LGI-1

A Validation Study of 4 Type Bowel Cleaning Scale: Aronchick, Boston Bowel Preparation, Ottawa, Harefield Scale

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Background/Aims: Total colonoscopy is a potent tool for assessing the large bowel. There are various bowel preparation scales, but few bowel preparation scale have been validated. Diversity in bowel preparation scales can cause a lot of confusion on decisions in clinical environment and much confounding results within clinical studies. However there have been no clinical trial that compared 4 types of bowel preparation scales. The aim of this study is to assess the compatibility and reliability of different 4 types of bowel preparation scales.

Methods: This study compared 4 types of bowel preparation scales: Aronchick scale (AC), Boston bowel preparation scale (BBPS), Ottawa scale (OS), Harefield cleansing scale (HCS). 5 trainees read 20 total colonoscopy studies twice, with an interval of 1 month. We used Intraclass correlation coefficient (ICC) to evaluate Intra-observer(test-retest) consistency and inter-observer reliability of the BBPS and the OS. The un-weighted kappa statistic was used to assess the reliability of the AC and the HCS.

Results: Total 400 ratings were completed in this study. Inter-observer and intra-observer reliability were assessed by ICC and kappa statistic. ICC for OS was 0.73 (95% CI, 0.52-0.87, p<0.0001), BBPS 0.76 (95% CI, 0.59-0.88, p<0.0001), inter-observer kappa for AC was 0.29 (95% CI, 0.19-0.42, p<0.0001), HCS 0.27 (95% CI, 0.15-0.41, p<0.0001). Intra- observer scores for OS, ICC was 0.79-0.96, BBPS, 0.73-0.89. Intra- observer kappa for AC was 0.51-0.79 and for HCS, 0.36-0.92.

Conclusions: Inter-observer agreement values were high in OS and BBPS. This validation analysis showed that OS and BBPS are reliable, coherent scales so that they can provide better standardization to evaluate bowel preparation in both study and clinical practice.

Key Words: Bowel Preparation, Colonoscopy

LGI-2

Usual Bowel Habits and Quality of Bowel Preparation for Colonoscopy

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Background: The effectiveness of colonoscopy is dependent on quality of bowel preparation because poor bowel preparation is associated with missed adenoma. Although multiple studies have evaluated the role of cleansing methods and dosing regimens, only few studies have examined the association between the bowel habit and the bowel preparation. The aim of this study was to evaluate the impact of the bowel habit on the quality of bowel preparation.

Methods: We analyzed colonoscopy results of 182 outpatients from December 2012 to May 2013. We collected patient characteristics; age, sex, education, smoking status, alcohol status, weight, height, previous colonoscopy history, and self-reported medical histories (hypertension, diabetes etc). The usual stool form of patients was classified into 7 categories according to Bristol Stool Scale. The quality of bowel preparation was determined during colonoscopy according to Ottawa Bowel Preparation Scale (OBPS): score of 0 to 4 per segment and amount of liquid in the entire colon, from 0 to 2 points. A case-control study was performed comparing the patients between good preparation group (score ≤2) and poor preparation group (score ≥3).

Results: The mean age of patients was 52.5±12.3 years, and 99 patients were male. The reasons of colonoscopy study consisted of abdominal pain (27.5%), constipation (5.5%), diarrhea (2.2%), bowel habit change (3.8%), body weight loss (1.1%), bleeding (11.5%), screening (30.8%) and others (17.6%). The usual stool form of patients were consisted of type 1 (2.7%), type 2 (4.4%), type3 (9.3%), type 4 (37.4%), type 5 (23.1%), type 6 (21.4%) and type 7 (1.6%). And average number of defecation per week was 8.2±5.5. The proportion of good preparation was 92.9%, 97.3%, 98.4% and 92.9% for segment; Right colon, mid colon, rectosigmoid colon and total colon (sum score ≤8). The number of defecation per week (≥10) was associated with quality of mid colon preparation (p=0.037). However, there was no independent predictor of optimal bowel preparation in multivariate analysis.

Conclusions: Although the number of bowel movement is partially related with quality of bowel preparation for colonoscopy, the bowel habits were not significantly associated with quality of bowel preparation. Further studies are needed to access the impact of bowel habits on the bowel preparation.

Key Words: Colonoscopy, Bowel preparation, Bowel habit, Bowel stool form
LGI-3

Comparison of the Efficacy and Adverse Events of Transenteral Bowel Preparation with Traditional Per Oral Preparation

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Background and Aims: It is difficult for patients to drink the bowel cleanser for colonoscopy. Upper gastrointestinal (GI) endoscopy and colonoscopy are frequently done at the same session and the distress of per oral administration can be avoided by transenteral administration of bowel cleanser. The aim of this study was to evaluate whether the effect of transenteral bowel preparation is comparable with per oral preparation, while adverse events (AEs) are in a permissible range.

Methods: Patients undergoing upper GI endoscopy and colonoscopy at the same session were randomized to transenteral preparation group (TE group) and per oral preparation group (PO group). For the TE group, scope was inserted up to duodenal third portion immediately after upper GI endoscopy and Coolprep® (polyethylene glycol, ascorbic acid and electrolytes) mixed with 500ml of normal saline was infused. For the PO group, Coolprep® mixed with 1 L of normal saline was administered at 10 PM the day before examination and 6 AM at the day of examination. A survey was done to investigate preference to preparation method and AEs. Efficacy of preparation was assessed with Aronchick score system, polyp detection rate and colonoscopic intubation time.

Results: One hundred and eleven for TE group and 112 for PO group were subjected. The result of TE group (72.2%) was not inferior to PO group (76.9%). There was no significant difference in polyp detection rate (TE: 0.50 vs. PO: 0.62) and colonoscopic intubation time (TE: 315±229 sec, PO: 308±151 sec) between two groups. There was no significant difference of the overall rate of AEs (TE: 47.6%, PO: 49.0%). However, dizziness in the TE group; nausea and vomiting in the PO group were significantly more frequent. Nine in 70 participants in TE group and undergoing upper GI endoscopy under conscious sedation experienced unwilled defecation on bed.

Conclusion: Transenteral bowel preparation is effective as traditional per oral method.

Key Words: Transenteral bowel preparation, Bowel preparation, Colonoscopy, Polyethylene glycol, Ascorbic acid

LGI-4

Impact of Patient Education with Photo Aids on Quality of Bowel Preparation for Colonoscopy

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Backgrounds: Diagnostic accuracy and therapeutic safety of colonoscopy depends on the quality of the colonic preparation. The effect of educational intervention on bowel preparation for colonoscopy has not been well studied. The aim of this study was to determine the effect of a photo aids on the quality of colonoscopy bowel preparation.

Methods: This was a prospective, endoscopist-blinded, and randomized controlled trial. One hundred and seventy-two subjects were enrolled and randomly assigned to one of two groups. The control group subjects received written instructions for colonoscopy (n=93). The photo aids group subjects received photo instructions (n=79). The quality of bowel preparation was assessed by using Ottawa Bowel Preparation Scale (OBPS). Insertion and withdrawal time, polyp detection rate, patient tolerance of bowel preparation and colonoscopy were assessed.

Results: The photo aids group exhibited better bowel preparation than the control group according to OBPS scale (6.1 ± 2.9 vs. 5.0 ± 3.1, p=0.013). While there was no significant difference in elderly patients (≥ 50yrs) (5.8 ± 3.3 vs. 5.8 ± 3.3, p=0.568), the photo aids group showed better OBPS score than the control group in younger patients (< 50yrs) (6.3 ± 2.4 vs. 4.4 ± 2.5, p<0.01). Other outcomes were similar between groups.

Conclusion: Patient education with photo aids improved bowel preparation more than the control group according to OBPS scale (6.1 ± 2.9 vs. 5.0 ± 3.1, p=0.013). While there was no significant difference in elderly patients (≥ 50yrs) (5.8 ± 3.3 vs. 5.8 ± 3.3, p=0.568), the photo aids group showed better OBPS score than the control group in younger patients (< 50yrs) (6.3 ± 2.4 vs. 4.4 ± 2.5, p<0.01). Other outcomes were similar between groups.

Key Words: Colonoscopy, Education, Photo aids, Bowel preparation
LGI-5

Endoscopic and Clinical Factors Affecting the Prognosis of Endoscopic Submucosal Dissection Related Colon Perforation

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Background and Aims: Although colon perforation is a major complication of endoscopic submucosal dissection (ESD) of colorectal tumors, few studies have investigated factors associated with prognosis of ESD related colon perforation. This study aimed to investigate the factors affecting clinical outcomes of ESD related colon perforation.

Methods: Forty three patients with ESD related colon perforation were enrolled. Their medical records and endoscopy pictures were reviewed. Patient demographics, tumor characteristics, ESD procedure related findings, post-ESD clinical findings were analyzed as possible prognostic factors. Clinical outcome variables consisted of duration of nil-per-os (NPO), duration of intravenous antibiotics and duration of hospital days.

Results: Twenty seven patients were male and mean age of patients was 64±11 years. Mean tumor size was 33±19 mm. On multivariate analysis, duration of NPO was related with abdominal pain (β = 1.055, p=0.004), ESD failure (β = 4.874, p<0.0001) and endoscopists (β = 1.919, p=0.001). Duration of intravenous antibiotics was related with tumor size (β = 0.045, p=0.009) and endoscopists (β = 3.056, p=0.002). Hospital day was related with tumor size (β = 0.047, p=0.004), abdominal pain (β = 1.334, p=0.033) and endoscopists (β = 3.097, p=0.001). On the analysis of the subgroup with endoscopically evident perforation, the time between perforation and clipping affected the duration of NPO.

Conclusions: Tumor size, abdominal pain, ESD failure and endoscopists were independent factors affecting clinical course after colon perforation related to ESD.

Key Words: ESD, Colon, Perforation, Prognosis, Risk factors

LGI-6

Predictive Factors of Post-Endoscopic Submucosal Dissection Coagulation Syndrome for Laterally Spreading Tumors on Colon

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Background/Aims: Although endoscopic submucosal dissection (ESD) has a high en bloc resection rate and subsequently leading to lower recurrence rate at long term follow-up, it requires high degree of technique and has potential risk of major complications such as bleeding and perforation. There are a greater number of studies demonstrated colon ESD related major complications, however little is known about the minor complications such as post-ESD coagulation syndrome (CS). The aim of this study was to evaluate the clinical features of CS after colon ESD of laterally spreading tumor (LST). In addition, we demonstrated the predictive factors related to post-ESD CS for colorectal LST.

Methods: A total of 312 patients who were treated with ESD (n=230) or endoscopic mucosal resection after precutting (EMR-P) (n=82) for the colorectal LST in Konkuk University Medical Center between January 2009 and June 2013 were included in this study. Patients with fever over the body temperature of 37.7℃ and upper abdominal pain/discomfort or tenderness after ESD without macro- or microperforation regardless of symptoms of peritoneal irritation were deemed as showing the post-colon ESD CS.

