

# ACP | Annals of Coloproctology

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Oral and Poster Presentation

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## Overview

*Annals of Coloproctology* (Ann Coloproctol, ACP) is an official journal of the Korean Society of Coloproctology (KSCP) and Asia Pacific Federation of Coloproctology (APFCP). It was launched in 1985 and was designated as an official journal of APFCP in 2019. The title of our journal was changed from *Journal of the Korean Society of Coloproctology* (abbreviated title-J Korean Soc Coloproctol) to *Annals of Coloproctology* (abbreviated title-Ann Coloproctol) in 2013. It is published bimonthly on the last day of February, April, June, August, October, and December each year. Supplements are published when applicable. All manuscripts are peer reviewed. The journal publishes original articles, case reports, editorials, brief communications, technical notes, letters to the editor, and video and invited review articles and guidelines in the field of coloproctology. Submitted manuscripts should not contain previously published material and should not be under consideration for publication elsewhere. This journal is supported by the Korea Research Foundation funded by the Korean government (MEST) and is published in part with financial support from the Korean Federation of Science and Technology Societies.

## Aims and Scope

The mission of ACP is to pursue academic advancement in coloproctology and to promote active communication between the members and international societies of coloproctology. The journal aims to contribute to in depth development, cure of diseases of coloproctology, and improvement of public health. The ACP is mainly interested in surgical issues of diseases originating from the lower digestive system such as colon, rectum, anus, and small bowel. These diseases include colorectal cancer, anal cancer, inflammatory bowel disease, benign colonic disease, anorectal disorders, functional diseases, and pelvic floor disorders. In addition, basic research, physiology, epidemiology, and pathophysiology related to these topics are also published.

## Readership

Contents of ACP are meaningful for clinicians participating in management of colorectal disease such as colorectal surgeon, surgical oncologist, medical oncologist, radiation oncologist, colorectal pathologist, radiologist, and gastroenterologist. The publication also appeals to researchers and clinicians interested in low gastrointestinal tract disease. Medical students, administrators, other health professionals, and policy makers can obtain information from ACP.

## Distribution

The journal is distributed to the members of the Korean Society of Coloproctology, members of Asia Pacific Federation of Coloproctology, medical schools, libraries, and related institutes to pursue academic advancement in coloproctology.

## Indexing

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# Sacrococcygeal Pilonidal Sinus Disease: Patient-Reported Outcomes, a 10-Year Follow-up

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**Purpose:** Sacrococcygeal pilonidal sinus disease (SPD) predominately affects young people and causes significant morbidity. The aim of this study was to compare patient-reported outcomes after SPD surgery and to better understand patient's perspective.

**Methods:** This study conducted a quantitative and qualitative mail/telephone questionnaire of self-reported patient outcomes from May 2020 to September 2020 on SPD patients who had surgery between 2010 and 2019.

**Results:** A total of 136 patients (106 males, 77.9%) responded and were included in the study. At follow-up after median 3 years (range, 2–10 years). Thirty-five patients (25.7%) had a recurrence, of which 25 (71.4%) needed operative treatment. Patients who had a Limberg flap (LF) had a faster return to work at 27 days (standard deviation [SD], 24.7), while secondary-intention techniques (SIT) had the slowest at 69 days (SD, 49.7) ( $P=0.007$ ). Patient who had modified Karydakias flap (MKF) were able to sit earlier without pain at 19.9 (SD, 19), while SIT patients took the longest at 47 days (SD, 49.5) ( $P=0.023$ ). Patient satisfaction was 6.3 (SD, 2.1) of 10. One-hundred and 23 (90.4%) would recommend their procedure to other patients. The MKF had the best mean body image score 18.6 (SD, 3.0) of 20, while other flap techniques had the worst at 14.7 (SD, 3.9) ( $P=0.001$ ). Correlation analysis revealed that a positive body image score correlated significantly with MKF, overall satisfaction, and likelihood of recommending the procedure to others. There was a positive correlation between being fully aware of the prognosis and confidence in managing their condition and associated complications postoperatively.

**Conclusion:** While the modified LF had the lowest recurrence rate, MKF had more favorable patient-reported outcomes on body image, cosmesis, confidence, and overall satisfaction. This study highlights the importance of balancing primary surgical interests and outcomes like recurrence with patients' values and goals. This is best achieved through the process of informed consent to enable full understanding and appreciation of what is important to patients.

