simple and effective method for removing rectal NETs. EMR-C may be preferable to resect rectal NETs less than 5mm, especially.

Key Words: Neuroendocrine tumor, EMR-C, ESD

LGI-40

EUS Is Not Essential Method for Decision of Endoscopic Treatment of Small Rectal NETs

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Backgrounds/Aims: The most important factors in the endoscopic treatment of rectal neuroendocrine tumors (NETs) are the size and depth of invasion of tumors. Endoscopic treatment is considered curative for lesions ≤10 mm that do not extend deeper than the submucosa. We investigated the usefulness of EUS for decision of endoscopic treatment in rectal NETs less than 10 mm, retrospectively.

Methods: Patients who were diagnosed rectal NETs by endoscopic resection in the PNUYH from 2008 to 2014 enrolled in this study. The rectal lesions were resected by endoscopic resection, and were diagnosed with NETs by histologic confirm. We evaluated the size estimates by endoscopy, the measured size and depth by EUS, and the measured size and depth by histology in the rectal NETs less than 10 mm.

Results: A total of 120 rectal NETs enrolled in this study. All lesions were located in the muscularis mucosa and submucosa on the EUS. Size estimates by endoscopy correlated with histological size (r=0.668, p<0.001). Size measurements by EUS also correlated with histological size (r=0.679, p<0.001). Size estimates by endoscopy strongly correlated with size measurements by EUS (r=0.864, p<0.001). The mean difference between endoscopic size estimation and EUS measurement was 0.24 ± 0.93 mm. Conclusion Although the measurements of size and depth by EUS can be relatively accurate, there is good correlation between the size measurements by EUS and the size estimates by endoscopy in the rectal NETs less than 10 mm. Therefore, we suggest that endoscopic resection can be performed without EUS in the small rectal NETs.

Key Words: Endosonography, Endoscopy, Carcinoid tumor, Rectum
LGI-41

Efficacy of Magnetic Marking Clip Method for Pre-Operative Localization of Gastrointestinal Tumor

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Background/Aims: As laparoscopic surgery has been mainly used to resect gastrointestinal (GI) tumors, the importance of tumor localization has been addressed. Without exact tumor localization, resection of unnecessarily excess tissue may be happened or surgeons could not secure enough resection margin. Until now, various methods were suggested for the localization of GI tumor in laparoscopic surgery; however there have been several limitations in these methods. This study aimed to assess efficacy and feasibility of a novel method in tumor localization.

Methods: This study enrolled 13 patients with gastric submucosal tumor and 12 patients with early colorectal cancer. We devised magnetic marking clip (MMC) that was silicon coated 10mm sized ring magnet fixed to endoclip using 3-0 nylon. MMC was applied on the center of lesion during preoperative endoscopy. During surgery, magnetic body which was hanged with long thread which was inserted through laparoscopic trocar, was used to find tumor lesion which marked by MMC. We analyzed tumor detection rate, detection time, proximal & distal margin from lesion and procedure associated complication.

Results: In 8 patients, tumors were located in the stomach and 12 patients in colon. Tumor size ranged from 12 to 18 mm in stomach and 10 to 18 mm in colon. MMC were successfully detected in 23 of 25 patients (92%) in laparoscopic surgery. The time required for detection ranged from 10 to 35 sec in stomach and 20 to 85 sec in colon. The resected margin from lesion ranged from 5 to 30 mm in stomach and 40 to 50mm in colon. None of our patients experienced complications associated with MMC procedure.

Conclusions: MMC method was simple and convenient in tumor localization, and showed excellent outcomes for accuracy of tumor localization and detection rate. Also, there were no procedure associated complications. MMC method could help surgeons to easily localize tumor lesion during laparoscopic surgery.

Key Words: Magnetic marking, Laparoscopic surgery, Gastrointestinal neoplasm