Results: Of 312 patients finally enrolled, 10 subjects (3.2%) showed CS after ESD for colorectal LST. The rate of CS was significantly lower in the patients with en bloc resection (86.0%) than those with no en bloc resection (OR, 8.30; 95% CI, 2.00-34.51; p=0.001). The mean hospitalization was longer 3.4±1.8 days in patients with CS (6.7±2.9 days) than those without CS (3.3±1.1 days) (p=0.001) and most patients with CS administered intravenous antibiotics except for one patient. Finally all of the patients recovered completely without surgical therapy or mortality.

Conclusions: The resection in pieces was an independent factor for CS after ESD for colorectal LST. The incidence of CS was lower than we expected. Even though CS occurred, a majority of patients with CS would show the favorable progression within one week.

Key Words: Coagulation syndrome, Endoscopic submucosal dissection, Colorectal lateral spreading tumor, Piecemeal resection
LGI-7

The Clinical Feature of the Ulcer Base Over Time after Prophylactic Argon Plasma Coagulation in Colonic EMR

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Background/Aims: The prophylactic Argon plasma coagulation (APC) of non-bleeding visible vessels seems not to have an advantage in the prevention of delayed polypectomy bleeding in recently studies. However, immediate APC after EMR may not mean the complete coagulation of exposed vessels because of injection material. The aim of this study was to evaluate the clinical feature of the exposed vessels in ulcer base over time after prophylactic APC in colonic EMR.

Methods: This study was designed as a prospective study. A total of 20 patients who was enrolled underwent prophylactic APC for non-bleeding visible vessels after colonic EMR. After verifying the complete coagulation of visible vessels, the numbers of exposed vessel group were counted by lap of time such as 1, 3, 5, and 7 min in ulcer base.

Table 1. The Mean Exposed Vessels Over Time after Prophylactic APC in Colonic EMR

<table>
<thead>
<tr>
<th>Time</th>
<th>Visible vessel group</th>
<th>P-value by compared with '1 min'</th>
<th>P-value by compared with '3 min'</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 min</td>
<td>0.42 ± 0.69</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3 min</td>
<td>0.63 ± 0.83</td>
<td>0.02</td>
<td>-</td>
</tr>
<tr>
<td>5 min</td>
<td>0.74 ± 0.81</td>
<td>&lt; 0.01</td>
<td>0.14</td>
</tr>
<tr>
<td>7 min</td>
<td>0.74 ± 0.81</td>
<td>&lt; 0.01</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Results: The mean age of patients was (57.7 ± 12.6) years (16 men, 4 women). The mean ulcer size, lesion size and amount of injections were 7.9 ± 3.2 mm, 5.5 ± 1.8 mm, and 2.5 ± 0.9 cc, respectively. The mean numbers of exposed vessel groups were 0.42 ± 0.69, 0.63 ± 0.83, 0.74 ± 0.81, and 0.74 ± 0.81 after 1, 3, 5, and 7 min respectively. One delayed bleeding was noticed.

Conclusion: It might be an advantage to observe the ulcer base for 3 minutes after prophylactic AP.

Key Words: Endoscopic mucosal resection, Argon plasma coagulation, Polypectomy bleeding

LGI-8

Risk Factors for Delayed Post-Polypectomy Bleeding

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Background and Aim: Among many complications that can occur following therapeutic endoscopy, the most serious complication is bleeding, which occurs in 1.3% of all colonoscopic polypectomies. The aim of this study was to identify risk factors associated with the development of delayed post-polypectomy bleeding.

Methods: This retrospective case-control study compares patients who developed delayed bleeding after colonoscopic polypectomy with patients without bleeding. The control patients were selected at a 3:1 ratio. Our data includes size and number of polyps, location and shape, BMI, endoscopist’s experience and comorbidity.

Results: Of 1745 patients who received colonoscopic polypectomy, 21 patients (1.2%) developed post-polypectomy bleeding, and 63 age and sex matched patients were selected as control group. According to multivariate logistic regression analysis, a polyp larger than 10 mm (odds ratio [OR] 2.605, 95% confidence interval [CI] 1.035-4.528, p=0.049), a pedunculated polyp (OR 3.517, 95% CI 1.428-7.176, p=0.045), a polyp located in the right hemi-colon (OR 3.10, 95% CI 1.291-5.761, p=0.013) and a higher BMI (OR 3.681, 95% CI 1.876-8.613, p=0.013) were significantly associated with delayed post-polypectomy bleeding. The association between delayed bleeding and endoscopist’s experience was confirmed only by univariate analysis.

Conclusion: More concern should be considered for the possibility of delayed bleeding in polypectomies with large sized polyp, pendulated polyp, polyp located in the right hemi-colon and polypectomies undergoing in patients with higher BMI.

Key Words: Polypectomy, Bleeding, Colonoscopy, Risk factors, Complication
LGI-9

Double-Balloon Enteroscopy in Elderly Patients: Is It Useful and Safe?

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Background and Aims: Procedural complexity, complications and long procedure time may induce the hesitation for double-balloon enteroscopy (DBE), especially in the elderly because of potentially added sedation risk and co-morbidities. There are limited data on its use in the elderly. The aim of this study was to access the utility of DBE in the elderly and safety compared to the younger patients.

Patients and Methods: We retrospectively analyzed records in a collected database on all patients (n=158) undergoing DBE (218 procedures) for the evaluation of small bowel. Patients were divided into the elderly group: ≥ 65 years (n=34, 41 DBEs), the younger group: < 65 years (n=124, 177 DBEs). Data on indications, diagnostic yield, therapeutic success and complications of DBE were compared between age groups.

Results: The mean age of the elderly group was 71.4±5.4 years. Co-morbidity (56.4 vs. 35.2%) and NSAIDs/anticoagulant drug history (30.8 vs. 10.1%) was observed a higher percentage of the elderly group compared with the younger, and this did reach statistical significance (p=0.018 and p=0.002, respectively). The most common indication was obscure gastrointestinal bleeding in both groups. Mucosal lesions (33.3% vs. 60.9%, p=0.002) were the most common finding, followed by tumors (30.8 vs. 14.1%, p=0.036) and vascular lesions (23.1 vs. 13.5%, p=0.143) in the elderly and younger groups. Endoscopic therapy and surgery were performed significantly more frequent in the elderly group compared with the younger, and this did reach statistical significance (p=0.018 and p=0.002, respectively). The most common indication was obscure gastrointestinal bleeding in both groups. Mucosal lesions (33.3% vs. 60.9%, p=0.002) were the most common finding, followed by tumors (30.8 vs. 14.1%, p=0.036) and vascular lesions (23.1 vs. 13.5%, p=0.143) in the elderly and younger groups. Diagnostic yield increased slightly in the elderly group (92.3 vs. 86.5%), but this difference was not significant. The therapeutic success rate was 100% in the elderly group (vs. 92% in the younger). An overall major complication rate of 1.4% was seen for DBE in this study, but no major complications were observed in elderly group.

Conclusions: DBE is a safe method with a high diagnostic yield and therapeutic success rate on patient management in the elderly.

Key Words: Double-Balloon enteroscopy, Elderly

LGI-10

The Novel Imaging of Colon Mucosa 3D Structure Using Multiphoton Microscopy

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Background and Aim: A multiphoton microscopy(MPM) can allow a detailed 3D structure analysis of tissue and can be used for the early diagnosis of dysplastic mucosal lesion. The aim of this study was to make the gastrointestinal mucosa 3D structure using multiphoton microscopy and to compare normal mucosa with adenomatous and adenocarcinoma tissues.

Methods: We obtained three colon tissue samples by biopsy and endoscopic mucosal resection during colonoscopy. Then the tissues were placed in sterile specimen bottles containing PBS (phosphate buffer solution). Multiphoton images were collected using a DM IRE2 Microscope (Leica Microsystems GmbH, Wetzlar, Germany).

Results: Three human colon tissues were obtained and histologically confirmed diagnosis of 1 normal, 1 adenoma and 1 cancer. We were able to get 3D structural images at depths of 90-140 μm. Normal tissue had a defined texture, whereas adenoma and cancer tissue was amorphous. And adenoma and cancer tissues showed lack of collagen in mucosa and increased nucleus/cytoplasm ratio compared to normal mucosa.

Conclusions: Colon mucosa 3D structure analysis using multiphoton microscopy can be successfully used to determine colon mucosa architecture and may help to diagnose early colon cancer together with histopathologic examination.

Key Words: Multiphoton microscopy, 3D structure, Colon mucosa

Conclusions: Colon mucosa 3D structure analysis using multiphoton microscopy can be successfully used to determine colon mucosa architecture and may help to diagnose early colon cancer together with histopathologic examination.

Key Words: Multiphoton microscopy, 3D structure, Colon mucosa
A Prospective Survey on the Colonoscopy Report System in the Real Clinical Practice in Daegu-Gyeongbuk Province of Korea

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Backgrounds and aim: Colonoscopy is an important procedure for diagnosis, treatment and prevention of colorectal diseases. Although the use of colonoscopy has increased dramatically in the past few years, the quality of colonoscopy in clinical practice varies significantly. The establishment of reporting system of colonoscopy is prerequisite for measuring quality and continuous quality improvement. The aim of this study was to investigate the real situation of reporting system in the clinical practice in Daegu-Gyeongbuk province of Korea.

Methods: We inquired about the colonoscopy reports to the endoscopists routinely doing gastrointestinal endoscopy throughout the Daegu-Gyeongbuk province of Korea using a standardized questionnaire by mail.

Result: Out of 1321 endoscopists who were invited, 125 responded to the questionnaires (response rate 9.4%). 84% (n=105) were internists and 14% (n=17) were surgeons. 57% (n=71) performed over average 35 cases of colonoscopy per month. 69% (n=87) of respondents were primary practitioners. Although 88.8% of endoscopists (111/125) reported that colonoscopy report system is necessary, only 18.4% (23/125) had the optimal level of reporting system recommended by the Quality Assurance Task Group of the National Colorectal Cancer Roundtable. One third of participants replied that they did not use a reporting document. The main reasons of not using report system were “too busy” and “inconvenience”.

Conclusion: Quality of reporting system for colonoscopy is widely variable and considerably suboptimal in the real practice of Southeastern area of Korea. There is an urgent need to encourage the implementation of standard reporting system in clinical practice for quality improvement of colonoscopy.

Key Words: Colonoscope recording system, Colonoscopy.

Long-Term Outcome of Surgery for Obstruction Caused by Unresectable Colorectal Cancer in Patients with Good Performance

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Background/Aims: In patients with obstruction caused by incurable primary colorectal cancer, choosing between self-expandable metal stent (SEMS) placement and palliative surgery is of concern, especially in those with good performance status.

Objectives: The aim of this study was to compare the long term outcomes of self-expandable metal stent (SEMS) placement and palliative surgery for the palliation of malignant obstruction caused by unresectable primary colorectal cancer.

Designs: Retrospective study. Patients: Patients with an Eastern Cooperative Oncology Group (ECOG) performance status of 0-3 who had malignant obstruction caused by unresectable primary colon cancer. Interventions: SEMS placement or palliative surgery. 1 Main Outcome Measurements: Success rate, adverse events, patency, and survival duration.