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# Gene Expression Variation Between Simple and Complex Fistula in Ano: A Preliminary Analysis

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**Purpose:** Vast literatures describe the role of bacteria, epithelization, and inflammation as contributing factors for recurrences in complex fistula in ano (FIA). However, limited studies were performed on gene expression exploring the underlying pathophysiology of the disease. The aim of this study was to identify gene expression and signaling pathway differences in idiopathic complex and simple FIA.

**Methods:** Microarray profiling was conducted on 22 FIA patients (9 idiopathic complex and 13 simple) using Agilent SurePrint G3 Human Gene Expression v3 Microarray kit. Differentially expressed genes (fold change > 1.5,  $P < 0.05$ ) were determined using the Agilent Genespring Analysis Software ver. 14.9.1. Gene ontology (GO) and pathway analysis of differentially expressed genes were performed using single experiment analysis (SEA). Differentially expressed genes from microarray analysis were validated using quantitative polymerase chain reaction (qPCR).

**Results:** There were 132 differentially expressed genes between both groups. The top 10 of upregulated and downregulated genes were both analyzed and a review was done on the gene expression. AKT1S1, NFKBIZ, TMEM165, MUC4, and NEDD9 from the upregulated genes and PLP1 and AANAT from the downregulated genes were reported to have a connection with the tissue inflammation, fibrosis, and epithelization process. No significant GO at corrected P-value cutoff of 0.1. Thirty-four significant pathways ( $P < 0.05$ ) were found using SEA. Results from qPCR showed that only expression of NEDD9 was statistically significant ( $P < 0.05$ ) between both groups.

**Conclusion:** Messenger RNA profiling through microarray has provided a preliminary dataset on differentially expressed genes in idiopathic complex and simple cases of FIA. Validation through qPCR on selected genes specifically on tissue inflammation, fibrosis, and epithelization process provide some information about the regulation of these genes and their involvement in the pathophysiology of complex and simple FIA.

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# Laser Hemorrhoidoplasty: Short-term Results From a Single Center

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**Purpose:** Laser hemorrhoidoplasty (LHP) applies diode laser to treat symptomatic hemorrhoid piles. This is a novel technique with few studies available, especially in Taiwan. To analyze the short-term outcome of LHP from a single hospital.

**Methods:** This study retrospectively collected data between June 2020 and June 2021, comprising of patients with at least grade II hemorrhoid. Patients were treated with a 1,470-nm diode laser. The operative time, total laser energy, postoperative complications, consequential short-term outcomes were analyzed, respectively.

**Results:** Twenty-five patients undertook LHP in our hospital. Indication of surgery was symptomatic hemorrhoids refractory to diet modification, topical medical treatment, or even prior hemorrhoid management. Six had previous operation including rubber band ligation or open hemorrhoidectomy. Patient distribution was 10 females (40%) and 15 males (60%). Average age was 44.6 years old. Defined symptomatic hemorrhoid included rectal bleeding (88%), anal protrusion (52%), anal pain when defecation (4%), tenesmus sensation (4%), or anemia (4%). Grade II to IV hemorrhoid were documented. Among the 25, there were 14 grade II (56%), 10 grade III (40%), 1 grade IV (4%). Average operative time was 23.8 minutes and average total laser energy was 517.4 W. Additional mucopexy was performed simultaneously with LHP in selected patients according to severity of symptoms. Postoperative complications including pain (4%), swelling (24%), bleeding or bloody discharge (24%), and delayed wound healing (8%) were documented. Short-term outcomes indicated improvement of clinical symptoms without reported recurrence. Our results also suggested that with higher energy applied, approximately above 600 W, more postoperative complications and less satisfaction were associated.

**Conclusion:** Our study concludes that LHP is a safe and effective procedure for grade II or III symptomatic hemorrhoid patients portraying satisfactory short-term outcome. While intraoperative energy may induce more postoperative pain, bleeding, and delayed healing, long-term follow-up results or larger scale studies should be considered accordingly.