Results: Of the 84 patients in this study, 50 underwent SEMS placement and 34 underwent palliative surgery. Clinical success rates in the SEMS group and those in the surgery group were not different (88% vs 91%, p=.733). And the 2 groups also did not differ in the technical success and incidence of early adverse events. However, the rate of late adverse events was significantly higher in the SEMS group (30% vs 14.7%; p=.02 ). The median patency duration was shorter after SEMS placement than after surgery (156 days vs 451 days; p=.004), even after additional intervention (202 days vs 474 days; p=.001). The median survival was also significantly shorter after SEMS placement than after surgery (253 days vs 473 days; p=.001). Survival differed between treatments in patients with ECOG performance status of 2-3 (p=.505). Limitations: Retrospective and single-center study.

Conclusions: Palliative surgery is preferable to SEMS placement for the palliation of malignant obstruction caused by incurable primary colon cancer in patients with a good performance status, especially ECOG 0-1.

Key Words: Palliative surgery, Unresectable colorectal cancer, Self-Expandable metal stent.
Usefulness of Endoscopic Ultrasonography in the Treatment of Rectal Carcinoid Tumor

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Background/Aims: The incidence of rectal carcinoid tumors is increasing by increasing number of screening colonoscopies and incidental findings from them. Rectal carcinoid tumors of 10 mm or less in size are thought to have superficial invasion down to submucosal layer with negligible metastatic risk and endoscopic resection is recommended for treatment of these lesions. However surgical resection is recommended for lesions larger than 10 mm. Endoscopic ultrasonography (EUS) is useful when examine the depth of tumor invasion and adjacent lymph node metastasis. However, the role of EUS in the treatment of rectal carcinoid tumor is unclear. This study evaluated the impact of EUS in determining management strategy for rectal carcinoid tumors.

Methods: We retrospectively reviewed clinical and pathological data of 117 pathologically proven rectal carcinoid tumors evaluated in Daegu Catholic University Medical Center between March 2003 and August 2013.

Results: Seventy six patients (64%) were male and the mean age was 51.1 years (range, 20-81). The mean tumor size was 8.14 ± 4.12 mm (range, 3 - 20 mm). Twenty seven tumors were larger than 10 mm in size. Eighty eight patients were evaluated with EUS before treatment and 22 patients of them had carcinoid tumor larger than 10 mm in size. Under EUS observation, all tumors showed homogenous hypoechoic mass confined within submucosal layer but one lesion. There was no adjacent lymph node metastasis. On EUS, of 22 cases of larger than 10 mm, only one lesion, 12 mm in size, showed invasion of muscularis propria and surgical resection was carried. Invasion of muscularis propria was pathologically proven after surgical resection. One lesion also underwent surgical resection per patient’s request. Other twenty cases were treated endoscopically and removed successfully.

Conclusion: EUS was useful in decision making in the treatment of rectal carcinoid tumors of larger than 10 mm in size.

Key Words: Endoscopic ultrasonography, Rectum, Carcinoid tumor

Cold Snare versus Hot Snare Polypectomy for the Complete Resection of 5-9 mm Sized Colorectal Polyps

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Background and Aim: The polypectomy techniques in the removal of small colorectal polyps in the 5-9mm size range are not consistent. And there is no data on cold snare polypectomy (CSP) in direct comparison with hot snare polypectomy (HSP) for the complete resection rate. The aim of our study is to compare CSP with HSP in the term of complete resection rate.

Methods: Patients with 5-9 mm colorectal polyps were randomized to CSP or HSP group. The presence of residual polyp was assessed by histological assessment of quadrant forceps biopsies taken from the edges of the polypectomy site. The primary outcome is the complete resection rate after HSP or CSP. Secondary outcome is clinically significant complication rate.

Results: Total 206 patients with 224 polyps were enrolled and randomized. 22 polyps were excluded and finally, 202 polyps were analyzed. The mean size of polyps was 6.40 (±1.40) mm. The complete resection rate was significantly higher in the HSP group than in the CSP group (92.9 vs 78.6%, \(p=0.007\)). There was no clinically significant bleeding in both groups. Failure of tissue retrieval was noted in 3.7% of polyps resected by CSP, but polyp retrieval rate was not significantly different in HSP and CSP groups (100% vs 96.3%, \(p=0.151\)). CSP and serrated polyp showed the strong association with incomplete resection in logistic regression analysis (CSP: OR=3.26, 95% CI 1.27-8.39, \(p=0.014\), serrated polyp: OR=5.33, 95% CI 2.22-12.82, \(p<0.001\)). However, gross type or size was not significantly associated with incomplete resection rate.

Conclusion: HSP is superior to CSP in the complete resection rate of 5-9 mm sized sessile or flat colorectal polyps without clinically significant complications.

Key Words: Colon polyp, Snare polypectomy, Complete resection
LGI-15

A Comparative Study of Low-Volume Bowel Preparation Methods for Colonoscopy: Sodium Picosulfate versus PEG-Asc

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Background and Aim: Low-volume bowel preparations have been shown to provide an equivalent cleansing with improved tolerability as compared to standard 4 L-PEG bowel preparation for colonoscopy. But, the study on superiority between low-volume bowel preparation methods are lacking. The aim of this study was to compare split-dose methods of Sodium Picosulfate/Magnesium Citrate (SPMC) and Polyethylene Glycol with ascorbic acid (PEG-Asc) in the aspect of bowel preparation quality and compliance.

Methods: Single center, randomized, observer-blinded study was performed from March 2013 to September 2013. Total 200 out-patients were prospectively enrolled and received colonoscopy using low-volume bowel preparation, split-dose method. We used the Boston Bowel Preparation Scale and Aronchick Bowel Preparation Scale for evaluation of bowel cleansing. And we compared Bubble scoring between two methods. To investigate the preference and compliance, a questionnaire was performed before colonoscopy.

Results: One hundred patients received SPMC and 100 patients received PEG-Asc. 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 SPMC group showed superior cleansing results over the PEG-Asc group (8-9 Boston scale score: 40% vs 22.8%, excellent Aronchick grade: 28.5% vs 14.2%, p<0.05). But, 5 cases in SPMC group showed severely inadequate preparation quality and they needed additional preparation. Some gastrointestinal symptoms (nausea, bloating) were less and taste of solution were better in SPMC group compared to PEG-Asc group (p<0.05).

Conclusions: Both PEG-Asc and SPMC showed good preparation quality and good compliance for colonoscopy bowel preparation. But SPMC had better tolerability compared with PEG-Asc.

Key Words: Bowel preparation, Colonoscopy

LGI-16

One Day Administration of Bowel Cleanser in Afternoon Colonoscopy: Comparison of Picosulfate versus Polyethylene Glycol

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Background & Aims: Proper bowel cleansing is essential for detection of colon polyps. The aims of our study were to assess the cleansing efficacy, tolerability and side effect of polyethylene glycol (PEG) versus picosulfate and bisacodyl in afternoon colonoscopy.

Methods: This was a prospective randomized controlled trial. The study subjects were randomly assigned to the two groups: picosulfate group; PEG group. All study subjects were instructed to take bowel cleanser on the day of colonoscopic examination. Blood sample and vital sign was obtained before colonoscopy. The study subjects completed questionnaire before colonoscopy. Acceptability to the bowel cleanser was scored from 1 (very easy) to 5 (very difficult). Bowel cleansing efficacy was calculated by the two scale: Ottawa bowel cleansing scale (OBPS); Aronchick scale.

Results: Two hundred eight patients were included (picosulfate 103, PEG 105). Cleansing score by OBPS and success rate by the two scale were not different between the two groups (Table 1). Acceptability to the bowel cleanser was superior in the picosulfate group (2.3 vs 3.2, p<0.01, Table 2).

Conclusions: One day administration of the two bowel cleanser were not different in bowel cleansing efficacy. Acceptability of picosulfate was superior to PEG.

Table 1. Bowel Cleansing Effect of the Study Subjects

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Picosulfate (N=103)</th>
<th>PEG (N=105)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OBPS score, total (0-14)</td>
<td>5.0 (±1.7)</td>
<td>4.9 (±1.7)</td>
<td>0.63</td>
</tr>
<tr>
<td>Fluid (0-2)</td>
<td>1.1 (±0.3)</td>
<td>1.1 (±0.3)</td>
<td>0.61</td>
</tr>
<tr>
<td>Ascending colon (0-3)</td>
<td>1.6 (±0.7)</td>
<td>1.6 (±0.8)</td>
<td>0.50</td>
</tr>
<tr>
<td>Mid colon (0-3)</td>
<td>1.2 (±0.7)</td>
<td>1.2 (±0.7)</td>
<td>0.97</td>
</tr>
<tr>
<td>Rectosigmoid colon (0-3)</td>
<td>1.2 (±0.8)</td>
<td>1.1 (±0.7)</td>
<td>0.84</td>
</tr>
<tr>
<td>Success rate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBPS score, n (%)</td>
<td>86 (83.5)</td>
<td>89 (84.8)</td>
<td>0.80</td>
</tr>
<tr>
<td>Aronchick, n (%)</td>
<td>98 (95.1)</td>
<td>101 (96.2)</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Abbreviations: OBPS, Ottawa bowel preparation scale; PEG, polyethylene glycol

Key Words: Picosulfate, Polyethylene glycol, One day administration
LGI-17

Comparison of Efficacy, Tolerability and Safety of Polyethylene Glycol versus Picosulfate for Colon Cleansing in Elderly

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Background and Aims: Polyethylene glycol and picosulfate are widely used as colon cleansing agents before colonoscopy in elderly patients. The aims of our study were to compare the efficacy, tolerability and safety of polyethylene glycol and picosulfate in colonoscopy preparation in elderly patients.

Patients and Methods: 101 patients were randomized into one of the two groups: the polyethylene glycol group or the picosulfate group. Colon-cleansing efficacy was evaluated by Ottawa bowel cleansing scale (OBPS) and Aronchick scale. Patient tolerability and incidence of adverse events were evaluated using a questionnaire and laboratory exam.

Results: Among 101 patients, one patient who was assigned to the picosulfate group was dropped out due to headache and elevated blood pressure after the ingestion of picosulfate. Overall, the mean OBPS score in the picosulfate group was significantly higher compared with that of the polyethylene glycol group (5.07 vs 3.95, p=0.013). Adverse events evaluated using a questionnaire were not significantly different between the two groups. However, hyponatremia developed more frequently in the picosulfate group.

Conclusion: Polyethylene glycol may be more appropriate compared to picosulfate in terms of efficacy and safety for colon cleansing in elderly patients.

Key Words: Picosulfate, Polyethylene glycol, Elderly

LGI-18

Is the Menthol Candy Drops able to Help the Patients to Take Polyethylene Glycol (PEG) Solution?

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Background and Aim: Polyethylene glycol (PEG)-based solution is widely used for bowel cleansing before colonoscopy but has poor compliance. Recently, 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 just a little of taste improvement. The aim of this study was to test the effectiveness of menthol candy drops in improving tolerability and bowel cleansing of PEG-Asc.

Methods: Single center, randomized study was performed during July to September 2013. Total 100 out-patients were prospectively enrolled and received colonoscopy using split-dose PEG-Asc preparation method; 50 subjects (PEG-Asc group) and 50 subjects (PEG-Asc plus menthol candy group). In the PEG-Asc plus menthol candy group, patients were provided 15 menthol candy drops and instructed to suck on a candy while drinking the split-dose PEG-Asc solution. We used the Boston scale and Aronchick scale for evaluation of bowel cleansing. To investigate the compliance, a questionnaire was performed before colonoscopy.