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# Postoperative Intravenous Ketorolac Significantly Reduces the Risk of Acute Urinary Retention Requiring Catheterization in Benign Anorectal Surgery

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**Purpose:** Urinary retention is a common complication after anorectal surgery, but it can be mainly prevented by fluid restriction and adequate pain control. Despite these strategies, nonsteroidal anti-inflammatory agents are more widely accepted because of the availability of parenteral ketorolac. The pain control effect of intravenous (IV) ketorolac has been widely described. However, its influence on postoperative catheterization has not been addressed.

**Methods:** A total of 116 patients who were subjected to benign anal surgery by a single surgeon were identified over a period of 1.5 years. Data on surgery type, anesthetic method, IV ketorolac, pain control agents, catheterization, time needed for surgery, elective surgery, and marsupialization were collected.

**Results:** We found a significant overall association between IV ketorolac group and catheterization with an odds ratio of 0.071 (95% confidence interval, 0.007–0.708;  $P=0.024$ ). However, operation times, anesthesia type, surgery type, elective or emergent surgery, and marsupialization had no significant associations.

**Conclusion:** Postoperative IV ketorolac may reduce the risk of acute urinary retention requiring catheterization in benign anorectal surgery. However, this treatment should be cautiously administered to the elderly, especially those with poor renal or liver functions and history of peptic ulcer disease. More data and a longer follow-up period are still needed to identify the possible complications, such as gastrointestinal bleeding or renal injury.

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# Are We Capturing All Our Complications?: A Review of Sacrococcygeal Pilonidal Sinus Disease Surgical Practice

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**Purpose:** Elective definitive surgical management practice, preferences, and outcomes for sacrococcygeal pilonidal sinus disease (SPD) are variable. This study aimed to compare self-reported patients with current medical records data on surgical practice preferences and outcomes for elective sacrococcygeal pilonidal sinus surgery in Western Australia. We hypothesized that surgeon self-reported practice underestimates complications rates.

**Methods:** A 26-item deidentified quantitative and qualitative online survey of self-reported surgeon practice was sent to 115 Royal Australasian College of Surgeons (WA) general/colorectal surgical fellows between September 2018 and March 2019. The survey data was then compared to the data from a comprehensive multicenter 5-year review of retrospective medical records. Data were analyzed using SPSS ver. 24.

**Results:** Surgeon survey response rate was 66%. Self-reported recurrence, wound infection, and wound breakdown rates were 10%, 10%, and 15%, respectively. This contrasted with the 380 medical records reviewed which captured higher rates at 24.2%, 25.3%, and 29.5%, respectively ( $P=0.001$ ). Thirty percent of patients presented to other health services other than their primary operator for their complication management. The survey showed that the preferred closure techniques were Karydakias flap (KF), modified KF (MKF), Limberg's flap (LF), and Bascom's flap (40%, 30%, 10%, and 10%, respectively). Operative medical records, however, showed the most common closure techniques to be KF (39%), MKF (30%), LF (12%), and open (11%). The respective recurrence rates for the aforementioned closure techniques were 27.9%, 19.5%, 13.3%, and 33.5% ( $P=0.051$ ).

**Conclusion:** In this study, self-reported practice underestimated the true recurrence, surgical site, and wound dehiscence rates. This can be partially attributed to the fact that a third of patients with complications did not re-present to their primary treating surgeon for management of their complications. Elective definitive surgical management practice, preferences, and outcomes for SPD remain variable and significant number of complications are missed at follow-up.

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# Outcomes and Quality of Life Assessment After Pure Laparoscopic Left Colectomy With Primary Anastomosis and Loop Ileostomy for the Treatment of Complicated Hinchey 3 Diverticulitis

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**Purpose:** This study was performed to evaluate the effectiveness of laparoscopic left colectomy with primary anastomosis and loop ileostomy in the treatment of complicated acute diverticulitis with diffuse purulent peritonitis aka Hinchey 3 diverticulitis.

**Methods:** A consecutive unselected series of 44 patients undergone emergency surgery for acute complicated Hinchey 3 diverticulitis from January 2012 to June 2018 were retrospectively evaluated. All patients were treated by pure laparoscopic left colectomy with primary colorectal anastomosis and temporary loop ileostomy. All the procedures were performed by the same surgeons (IS, ADL, FR). Perioperative care plan, operative steps, and surgical instrumentations were standardized. We collected patients-, surgery-, and hospital stay-related data, as well as short- and long-term outcomes. Complications were classified using the Clavien-Dindo classification system (CDCS). Perceived quality of life was assessed by GastroIntestinal Quality of Life Index (GIQLI), translated into Italian language, between 6 and 12 months after the ileostomy reversal; total score range is 0–144.