Results: There were no significant differences between two-groups in the aspect of cecal intubation time and total examination time. In the compliance, nausea (score 0-5) and taste (score 0-5) were lower score in PEG-Asc plus menthol candy group (p<0.05). In the aspect of the preparation quality, all patients in two groups showed good quality (mean 7.14 Boston scale score, range 4-9; 72.7% excellent or good grade in Aronchick scale) but there were no significant differences between two-groups. Considering the total number of ingested menthol candy, patients who had 10 or more candies showed better bowel cleansing quality (mean 8.25 Boston scale score, range 7-9; 75% excellent grade in Aronchick scale) but it was not statistically significant.

Conclusions: The menthol candy drops improve the compliance and taste of PEG-Asc, but not associated with bowel cleansing effect.

Key Words: Bowel preparation, Colonoscopy, Menthol candy
**LGI-19**

**Effect of Additional Mixture of Coffee into Traditional Bowel Cleanser, Polyethylene Glycol+Ascorbic Acid**

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**Background and Aims:** Poor compliance about bowel cleanser has limited successful colonoscopy. It has been reported that solution of polyethylene glycol (PEG) and ascorbic acid (ASC) one liter at the night the day before colonoscopy and another one liter at dawn the day of colonoscopy, is effective for bowel preparation. Coffee has intense and unique flavor, and it has been reported to increase bowel motility. We ascertained whether additional mixture of coffee into the solution of PEG+ASC had efficacy as the solution of only PEG +ASC.

**Methods:** Outpatients undergoing colonoscopy for routine clinical indication were subjected. For control (PEGAS; PEG+ASC) group, One liter solution of PEG+ASC was required to drink within an hour from ten o’clock the day before the examination and six o’clock the day of the examination. For study (COF; PEG+ASC+coffee) group, 750 milliliters solution of PEG+ASC and blended coffee was instructed to drink as the same pattern as that of PEGAS group.

**Results:** Eventually, one hundred and twelve for COF group and 110 for PEGAS group were subjected. Efficacy of COF group scored with Aronchick score system was not inferior to that of PEGAS group (low limit of 97.5 confidence interval ≥ -15%). Polyp detection rate (0.60 in COF vs 0.53 in PEGAS) and Colonoscopic intubation time (330±244 sec vs 323±167 sec) was not significantly different between both groups. Feasibility and acceptability in COF group were significantly higher than those in PEGAS group but preference was not different between both groups. Rates of adverse events (0.61 in COF vs 0.55 in OEGAS) were not different. But, for each symptoms of adverse events, insomnia was significantly more frequent in COF group and abdominal pain in PEGAS group.

**Conclusions:** Additional mixture of coffee to the solution of PEG and ASC is not inferior to the solution of only PEG and ASC in efficacy for bowel preparation, and is more comfortable without increased rates of adverse events.

**Key Words:** Coffee, Polyethylene glycol, Ascorbic acid, Bowel preparation, Colonoscopy

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**LGI-20**

**Orange Juice Intake Reduces Patient’s Discomforts and Improves the Palatability of 2 L Polyethylene Glycol**

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**Background/Aims:** Colonoscopy is the gold standard for diagnosis of colon cancer and colon polyp. But, many outpatients are complaining of nausea due to taste of bowel preparations. The aim of this study was to determine whether orange juice intake before drinking 2 L polyethylene glycol plus ascorbic acid (PEG+ASC) is effective for improving palatability and bowel cleansing during bowel preparation.

**Methods:** This study included 87 Korean adults who underwent diagnostic colonoscopy at two general medical centers (one tertiary referral center and one secondary referral center). Adult patients undergoing colonoscopy received either 2 L PEG-ascorbic acid (Group 1) or 2 L PEG-ascorbic acid+ orange juice (Group 2). Bowel cleansing was rated by the Aronchick scale. Subject acceptance, satisfaction, willingness and related adverse effects were reported by questionnaire.

**Results:** A total of 87 subjects were included (42 2 L PEG-ascorbic acid group, 45 orange juice added group). The mean palatability score (±standard deviation) was higher in orange juice-added group than controls (1.67±0.90 vs 2.40±0.75, \(p<0.001\)). Nausea and interference in daily activity were more frequent in control group (59.5% vs 39.5%, \(p=0.026\) and 14.3% vs 2.2%, \(p=0.04\)). Total amount of drinking 2 L PEG-ascorbic acid was not significantly different between both groups (\(p=0.825\)). The mean score of bowel preparation (±standard deviation) graded by the aronchick scale was lower in orange juice-added group, but the difference between two groups was not statistically significant (1.64±0.91 vs 1.56±0.79, \(p=0.906\)). Willingness to repeat the procedure was higher in orange juice-added group (16.7% vs 37.8%, \(p<0.001\)).

**Conclusions:** Orange juice intake before drinking 2 L PEG for colonoscopy can reduce patient’s discomforts, resulting in acceptability and patient’s compliance. This method is as effective for bowel cleansing as 2 L PEG plus ascorbic acid.

**Key Words:** Colonoscopy, Bowel preparation, PEG, Orange juice
**LGI-21**

**The Comparison of the Outcomes of Colorectal Stent: Colorectal Cancer vs. Extracolonic Malignancy**

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**Background and Aims:** Self-expandable metal stent (SEMS) insertion has been known to be effective and safe for palliation of obstructive primary colorectal cancer. However, the clinical outcomes of stent placement for colorectal obstruction from extracolonic malignancies are controversial. The aim of this study is to compare the outcomes of SEMS insertion between primary colorectal cancer (CRC) and extracolonic malignancy (ECM) groups.

**Patients and Methods:** A total of 510 patients from August 2005 to March 2013 were retrospectively analyzed in a tertiary referral medical center. Palliative stent placement was performed for inoperable malignant colorectal obstruction, including 343 for primary CRC and 167 for ECM. We excluded the patients with CRC who underwent SEMS insertion for bridge therapy before the surgery.

**Results:** The overall technical and clinical success rate was 95.7% and 84.1%, respectively. Among 510 patients, 154 (30.2%) had experienced complications. In both groups, re-obstruction was the most common complication. Contrary to CRC group, ECM group had less technical and clinical success rates (92.8% vs 97.1%, 72.5% vs 89.8%, p<.0001 in both) and more complication rate (37.1% vs 26.8%, p<.0001). ECM included advanced gastric cancer (63.5%), pancreatic cancer (13.2%), ovarian cancer (6.0%) and others. Multivariate analysis indicated that carcinomatosis (OR 2.17, 95%CI 1.26-3.72), ECM (OR 2.09, 95%CI 1.20-3.64), and previous radiotherapy (OR 2.03, 95%CI 1.01-4.10) were the factors predictive of the reobstruction of SEMS.

**Conclusion:** SEMS insertion for colorectal obstruction from extracolonic malignancy was less effective and safe than that from primary colorectal cancer in terms of low clinical and technical success rate, high complication rates, and long-term stent patency. Carcinomatosis, ECM, and previous radiotherapy were the independent risk factors of reobstruction of SEMS in colorectal malignant obstruction.

**Key Words:** Colorectal cancer, Extracolonic malignancies, Stent, Colorectal obstruction, Stent patency

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**LGI-22**

**Is Endoscopic Colorectal Stenting as a Bridge to Surgery Really Useful for Malignant Colonic Obstruction?**

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**Background and Aim:** There is controversy about the benefit of colorectal stent as a bridge to surgery. The aim of this study was to compare the outcomes between operation after colorectal stenting as a bridge and emergency surgery in patients with colorectal obstruction.

**Methods:** We reviewed the medical records of 105 patients who were treated for primary obstructing colorectal cancer between May 2009 and May 2013. 48 patients were performed the endoscopic colorectal stent insertion as a bridge to surgery (stent group). 11 patients who underwent the emergency surgery whether stent insertion was successful or not, were included among stent group. 15 patients underwent an emergent operation without colorectal stent.

**Result:** The overall success rate of colorectal stent insertion for malignant colorectal obstruction was 88.7%(77/86). The success rate of stent as a bridge to surgery was 83.3(40/48). Technical failure occurred in 5 patients(10.4%). Perforation during colorectal stenting occurred in 3 patients(6.3%). 37 patients(77.1%) in stent group underwent elective surgery. The stoma rate was 33.3%(16/48) in stent group versus 46.7% (7/15) in emergency surgery group (p=0.35). The median postoperative hospital stay was 13.6±11.4 days versus 14.8±7.2 days (p=0.20). The postoperative complication rate was 14.6%(7/48) versus 13.3%(2/15) (p=1.00). The in-hospital mortality rate in both groups was 6%. Kaplan-Meier survival curves showed no significant difference(1 year survival rate 65.6% versus 62.3%, p=0.639).

**Conclusion:** Endoscopic colorectal stenting showed no additional clinical benefit comparing with surgery only in malignant colorectal obstruction. If the patients are at increased risk for complications of emergency surgery, stent can be considered as alternative approach to emergency surgery of obstructive colorectal cancer.

**Key Words:** Stent, Obstruction, Colorectal cancer
**LGI-23**

**Risk Factors for Surgical Failure after Colonic Stenting as a Bridge to Surgery in Malignant Colonic Obstruction**

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**Background and Aims:** Although self-expanding metal stents (SEMS) as a bridge to surgery (BTS) is an alternative to emergency surgery in patients with malignant colonic obstruction (MCO), risk factors for unsuccessful surgical outcomes after stenting as a BTS remains uncertain. The aim of our study was to identify risk factors for poor postsurgical outcomes of SEMS as a BTS.

**Patients and Methods:** The medical records of patients who underwent SEMS insertion for colonic obstruction between February 2004 and August 2012 were retrospectively reviewed. A total of 181 patients underwent SEMS insertion during the study period; of these, 68 patients who underwent SEMS insertion as a BTS in acute left-sided MCO were included in this study.

**Results:** The mean age was 64.9 years (range, 38-89), and 70.6% (48/68) were male. The most common obstruction site was in the rectosigmoid junction (25/68, 36.8%). The technical and clinical success rates of SEMS were 97.1% (66/68) and 88.2% (60/68), respectively. 85.3% (58/68) of patients underwent primary tumor resection and primary anastomosis, with a mean interval of 11.3 days (range, 0-26) between SEMS insertion and surgery. Surgically successful SEMS as a BTS was achieved in 77.9% (53/68). On multivariate analysis, multiple SEMS (≥2 stents or ≥2 stent insertion sessions) was a significant independent risk factor for surgical failure of SEMS as a BTS. Morbidity and mortality rates in surgery after SEMS insertion were in 4.4% (3/68) and 1.5% (1/68). One patient experienced anastomosis leakage, another patient wound infection, and the other patient pneumonia. The patient who had pneumonia eventually passed away 6 days after elective surgery.

**Conclusions:** Multiple SEMS appears to be a risk factor for surgical failure. This finding may aid in determining the appropriate treatment strategy in patients with acute left-sided MCO.

**Key Words:** Stents, Endoscopy, Intestinal obstruction, Outcomes, Colorectal neoplasms

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**LGI-24**

**Risk Factors for Incomplete Polyp Resection during Colonoscopic Polypectomy**

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**Background and Aims:** Colonoscopic polypectomy is highly efficient in preventing colorectal cancer, but sometimes the polyp may not be completely removed. Better knowledge of the risk factors for incomplete polyp resection after polypectomy might decrease the cancer risk and additional costs. The aim was to investigate the conditions that can cause incomplete polyp resection (IPR) after colonoscopic polypectomy.

**Patients and Methods:** A total of 12,970 polyps which were removed by colonoscopic polypectomy were investigated. Among them, we identified 228 cases with a positive resection margin and 228 controls with a clear resection margin which were matched for age, sex, and polyp size. We investigated the location, morphology, and histological type of the polyps and evaluated the workmanship of the endoscopist and assisting nurse.

**Results:** Multivariate analysis revealed that the polyps, which were located in the proximal part of the colon and the rectum, were at significant risk of IPR. Histologically advanced polyp and inexperienced assistant were also independent risk factors of IPR.

**Conclusions:** Polypectomy should be performed more carefully for polyps suspected to be cancerous and polyps located in the proximal part of the colon or rectum. A systematic training program of inexperienced assistant might be needed to decrease the risk of IPR.

**Key Words:** Colonic polyps, Colonoscopic polypectomy, Adenomatous polyps, Interval colorectal cancer, Polypectomy
LGI-25

Improved Colorectal Polyp and Adenoma Detection in Cap-Assisted Colonoscopy Compared with Standard Colonoscopy

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Background/Aims: Colonoscopy is an effective procedure for prevention of colorectal cancer (CRC) because early detection and removal of colon adenoma can be possible. A few studies showed that cap-assisted colonoscopy (CAC) improved polyp detection rate (PDR) and adenoma detection rate (ADR), but other studies showed conflict results. Also, recent studies have demonstrated that proximal colon cancers are not efficiently prevented by colonoscopy screening. We studied the effect of CAC on polyp and adenoma detection in colorectum.

Patients and Methods: Patients who underwent the first screening colonoscopy in Pusan National University Yangsan Hospital were enrolled. We evaluated retrospectively PDR, ADR, advanced adenoma detection rate (AADR), and sessile serrated adenoma detection rate (SADR) in CAC compared with standard colonoscopy (SC) in the right side colon as well as colorectum.

Results: A total of 723 colonoscopies were analyzed in this study. CAC group consisted of 226 colonoscopies, and SC group consisted of 497 colonoscopies. PDR and ADR were significantly higher in CAC group (51.3% vs 34.6% (p<0.01), 37.6% vs 24.7% (p<0.01)). AADR and SADR were not different between two groups (7.5% vs 5.4% (p=0.276), 0.4% vs 1.2% (p=0.44)). PDR and ADR of right side colon were higher in CAC group (33.6% vs 15.7% (p<0.01), 25.7% vs 11.3% (p<0.01)). AADR and SADR of right side colon were not different between two groups (3.5% vs 2.2% (p=0.3), 0.4% vs 0.8% (p=1.0)).

Conclusion: CAC improved PDR and ADR, especially right side colon. Thus, CAC may be effective for preventing proximal colon cancer.

Key Words: Colonoscopes, Cap, Polyp detection rate, Adenoma detection rate

LGI-26

Effectiveness of Cimetropium Bromide Administered at the Cecum for Polyp and Adenoma Detection in Colonoscopy

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Background and Aims: Colonoscopy is the effective method in preventing colorectal cancer because easy detection and resection of polyp. But, miss rates of polyps range from 5 to 32% and recent studies have demonstrated that proximal colon cancers are not efficiently prevented by colonoscopy screening. Cimetropium bromide results in colonic spasmolysis and may improve polyp detection, especially right side colon. We studied the effect of cimetropium bromide on polyp and adenoma detection in colorectum.

Patients and Methods: Patients undergoing colonoscopy for screening and diagnostic examinations were included and received 5 mg cimetropium bromide at cecal intubation in Pusan National University Yangsan Hospital during 2 months at 2011 and 2012, respectively. We evaluated retrospectively polyp detection rate (PDR), adenoma detection rate (ADR), advanced ADR (AADR) and serrated ADR (SADR) in right side colon as well as in whole colorectum.

Results: A total of 938 patients were analyzed in this study. Cimetropium group consisted of 196 patients and control group consisted of 742 patients. ADR, AADR in whole colorectum were significantly higher in cimetropium group, respectively (35.2% vs 27.0% (p=0.026), 9.2% vs 5.1% (p=0.033)). Also, PDR, ADR and AADR in right side colon were significantly higher in cimetropium group, respectively (28.6% vs 20.4% (p=0.014), 21.4% vs 14.2% (p=0.013), 6.6% vs 3.2% (p=0.030)). But, PDR in whole colorectum and SADR in right side colon between two groups were not different. In non-right side colon, PDR and ADR were not significantly higher in cimetropium group, respectively (30.6% vs 27.8% (p=0.431), 23.0% vs 19.0% (p=0.217)).

Conclusions: Cimetropium bromide improved ADR and AADR in right side colon as well as colorectum. Thus, the use of cimetropium bromide may be effective for preventing proximal colon cancer.

Key Words: Cimetropium bromide, Colonoscopy, Polyp, Adenoma
LGI-27

The Effect of Real-Time Monitoring of Colonoscopy Withdrawal Time in Trainees

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Background/Aims: There is the strong correlation between colonoscopy withdrawal time (WT) and adenoma detection rate (ADR). Previous study showed that real time measurement increased WT in trainees. The aim of this study was to determine whether real-time monitoring may improve WT, polyp detection rate (PDR) and ADR than simply knowing that WT is being monitored.

Methods: In study group, observer who was a registered endoscopy nurse(RN)s started timer on monitor for operator to check WT in real time. In control group, observer recorded the insertion time on monitor before withdrawal phase to make operator know that WT is monitored. Colonoscopies were performed by four endoscopy specialists and four GI trainees. WT, clinical features, bowel preparation, PDR and ADR were comparatively analyzed.

Results: 388 subjects were assigned in study group and 297 subjects comprised a control group. No significant differences were found in age, gender, bowel preparation, polyp history or colonoscopies performed by trainees during withdrawal phase in both groups. There was no difference in PDR(43.0% vs. 42.4%) and ADR(28.9% vs. 29.7%) in two groups. The ADR among more than 50 yrs were over 35% (37.3% vs.36.6%, p=0.92) in both groups. Most of colonoscopy performed by trainees showed more than 6 min WT in both groups (80% vs. 81.7%). The polyp detection rate, adenoma detection rate, advanced adenoma detection rate of fellow group were slightly higher in the endoscopy specialist, but there was not statistically significant.

Conclusions: Real-time monitoring did not increase WT, PDR and ADR compared with simply making operator to know that WT is monitored. If adequate WT was encouraged thoroughly in trainees who have adequate PDR, both ways in monitoring made no difference.

Key Words: Colonoscopy withdrawal time, Real-time monitoring, Polyp detection rate, Adenoma detection rate

LGI-28

Interobserver Agreement of Colorectal Laterally Spreading Tumors: A Multicenter Study between Experts and Trainees

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Background/Aims: The risk of cancer varies with the subtype of the colorectal laterally spreading tumors (LST). However, there are various visual interpretations among endoscopists. The aim of this study was to evaluate interobserver agreement and accuracy for endoscopic classification of LST subtypes among experts and trainees.

Methods: Forty LST images were collected and independently reviewed by 14 gastroenterology experts and 10 trainees. All investigators recorded their findings as one of the four categories (homogeneous, nodular mixed, flat elevated, and pseudodepressed). Agreement was expressed by kappa (k) and AC1 estimate. The accuracy was reported as percentage of agreement with gold standard which was based on the gross morphology of resected specimen.

Results and Conclusions: Forty one (45.1%) out of the possible 91 pairwise k estimates among experts were greater than 0.75, indicating excellent agreement while only 2 (4.4%) out of the 45 pairwise k estimates among trainees were greater than 0.75. The k and AC1 estimates show similar values in each individual subtype of LSTs. The agreements for individual LST subtype in trainee group were significantly lower than those in the expert group. Also, the overall accuracy of LST was significantly higher in experts than in trainees (85.9% vs. 72.5%, p<0.001). Notably, flat elevated subtype showed the lowest agreement in both groups. Two non-granular subtypes (flat elevated and pseudodepressed) were frequently misinterpreted with each other. In conclusion, the interobserver agreement and accuracy for LST subtype classification were different between experts and trainees. Implementation of adequate training system is necessary for beginners to better classify colorectal LSTs.

Key Words: Laterally spreading tumors, Interobserver agreement, Kappa value
**LGI-29**

**Endoscopic Mucosal Resection and Endoscopic Submucosal Dissection for Large Colorectal Laterally Spreading Tumors**

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**Background/Aims:** Colorectal laterally spreading tumors (LST) ≥ 20mm are usually treated by endoscopic mucosal resection (EMR) or endoscopic submucosal dissection (ESD). The aim of our study was to compare the effectiveness of EMR and ESD for such LST.

**Methods:** A total of 309 patients with a colorectal LST > 20mm were treated endoscopically at our hospital. We retrospectively evaluated the clinical outcomes of EMR and ESD for large colorectal LST.

**Results:** A total of 232 colorectal LSTs were treated by EMR and 77 were treated by ESD. EMR was associated with a lower en bloc resection rate (72.8%/94.8%; p<0.001) and smaller tumor size (26.8 ± 9 mm/37.7 ± 12 mm; p<0.001) than ESD. Between-group differences in perforation rates (5.2%/9.1%; p=NS) and delayed bleeding rates (3.4%/3.9%; p=NS) were not significant. One ESD case of perforation was managed by surgical operation and the others of perforation were managed effectively treated endoscopically. Additional colectomy rates due to non-curative resection were 6(2.6%) in EMR and 4(5.2%) in ESD, respectively and no significant differences (p=NS). One (1.4%) recurrence was detected in EMR, whereas there were no recurrences observed in ESD during a mean endoscopic follow-up period of 13.0 months. The one recurrence case was managed endoscopically.

**Conclusions:** ESD is a feasible technique for en bloc resection and showed no local recurrences. Although EMR was associated with local recurrences and lower en bloc resection rates, EMR showed similar complication rates and additional surgical resection rates. And its local recurrences could obtain complete cure by additional endoscopic treatment.

**Key Words:** Laterally spreading tumor, Endoscopic mucosal resection, Endoscopic submucosal dissection

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**LGI-30**

**Endoscopic Submucosal Dissection for Giant Colorectal Lateral Spreading Tumors Larger than 10 cm: Is It Feasible?**

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**Background/Aims:** Colorectal ESD has recently been used for the resection of large colorectal neoplasms that could not be completely resected by conventional EMR. The colorectal ESD is not accepted as a standard procedure due to several limitations, such as relatively high perforation rate and very high technical difficulty. However, ESD was applied to the lesions such as the giant colorectal LST larger than 10 cm by some expert ESD-endoscopist. Thus, we investigated feasibility and safety of ESD of giant colorectal LST over 10 cm.