**Results:** There were 31 males (70.4%) and 13 females (29.6%) with a mean age of  $57.8 \pm 11.9$  years. The mean body mass index was  $28.3 \pm 3.1$  kg/m<sup>2</sup>. No conversion to open surgery was registered. The mean operative time and estimated blood loss were  $184.3 \pm 32.7$  minutes and  $81.2 \pm 72.7$  mL, respectively. All the specimens showed diverticulitis with associated peridiverticulitis. Length of hospital stay was  $7.8 \pm 2.8$  days and we have not recorded any readmissions in patients discharged within 60 days after surgery. The rates of postoperative complications were 6.8% and 2.3% for grades 3 and 5 according to the CDCS, respectively. We recorded 7 cases (16.2%) of peristomal hernia and 3 (6.9%) readmissions due to adhesive small bowel obstruction conservatively resolved. All patients underwent ileostomy closure within 12 months from the main procedure. Long-term GIQLI was  $123.9 \pm 13.1$ , with a response rate of 76.7% (33/43).

**Conclusion:** Laparoscopic left colectomy with primary anastomosis and loop ileostomy seems to be an effective choice for the treatment of acute Hinchey 3 diverticulitis, resulting in encouraging short- and long-term outcomes.

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# Increased Pyruvate, Lactate, and Potassium Levels in Peritoneal Fluid for Bowel Ischemia: A Pilot Prospective Observational Study

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**Purpose:** Acute mesenteric ischemia has up to 80% mortality and is diagnosed preoperatively based on a constellation of clinical, biochemical, and radiological findings. A diagnostic tool for bowel ischemia will facilitate in timely operative intervention and prevent unnecessary invasive exploratory laparotomies for selected patients. This study aims to examine peritoneal fluid biochemical markers for correlation with bowel ischemia to guide further management.

**Methods:** This is a prospective observational study where 48 patients were recruited from The Canberra Hospital undergoing emergency exploratory laparotomies for suspected bowel ischemia in January 2017–2020. Preoperative and intraoperative biochemical blood samples and 10 mL of peritoneal fluid were analyzed. Mean ( $\pm$  standard deviation) and 2-tailed t-test was performed for this study.

**Results:** Eighteen control patients without bowel ischemia and 30 patients with bowel ischemia were included in this study. Patients in the ischemic group were found to have preoperative leucocytosis ( $15.7 \times 10^9 \pm 8.7/L$ ) and neutrophilia ( $13.2 \times 10^9 \pm 8.5/L$ ) as compared to the control group. Acidosis (pH  $7.3 \pm 2.5$ ) and elevated glucose levels ( $8.8 \pm 3.9$  mmol/L) were evident in the blood gas for the ischemic group. Peritoneal fluid analysis detected raised lactate ( $5.8 \pm 6.0$  mmol/L,  $P=0.02$ ), potassium ( $4.9 \pm 1.9$  mmol/L,  $P=0.02$ ) and pyruvate ( $223 \pm 132.6$   $\mu$ mol/L,  $P < 0.001$ ) in the ischemic group as compared with the control group.

**Conclusion:** Patients with suspected bowel ischemia who have preoperation leucocytosis, neutrophilia, acidosis, and serum glucose above 8.8 mmol/L should be offered an exploratory laparotomy. Peritoneal fluid with higher lactate, potassium, and pyruvate levels were associated with bowel ischemia. Future study with larger cohort can further validate these results with correlation to the degree of bowel ischemia.

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# Risk Factors for the Development of *Clostridium difficile* Post Ileostomy Reversal

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**Purpose:** Loop ileostomies are often performed for proximal diversion of stool from a distal anastomosis, with subsequent reversal of the stoma after a period of around 6 months pending healing of the anastomoses. *Clostridium difficile* infection is a rare but highly morbid condition that can affect the clinical course of the patient post reversal of ileostomy. Several risk factors such as chemotherapy use, previous antibiotics or proton pump inhibitor have been suggested in contributing to the development of *C. difficile* in the disused section of colon. Thus far no study has been published discussing the role of preoperative *C. difficile* testing prior to the reversal of ileostomies. This study aims to provide further data on the risk factors in development of *C. difficile* colitis post ileostomy reversal. Results of this retrospective study can be used in development of a prospective study or guide in the development of role of preoperative *C. difficile* screening prior to reversal of ileostomies.