**Methods:** A total of 133 patients received colorectal ESD between 2009 and 2013 by a single expert ESD-endoscopist. Among them, 7 patients had giant colorectal LSTs larger than 10cm. We compared clinicopathologic factors of ESD between giant colorectal LSTs and others.

**Results:** The locations of the 7 giant LST lesions as follows: cecum (n=1), sigmoid colon (n=2), and rectum (n=4). The average diameter of giant LST lesions was 124.3 mm, and the procedure time was 294.3 min. 2 lesions were whole nodular types and 5 lesions were focal nodular lesions. Histologic diagnosis determined that 1 lesion was low grade dysplasia, 2 lesions were high grade dysplasia, and 4 lesions were carcinoma. Profound bleeding occurred in 1 patient with whole nodular type LST, who changed to piecemeal resection and was needed transfusion during ESD. Perforations developed in 2 patients after ESD, which were managed by endoscopic treatment. The duration of hospitalization in giant LST was 5.6 day. During a mean follow-up period of 18.5 mo, no local recurrence and distant metastasis occurred. The complication rate was higher in giant LST than others (42.9% vs 8.7%). The en-bloc resection and curative resection rate of ESD for the giant colorectal LST was 85.7% and 100%.

**Conclusions:** The ESD of giant colorectal LSTs appears to be a feasible and curative treatment, even if, it endure the higher complication rate, higher technical difficulty and longer procedure time.

**Key Words:** ESD, Lateral spreading tumor, Colorectal, Giant
**LGI-31**

**Effectiveness of Surgicel® (Fibrillar) in Patients with Colorectal Endoscopic Submucosal Dissection**

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**Background and Aims:** Because the invasive procedure of colorectal endoscopic submucosal dissection (ESD) entails a extensive mucosal defect and submucosal exposure to the colonic bacterial flora, the procedure may have a substantial risk for increasing inflammatory reactions and bacteremia. The aim of our study is to examine that surgicel reduces the risk of inflammatory reactions in colorectal ESD patients.

**Patients and Methods:** Between 2011 and 2013, 66 consecutive patients who underwent a colorectal ESD by one skilled endoscopists were enrolled. After the colorectal epithelial neoplasm removed, surgicel was sprayed onto the submucosal surface using the wet type of application in some cases. We evaluated tumor type, location, size, histology, procedure time, hospital stay and associated complication for both the non-surgicel groups (Group I) and surgicel groups (Group II). For assessing inflammatory reaction, white blood cells and body temperature were monitored.

**Results:** Of the 66 patients, two patients with microperforation were excluded. Of the total 64 patients, 30 cases (46.8%) underwent the surgicel application. During follow-up period, rebleeding occurred in 2 (5.7%) in Group I and 0 (0%) in Group II) patients. The fever (>37.3) was 9 (26.5%) and 1 (3.3%) patients, respectively (p=0.015) and the leucocytosis (>10,000) was 10 (29.4%) and 4 (13.3%) patients, respectively (p=0.120). The inflammatory reaction (fever or leucocytosis) was 13 (38.2%) and 5 (16.7%), respectively (p=0.055). The hospital stay was 6.06 and 4.96 days, respectively (p=0.001). The Group (surgicel Vs non-surgicel, p=0.012, odds ratio (OR)=17.5(1.8-161.7) and Lesion size (p=0.065, OR=4.4(0.9-22.0) were identified as independent predictor for fever by multivariated analysis.

**Conclusions:** Surgicel application after Colorectal ESD is effective method to reduce the inflammatory reaction and hospital stay. Therefore surgicel application is considered to be a valuable clinical methods.

**Key Words:** Colorectal endoscopic submucosal dissection, Surgicel, Fever

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**LGI-32**

**The Effectiveness of Adjuvant Radiotherapy Followed by Local Excision of Rectal Cancer with Deep Submucosal Invasion**

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**Objective:** To evaluate the efficacy of adjuvant radiotherapy (RT) after local excision for early rectal cancer with deep submucosal invasion.

**Methods:** From 1992 to 2012, a total of 232 patients underwent transanal excision or endoscopic removal of deep submucosal invasive rectal cancer. Among these, 71 patients have not undergone radical surgery because of patients’ preference or poor medical conditions. Thirty nine (54.9%) patients underwent local excision alone (no RT group), and 32 (45.1%) patients underwent adjuvant RT after local excision (RT group). Nine patients in RT group underwent adjuvant chemotherapy with 5-fluorouracil concurrently. All medical records were reviewed and the histologic data was reviewed by two independent pathologists.

**Results:** Mean age of RT group and no RT group was 56.2±12 years and 58.2±11 years respectively. Mean follow-up duration was 67.4±33.2 months in RT group and 50.0±38.8 months in no RT group. Five patients (7.0%) had eventual recurrence (2 in RT group and 3 in no RT group). Four of them recurred within 2 years after initial treatment. The other one patient in no RT group experienced multiple lymph node metastasis at 116th month of follow-up. Kaplan-Meier estimates of recurrence free survival at 5 years after treatment were 93% in adjuvant radiotherapy group and 94% in local excision alone group, respectively (p=0.678).

**Conclusion:** Adjuvant radiotherapy after local excision of early rectal cancer with deep submucosal invasion might not have additional improvement of recurrence-free survival compared with local excision alone.

**Key Words:** Rectal cancer, Local excision, Deep submucosal invasion, Radiotherapy
LGI-33

Effect of Visceral Obesity on Lymph Node Metastasis in Colon Cancer

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Background & Aim: An association between obesity and unfavorable outcomes for various types of malignancy has been established. However, the relationship between fat distribution and lymph node metastasis has not been well studied. The aim of this study is to determine the impact of visceral obesity on lymph node metastasis and overall survival in colon cancer.

Patients & Methods: This study reviewed medical records for consecutive patients who underwent radical resection for colon cancer between 2003 and 2008. Metastatic lymph node ratio (MLR) was defined as the number of involved nodes by tumor divided by the total number of resected lymph nodes. Visceral obesity was determined by measuring abdominal fat volume distribution via CT scan and then calculating the percentage of visceral fat (VF%) to total fat area.

Results: 278 patients were divided into two groups: VF≤ 29, n = 81 and VF > 29, n = 197. The baseline characteristics showed some differences between two groups with respect to body mass index, total cholesterol and the proportion of MLR. In the multivariate analysis, MLR significantly decreased with the higher VF% (OR = 0.406, 95% CI = 0.206-0.801, p=0.009). In addition, MLR was significantly associated with HbA1c, tumor location, differentiation, lymphovascular invasion and perineural invasion. Contrary to the MLR, there were significant differences in overall survival between patients with VF≤ 29 and those with VF > 29 (p<0.009).

Conclusions: A higher ratio of visceral fat was associated with a decreased ratio of metastatic lymph nodes and decreased overall survival.

Key Words: Visceral obesity, Colon cancer

LGI-34

Comparative Study of a New Responsive Insertion Technology Colonoscope versus a Standard Variable Stiffness Colonoscope

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Background & aims: New colonoscope (Olympus, CF-HQ290I) with responsive insertion technology (RIT) includes passive bending, high force transmission and variable stiffness. We evaluated whether the use of CF-HQ290I could be inserted easily, increasing the cecal intubation rate, and shortening the cecal intubation time.

Methods: The study was a prospective observational study. Between July and September 2013, 204 patients who were performed colonoscopy under sedation by endoscopist including expert and trainee were enrolled. We compared colonoscopies performed with CF-HQ290I with those performed with conventional colonoscope (CF-H260AL). Primary outcomes were cecal intubation time, terminal ileal intubation time and cecal intubation rate.

Results: Colonoscopy using CF-HQ290I was performed in 64 patients and using CF-H260AL in 140 patients. Cecal intubation rate was 100% and cecal intubation time was not significant differences in both groups (p=0.47). The type of endoscope did not influence to cecal intubation time but experiences and skillfulness of endoscopists significantly influenced. There were no significant differences comparing the subjective sensation of difficulty of endoscopist about the passage of the sigmoid colon, splenic flexure, hepatic flexure and cecum, but there was a tendency to have differences of the subjective sensation of difficulty in the passage of the ileum but without significance (p=0.053). No significant differences were noted in the other characteristics assessed. The dosage of propofol given during the colonoscopy was significantly lower in the CF-HQ290I than CF-H260AL (p=0.006).

Conclusion: We concluded that CF-HQ290I cannot shortening cecal intubation time compared with CF-H260AL. The influencing factor of cecal intubation time was not a type of endoscope used but experiences and skillfulness of endoscopists.

Key Words: Responsible insertion technology, New colonoscope, CF-HQ290I
The Efficacy of Endoscopic Mucosal Resection Using Dual Channel Scope in the Treatment of Rectal Neuroendocrine Tumor

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Background and Aims: Recent studies show that conventional EMR has a lower histological complete resection rate for rectal neuroendocrine tumor (NET). ESD for rectal NET could be considered a valuable endoscopic treatment because it provides a higher en bloc resection rate than conventional EMR. However, the technical difficulty requires a long learning period. EMR using a dual-channel endoscope (EMR-D) might be another safe and effective method for resection of rectal NET. EMR-D enables deeper resection compared to conventional EMR by grasping and lifting the lesion with forcep. However, little is known about the efficacy of EMR-D in the treatment of rectal NET. The aims of this study were to evaluate the efficacy and safety of EMR-D compared to ESD.

Patients and Methods: From August 2011 to August 2013, we prospectively enrolled consecutive patients with rectal NET less than 10 mm in diameter and with no regional lymph node enlargement. A total of 73 patients were enrolled in this study. All patients were randomized and assigned to ESD group or EMR-D group.

Results: The EMR-D group contained 37 patients and the ESD group contained 36 patients. There was no statistically significant difference between two groups in age, gender, location of tumor and diameter of tumor. All patients in both groups showed endoscopic complete resection. The histological complete resection rate was 97.3% (36 of 37) in the EMR-D group and 100% (36 of 36) in the ESD group (p=1.00). Complications were occurred in 2 ESD patients (5.5%; 1 patient of fever and 1 patient of bleeding after procedure). No complications were observed in EMR-D group (p=0.24). The procedure time was significantly shorter for the EMR-D group than for the ESD group (5.4 ± 2.2 vs. 20.7 ± 10.8 min, p=0.001).

Conclusion: Compared with ESD, EMR-D showed similar complete resection rate and shorter procedure times. EMR-D can be another effective, safe and simple resection method for small rectal NET.

Key Words: EMR, ESD, Neuroendocrine tumor, Rectum
LGI-37
Genetic Polymorphisms in Autophagy Associated Genes in Korean Children with Early-Onset Crohn Disease

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Aims: We investigated genetic polymorphisms in autophagy associated genes (ATG16L1, IRGM, ULK1, NOD2) in Korean children with early-onset Crohn disease (CD).

Methods: Genomic DNA from 137 individuals including 65 CD (all younger than 15 years at onset) and 72 healthy, unrelated controls was analyzed for 12 single nucleotide polymorphisms (SNPs); ATG16L1 SNP rs2241880, IRGM SNP (rs13361189, rs4958847, rs1000113, rs10065172, rs72553867), ULK1 SNP (rs12303764, rs10902469, rs7488085), NOD2 SNP (Arg702Trp, Gly908Arg, leu1007fsinsC). NOD2 SNP leu1007fsinsC was analyzed by direct sequencing method and others was analyzed by Taqman assay. The mean age at onset of patients was 8.6±4.72 years. The number of patient younger than 1 was 12 (18.5%) and age distribution showed a bimodal distribution(<1 years vs > 8 years).

Results: Among 12 SNPs, 2 SNPs were associated with CD susceptibility. IRGM SNP rs1000113 was significantly associated with CD susceptibility in terms of allelic frequency (OR 1.71 95% CI: 1.05-2.79, p=0.03) and genotype frequency (dominant model; OR 2.17 95% CI 1.07-4.39, p=0.03). IRGM SNP rs72553867 was also significantly associated with CD susceptibility in terms of allelic frequency (OR=0.50 95% CI: 0.27-0.91, p=0.02) and genotype frequency (dominant model; OR=0.50; 95% CI, 0.23-0.94, p=0.03). None of the ATG16L1 SNP, ULK1 SNPs showed any positive association with CD. None had NOD2 3 SNPs (Arg702Trp, Gly908Arg, leu1007fsinsC). Genotype-phenotype analysis revealed no significant associations with a specific CD phenotype, especially age at onset.

Conclusions: Our results confirm IRGM SNP rs1000113 as risk loci and IRGM SNP rs 72553867 as protective loci for early-onset Crohn disease. This study suggested that autophagy pathway appears to play a central role in the pathogenesis of early-onset Crohn disease in Korean children.

Key Words: Early-onset Crohn disease, ATG16L1, IRGM, ULK1, NOD2

LGI-38
Infantile-Onset IBD Is a Different Disease Entity from Adult-Onset IBD: One Form of Interleukin-10 Receptor Mutations

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Background: Inflammatory bowel disease (IBD) with an onset of infancy accounts for less than 1% of pediatric IBD patients. Recently, genetic defects of interleukin-10 receptor (IL-10R) have provided new insights into IBD. The aim of the study is to investigate whether mutations of IL-10 signaling pathway genes have an important role in the pathogenesis of IBD in children.

Methods: Forty children clinically and endoscopically diagnosed with IBD before the age of 10 years were enrolled. We sequenced the genes of IL-10RA, IL-10RB, and IL-10, and analyzed the clinical characteristics of very early-onset IBD.

Results: Fourteen of 40 children developed their symptoms within one year of age. We found mutations of IL-10RA in 7 of 40 children (17.5%). All 7 children developed their symptoms within one year of age. Particularly, half of children with infantile-onset IBD had IL-10RA mutations. None of remaining 26 children diagnosed above one year of age had mutations in IL-10RA. No mutations were found in IL-10RB and IL-10. Identified IL-10RA mutations were p.[R101W], p.[Y91C], p.[R262C], p.[R117H], and p.[W69R]. All children have compound heterozygous mutations but one child has only one mutation. The IL-10RA mutations were associated with onset of infancy (p=0.000), perianal fistulae (p=0.000), poor response to medical management (p=0.017), and early surgical interventions (p=0.000).

Conclusion: Very early-onset IBD in infancy is phenotypically and genetically different from adult-onset IBD. It has strong association with IL-10 receptor gene. We should consider the genotyping of genes of IL-10 signaling pathway in patients with very early-onset IBD in infancy, especially in whom with onset of perianal fistulae and severe colitis.

Key Words: Interleukin-10 receptor, Gene, Mutation, Pediatric, Inflammatory bowel disease
**LGI-39**

**The Long-Term Outcomes of Endoscopic Balloon Dilation for Benign Stricture in Patients with Inflammatory Bowel Disease**

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**Background and Aim:** Benign stricture is one of the common complications in patients with inflammatory bowel disease (IBD). Endoscopic treatment in IBD patients has been tried to relieve obstructive symptoms such as abdominal pain, nausea, and vomiting. This study is aimed to assess the long-term prognosis of endoscopic balloon dilation (EBD) for benign stricture of IBD.

**Methods:** A retrospective review of patients with IBD strictures who underwent EBD between January 2004 and April 2013 was performed in a tertiary referral medical center. The patients were regularly followed up to check their status of IBD.

**Results:** Twenty benign strictures were identified in 14 patients (6 men and 8 women). Twelve patients (85.7%) were Crohn’s disease and two (14.3%) were Ulcerative colitis. Nine patients (64.3%) had clinical obstructive symptoms such as abdominal pain and difficulty of stool passing. A total of 30 balloon dilation was performed for 20 strictured lesions (stomach 1 vs. jejunum 1 vs. ileum 1 vs. colorectum 17 lesions). The lesions included two (14.3%) anastomotic and 12 (85.7%) de novo strictures. The technical success (defined as scope passing after balloon dilation) was found in 12 patients (85.7%) and clinical success (defined as improvement of obstructive symptoms) was found in all patients. Median duration of follow-up was 110 months (10.1 - 206.8). Among 14 patients, seven patients (50%) were recurred and they underwent re-balloon dilation. The median time to relapse was 43 months (35 - 266). During re-balloon dilation, perforation was occurred in one case and clipping was performed successfully.

**Conclusion:** EBD was thought to be effective and safe for benign strictures of IBD. EBD may provide long-term effective palliation of symptoms association with strictures. Further studies are needed to indentify long-term prognosis with a large number of patients through designing prospective multi-center study.

**Key Words:** Endoscopic balloon dilation, Inflammatory bowel disease, Benign stricture

**LGI-40**

**Fecal Calprotectin Reflects Mucosal Healing in Ulcerative Colitis**

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**Background:** Mucosal healing (MH) is reported to be associated with sustained remission and reduced risk of surgery in inflammatory bowel disease (IBD). Fecal calprotectin (FC) is known to correlate with disease activity and can be used as a predictor for relapse or treatment response in IBD. We aimed to assess the usefulness of FC as a marker of MH in patients with ulcerative colitis (UC).

**Methods:** Endoscopic examination and stool collection were performed in twenty five UC patients. FC levels were analyzed by ELISA. Endoscopic activity was assessed according to the Mayo endoscopic score and MH was defined as endoscopic score of 0.

**Results:** Six patients showed MH and the remainder showed endoscopic activity, of which Mayo endoscopic score 1 was observed in 6, score 2 in 8, and score 3 in 5 patients, respectively. FC level was significantly lower in patients with MH compared to those without MH (81.0±59.5 vs. 1039.7±1598.1 μg/g, p=0.021).

**Table 1. Comparison between MH Group and Non-MH Group**

<table>
<thead>
<tr>
<th>Mucosal healing (+)</th>
<th>Mucosal healing (-)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N=6</td>
<td>N=6</td>
<td>N=8</td>
</tr>
<tr>
<td>Mayo endoscopic sub-score</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Mean FC level (μg/g)</td>
<td>810 ± 59.5</td>
<td>414.5 ± 428.6</td>
</tr>
<tr>
<td></td>
<td>810 ± 59.5</td>
<td>1039.7 ± 1598.1</td>
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</tbody>
</table>

**Conclusions:** FC is a good surrogate marker for MH in UC. Thus, FC has the potential to replace colonoscopy for assessment of mucosal inflammation in clinical practice.

**Key Words:** Calprotectin, Mucosal healing, Ulcerative colitis
Clinical Significance of Diminutive Colorectal Polyps in Korean Population

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Background/Aims: The prevalence of advanced histology in diminutive polyps (≤ 5 mm) is becoming a crucial issue in optimizing colorectal cancer screening strategies, especially in the advent of computed tomography colonography (CTC) technique and the “predict, resect, and discard” strategy as a cost-saving approach. The primary aim of this study was to determine the rates of advanced histology in diminutive colorectal polyps detected in elective colonoscopies among Korean population.

Methods: All colonoscopies were performed at the single tertiary hospital, between April 2011 and January 2013. Subjects included all adults (≥ 20) had 1 or more polyps detected and confirmed histologically. Advanced histology was defined as the presence of villous component, high-grade dysplasia or cancer.

Results: Of the 4545 subjects, a total of 9456 polyps were detected and analyzed. There were 5240 (54.9%) diminutive (≤ 5 mm) polyps, 3330 (34.9%) small (6-9 mm) polyps, and 976 (10.2%) large (≥ 10 mm) polyps. An 84.5% (8068/9456) of all eligible polyps were tubular adenoma; 12.8% were non-neoplastic. Among all polyps, 2.0% (188/9456) had advanced histological features, including 80 (0.9%) cancers. Both diminutive and small polyps had a lower frequency of any advanced histological features, compared with large polyps [0.11% (6/5240) and 0.78% (26/3330), respectively vs. 15.97% (156/976); p<0.001 for both comparisons]. Diminutive polyps had a lower frequency of advanced histology compared with small polyps (0.11% vs. 0.78%; p<0.001). These results were similar for average risk (aged 50 years of older) patients who underwent screening colonoscopy as well.

Conclusions: The prevalence of advanced histological features in colon polyps ≤ 5 mm and 6-9 mm was exceedingly low in Korean population (0.11% and 0.78%, respectively). This finding helps guide the management of sub-centimeter colon polyps found by CTC and support the application of the “resect and discard” policy.

Key Words: Colonoscopy, Colonic polyps, Polypl size, Prevalence

Risk of Metachronous Advanced Colorectal Neoplasia after Polypectomy of Small and Diminutive Adenomas

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Backgrounds: As screening colonoscopy is increasing for colorectal cancer prevention, colorectal polyps <10 mm in diameter are encountered more frequently. Generally, surveillance colonoscopy is recommended considering index colonoscopic findings. However, it is not well established what factors are related with developing advanced neoplasia after polypectomy of small and diminutive polyps.

Methods: We enrolled 3,526 patients (mean age 53.9 year, 2,164 male), who underwent surveillance colonoscopy after index colonoscopy from January 2002 to June 2012. We reviewed the medical records and pathology reports to evaluate the risk for the development of advanced colorectal neoplasm in surveillance colonoscopy. According to the largest size and number of adenoma in index colonoscopy, the patients were divided into the subgroups and analyzed.

Results: Among 3,526 patients, 1,949 (55.3%) had colorectal adenoma and 528 (15.0%) of them had advanced adenoma in index colonoscopy. During a median follow-up period of 46.5 months, colorectal adenoma was diagnosed in 1,401 (39.7%), 115 (3.3%) of whom had advanced neoplasm. In the patients with polypectomy in index colonoscopy, metachronous advanced neoplasia was higher among patients with 4 or more baseline adenomas, those with an adenoma 6 mm in diameter or greater. In subgroup analysis, the risk of metachronous advanced adenoma was increased with the adenoma number and size. However, the risk in the group with multiple (>3) diminutive adenomas was not higher than the group with 1 or 2 small adenomas. In multivariate analysis, age (OR 1.06, 95%CI 1.03-1.08) was significantly associated with an increasing metachronous advanced neoplasm, as were the number and size of baseline adenomas (p<0.01).