**Methods:** This retrospective cohort study is aimed at all patients who underwent ileostomy reversal over a 2.5-year period at a single center. Appropriate patients would be identified via operative records, and data points (including previously identified risk factors for development of *C. difficile*) extracted from patients' medical records. Results will be analyzed via logistic regression or ANOVA models, depending on study outcome.

**Results:** A total of 69 patients were identified in preliminary screening, 6 of whom has *C. difficile* post ileostomy reversal (8.6% of patients). Data collection is still in progress, likely completed by mid-late September 2021.

**Conclusion:** This retrospective study aims to provide further knowledge and data into risk factors for the development of *C. difficile* post ileostomy reversal, with further research aimed at a prospective study/development of a pre-reversal protocol for *C. difficile* screening prior to ileostomy reversal.

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# *En Bloc* Resection of Colorectal Endoscopic Submucosal Dissection Under Water Ejection and Circumferential Incision Even Without Submucosal Injection Is Feasible and Secure

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**Purpose:** Endoscopic submucosal dissection (ESD) is being increasingly practiced for the removal of large colorectal polyps and submucosal injection of lifting solution is often performed to facilitate ESD. However, complications of perforation during injection, foreign body granuloma and submucosal fibrosis, and etc. are reported and those submucosal injection solutions are without long-term and large investigations. In our study, we examined the potential of novel technique of water ejection plus circumferential incision in colorectal ESD without submucosal injection.

**Methods:** From August 2019 to July 2021, we had performed colorectal ESD without submucosal injection to colorectal polyps of 13 patients. Under water ejection and circumferential incision by traditional snare tip, the *en bloc* resection of colorectal lesion is appealing therapy for large colorectal polyps.

**Results:** *En bloc* resection of ESD without submucosal injection was achieved in 14 lesions of 13 patients. We removed 11 sessile type of colorectal polyps and 3 lateral spreading colorectal tumors. The median (interquartile range) of diameter is 45 mm (35–50 mm). The median (interquartile range) hospitalization days are 4 days (3–5 days). There were no significant peritoneal signs observed in all patients. They are discharged after completed recovery oral intake without complications.

**Conclusion:** This study demonstrated that the new technique of water ejection plus circumferential incision leads to feasible and security for *en bloc* resection of colorectal ESD without submucosal injection. This technique can play an important role in the future of ESD.

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# Ileostomy Closure Surgical Site Outcomes: A 5-Year Single-Center Experience

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**Purpose:** The closure of ileostomy is associated with significant operative morbidity, the most common being surgical site infection, ranging up to 41%. This study aimed to compare the incidence of stoma site infection (SSI) after closure with the conventional-linear closure (CLC) or purse-string-closure (PSC).

**Methods:** Retrospective cohort study of elective ileostomy closures at a teaching hospital in Western Australia from June 2015 to January 2021. Patient demographics, surgical techniques, and reported SSI were analyzed to determine relevant associations using SPSS ver. 27.

**Results:** A total of 106 patients underwent ileostomy closure, 91.5% (n=97) had CLC stoma site closure of which 67% (n=65) were stapled skin closures. The stoma SSI rate was 19.6% (n=19) for CLC and 11.1% (n=1) for PSC. The SSI rate was significantly reduced to 3.7% (P<0.001) in CLC cases that had betadine stoma site wash prior to closure. Male patients comprise 67.9% with a median age of 62 years. The median body mass index was 27 kg/m<sup>2</sup>. The median surgical time for loop ileostomy was 66 minutes. Median length of hospital stay was 4.5 days and time to stoma closure was 5.5 months. Multivariate logistic regression of ileostomy closures, controlled for statistically insignificant confounders and showed that washing the stoma site with betadine prior to a stapled closure was significantly and independently associated with reduced SSI risk (odds ratio [OR], 17.4; 95% confidence interval [CI], 1.4–213.5; P=0.026). Other significant factors which reduced SSI risk were, appropriate prophylactic antibiotic therapy (OR, 13.1; 95% CI, 2.2–75.0; P=0.004), surgical operative time <60 minutes (OR, 7.8; 95% CI, 1.3–45.1; P=0.021), and having the closure done >3 months post the formation surgery (OR, 5.1; 95% CI, 1.1–25.0; P=0.040).