Conclusions: As risk of metachronous advanced neoplasia is associated with the number and size of prior adenomas, it will be needed to modify the surveillance interval considering the size and number of previous adenomas.

Key Words: Surveillance, Colonoscopy, Adenoma
The Usefulness of a Newly Developed IT Knife for Rectal Endoscopic Submucosal Dissection in an Experimental Setting

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Background/Aims: The newly developed IT knife (IT-knife nano, Olympus) was designed for colorectal ESD. It has a smaller insulation tip and small disk blade perpendicular to the main blade for improving the movability and safety in small and thin lumen. The aim of this study was to evaluate the efficacy of newly developed IT knife for the rectal ESD in comparison with conventional ESD.

Methods: This study was designed as a prospective, controlled, and ex vivo study. A total of 30 standardized artificial lesions measuring 3 x 3 cm was created approximately 10 cm from anal verge in fresh ex vivo porcine colorectal specimens. An endoscopist completed each 15 cases of ESD with conventional ESD knives and 15 cases with newly developed IT knife. Independent observer recorded procedure time, en-bloc and perforation rate.

Results: The mean size of resected specimen was 4.1 x 3.7 cm. The mean submucosal dissection time (6.5 ± 3.1 vs 11.2 ± 4.0 minutes; p=0.04) and total procedure time (14.3 ± 4.9 vs 20.4 ± 6.5 minutes; p=0.019) were significantly shorter in the new knife group in comparison with the conventional knife group. There was one perforation in conventional knife group.

Table 1. The Overall Results of Rectal ESD between the Conventional Knife Group and the New Knife Group

<table>
<thead>
<tr>
<th></th>
<th>Conventional knife group (N=15)</th>
<th>New knife group (N=15)</th>
<th>Statistical significant (P=value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal cutting time (minutes ± SD)</td>
<td>3.8 ± 1.6</td>
<td>3.7 ± 1.5</td>
<td>P=0.78</td>
</tr>
<tr>
<td>Dissection time (minutes ± SD)</td>
<td>11.2 ± 4.0</td>
<td>6.5 ± 3.1</td>
<td>P=0.04</td>
</tr>
<tr>
<td>Total procedure time (minutes ± SD)</td>
<td>20.4 ± 6.5</td>
<td>14.3 ± 4.9</td>
<td>P=0.019</td>
</tr>
<tr>
<td>En-bloc (%)</td>
<td>100 %</td>
<td>100 %</td>
<td>P=0.32</td>
</tr>
<tr>
<td>Perforation (%)</td>
<td>6.6 % (1/15)</td>
<td>0 %</td>
<td>P=0.32</td>
</tr>
<tr>
<td>Injection frequency</td>
<td>2.7 ± 0.6</td>
<td>2.2 ± 0.3</td>
<td>P=0.013</td>
</tr>
<tr>
<td>Injection volume (cc)</td>
<td>31.0 ± 8.5</td>
<td>27.8 ± 8.4</td>
<td>P=0.360</td>
</tr>
</tbody>
</table>

Conclusion: Newly developed IT knife seems to be safe and reduce the time for rectal ESD in ex vivo setting.

Key Words: ESD, Rectal, Ex vivo, Perforation

Optimal Management of Colon Perforation Associated with Colonoscopic Procedure: A Review of 48,088 Patients

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Aim & Methods: This study aimed to suggest the guideline for choosing optimal management of perforation that occurred during colonoscopy. We conducted a retrospective review of medical records of patients who had been treated for colonoscopic perforation from January 2004 to April 2013 at CHA Bundang Medical Center in Korea.

Results: A total of 48,088 patients underwent either a diagnostic or therapeutic colonoscopy. A total of 41 patients including 12 referred patients from outside institution were treated due to colon perforation associated with colonoscopic procedure. The overall perforation rate was 0.05%. The perforation rate by diagnostic colonoscopy was 0.01%, while that by therapeutic colonoscopy was 0.29%. Most common perforation sites were sigmoid colon (40%) and rectum (17%). Twenty one patients underwent surgery for management of colon perforation. Laparotomy was performed in 13 patients and laparoscopic surgery was performed in 8 patients. Twenty patients underwent conservative management including endoscopic repair in 9 patients. Colon perforation was detected only in 56% (23 out of 41) of cases during colonoscopic procedure. Selection of surgical method is dependent to the surgeons’ experience of the laparoscopic approach. Among the patients who underwent surgery, laparoscopic surgery group was superior to laparotomy group in hospital stay (8.6 vs. 14.7 mean days, p<0.001) with non inferior adverse outcomes. Medical and compensation costs were 1.45 and 3.20 times more in laparotomy group compared with laparoscopic surgery group.

Conclusions: Conservative management including endoscopic repair for iatrogenic colon perforation was available in 43.9% and is expected to increase with updated instruments. Laparoscopic surgery seems superior to laparotomy in hospital stay, medical cost and claim with non-inferior outcomes. Hence, in surgical setting, laparoscopic surgery should be considered as initial management of colonoscopy perforation if available.

Key Words: Colonoscopy, Colonoscopic perforation, Conservative treatment, Laparoscopic surgery
**LGI-45**

**A Randomized Multicenter Trial of Efficacy, Safety and Satisfaction of 2 L Polyethylene Glycol with Asobic Acid**

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**Background:** Recently, 2 L PEG with asobic acid (2 L PEG + Asc, Coolprep®, Taejun co.) is available in Korea. Some studies showed that 2 L PEG + Asc had same efficacy for bowel preparation with higher tolerance, whereas there were few studies concern about electrolyte imbalances. We evaluated the efficacy, tolerance, safety of 2 L PEG + Asc for bowel preparation in multicenter.

**Method:** From August 2012 to February 2013, a total of 240 patients were enrolled at 4 tertiary hospital. All patients were randomly allocated to 2 L PEG with asobic acid group (2 L PEG + Asc group) or 4 L PEG group (PEG group). Bowel preparations were performed with split same volume schedule in both group. Colonoscopists assessed the bowel preparation by Boston Bowel Preparation Scale (BPPS). After colonoscopy procedure, patients filled up the questionnaire for bowel preparation-related symptoms, satisfaction, willingness. In addition, blood test including white blood cell count (WBC), red blood cell count (RBC), hemoglobin (Hb), hematocrit (Hct), and serum electrolytes such as sodium (Na⁺), potassium (K⁺), calcium (Ca++,), phosphate (P-).

**Results:** Among 240 patients, 15 patients were dropped out and 225 patients were finally analyzed. BPPS score were similar (PEG vs. 2 L PEG + Asc, 7.0 ± 2.2 vs. 6.9 ± 2.2, p=0.366) and adequate bowel preparation rate (BPPS ≥ 6) was no difference in both group (PEG vs. 2 L PEG + Asc, 76.3% vs. 73.2%, p=0.760). Bowel preparation symptoms were not different in both group. 2 L PEG + Asc taste more good than 4 L PEG (PEG vs. 2 L PEG + Asc, 16.7% vs. 41.1%, p<0.001). Willingness of bowel preparation was higher in 2 L PEG + Asc group (PEG vs. 2 L PEG + Asc, 59.3% vs. 73.2%, p=0.027). There were no significant change of blood test in both group.

**Conclusion:** In this multicenter randomized controll trials, bowel preparation with 2 L PEG + Asc could be better option than 4 L PEG regarding degree of bowel preparation, safety and patient satisfaction.

**Key Words:** Polyethylenglycol

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**LGI-46**

**Randomized Controlled Trial of Sodium Phosphate Tablets versus 4 L PEG Solution as Bowel Cleansing for Colonoscopy**

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**Background and Study Aims:** Polyethylene glycol (PEG) has become the most commonly used agent for colon cleansing. However, the need to ingest a large volume of fluid and an unpleasant taste reduce patient compliance. Therefore, this study was designed to compare the efficacy, patient compliance, and safety of sodium phosphate (NaP) tablets (Cricolon) to a standard 4-L PEG solution in adults undergoing colonoscopy.

**Methods:** This was a multicenter, randomized, prospective, investigator-blind study. A total of 119 healthy patients undergoing morning colonoscopy were randomized to either NaP tablets (n=71) or PEG solution (n=48). NaP group was asked to take 4T, 5 times in the evening a day before and 4T, 3 times in the early morning of the colonoscopy. PEG group was asked to ingest 2 L in the evening a day before and remaining 2 L in the early morning of the colonoscopy. The adequacy of bowel preparation was scored using the Boston Bowel Preparation Scale.

**Results:** The quality of bowel cleansing (adequate preparation 93.0% vs. 91.7%, p=1.000), patient compliance (NaP ≥ 24 tablets 100% vs. PEG ≥ 3L 100%, p=1.000) and overall adverse events (42.3% vs. 33.3%, p=0.799) were not different between NaP group and PEG group. However, patient acceptability was significantly higher in NaP group than in PEG group.

**Conclusion:** NaP tablets, compared with PEG solution, produce equivalent colon cleansing, are better tolerated by patients, and do not cause greater side effects. An oral tablet formulation may make the overall bowel preparation less burdensome and allow for more patient participation in screening programs.

**Key Words:** Sodium phosphate tablets, Polyethylene glycol, Colonoscopy, Bowel preparation
Randomized Controlled Trial of Sodium Phosphate Tablet vs. 2 L PEG as Bowel Cleansing for Colonoscopy

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Background and Study Aims: Polyethylene glycol (PEG) solution is often unsatisfied as bowel preparation agents for colonoscopy. A sodium phosphate tablet has been developed to provide equivalent efficacy with better patient tolerance. This study was carried out to compare the efficacy and compliance of two bowel preparation methods: the 2 L PEG solution with ascorbic acid (PEG group) versus a sodium phosphate tablet preparation (SPT group).

Patient and Methods: A multicenter, randomized controlled trial was performed. The primary efficacy variable was the overall quality of colon cleansing by Boston Bowel Preparation scale (BBPS) during colonoscopy. Patient’s satisfaction and adverse events were evaluated by means of a symptom questionnaire completed by each patient immediately before the colonoscopy.

Results: 148 patients were included and 7 patients were excluded due to an incomplete questionnaire. A total of 141 consecutive patients were randomly assigned to undergo pre-colonoscopic bowel preparation with either of SPT group (n=71) or PEG group (N=70). Overall BBPS score was 8.49±0.87 in the SPT group and 8.34±1.00 in the PEG group (p=0.346). Among the 141 patients, 71 had a polyp (51%) and 41 had an adenoma (29.1%). The polyp/adenoma detection rate was 57.7%/31% for SPT group, compared with 42.3%/27.1% for PEG group (p=0.093, 0.711, respectively). Adverse events (mainly nausea/vomiting and abdominal pain) were equivalent in the two groups (p=0.358). Overall satisfaction score was 8.11±1.60 in the SPT group and 7.51±1.50 in the PEG group (p=0.024). Two patients (2.8%) in the SPT group and 8 (11.4%) in the PEG group did not complete the preparation (p=0.046).

Conclusions: Degree of colon preparation, polyp/adenoma detection rate and adverse effect were similar for SPT group and PEG group. Patient compliance and satisfaction were greater with SPT group than with PEG group.

Key Words: Sodium phosphate tablet, Polyethylene glycol solution, Colonoscopy