**Conclusion:** The overall CLC closure SSI rate was consistent with reported literature. This study found that SSI risk was significantly reduced when betadine wash was used prior to staple wound closure.

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# Double-Edged Sword in Lower Gastrointestinal Bleeding: Small Bowel Bleeding or Lower Rectal Adenocarcinoma? On Table Decision Making: A Case Report

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Lower gastrointestinal (GI) bleeding is defined as the occurring of bleeding from colon, rectum, or anus. It usually leads to hospital admission with invasive diagnostic evaluations and consumes significant medical resources. We report a case of a woman with overt lower GI bleeding with challenging diagnosis. A 71-year-old Malay woman presented with syncopal attack, melena, and lower abdominal pain for 1 day. Clinical assessment noted patient hypotensive, tachycardic, per abdomen revealed mild tenderness with per rectal revealing melanic stool. Hemoglobin level on admission was 2.6 g/dL. Resuscitated crystalloids and blood transfusion, proceeded with urgent colonoscopy, noted lower rectal tumor oozing secured with adrenaline anal packing, biopsy taken revealed consistent with adenocarcinoma. Abdominopelvic computed tomography scan reported showed fungating mass seen at lower rectum. On day 4 of admission, we noted that the patient developed massive haematochezia. Colonoscopy reassessment done, we noted appendicular bleed and hence proceeded Lanz incision. We noted multiple spot of intraluminal blood clot in appendix and proximal ileum, proceeded with on table esophagogastroduodenoscopy, which showed blood clot at D3 and distal jejunum. Hence we decided for upper midline laparotomy, only found intraluminal blood clot. On table enteroscopy performed, enterotomy performed at 16 cm from duodenojejunal junction. Limited right hemicolectomy was performed in view of intraluminal blood clot in appendix and multiple ulcer at caecum during colonoscopy. Histopathological examination evaluation revealed jejunum, cecum, and ileum benign ulcers. In conclusion, accurate diagnosis of GI bleeding relies on prompt resuscitation, initial risk evaluation, provisional clinical diagnosis followed by appropriate definitive investigation and specific interventions.

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# Perforated Sigmoid Diverticulitis Complicated With Commensal Septic Thrombophlebitis From *Eggerthella lenta* and *Candida glabrata*: A Case Report and Review of Literature

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**Purpose:** Colonic diverticulitis is rarely associated with septic thrombophlebitis and its incidence remains unclear. *Eggerthella lenta* is an obligate anaerobic bacillus bacterium and *Candida glabrata* is a haploid saprophyte. They are part of the commensal gastrointestinal microbiome associated with higher mortality in cases of bacteremia. Both pathogens have never been described concurrently in septic thrombophlebitis secondary to colonic diverticulitis.

**Methods:** An otherwise healthy 83-year-old patient was admitted with sigmoid diverticulitis. She reported 1-week of abdominal pain associated with vomiting and diarrhea. Since 2017, she had recurrent uncomplicated sigmoid diverticulitis. Her colonoscopy in 2019 showed uncomplicated sigmoid diverticular disease.

**Results:** Computed tomography scan demonstrated extensive gas and thrombus within the superior rectal, inferior mesenteric vein (IMV), and portal vein. There was no consequential hepatobiliary insult at presentation. An emergent laparotomy was undertaken in view of septic shock. At laparotomy, IMV pyo-thrombophlebitis with purulent peritonitis as a consequence of sigmoid diverticulitis was noted. A Hartmann procedure along with distal ligation of the IMV was performed. *E. lenta* and *C. glabrata* complex was isolated from her peritoneal fluid. Postoperatively, she was managed on extended antimicrobial and anticoagulation therapy. At 1-year follow-up, her colostomy was reversed uneventfully.

**Conclusion:** Pyo-thrombophlebitis is a rare entity. This is the first case reporting septic thrombophlebitis (*E. lenta* and *C. glabrata* bacteremia) as a complication of colonic diverticulitis. Pyo-thrombophlebitis of gastrointestinal sources may have a potentially fatal outcome and therefore it is prudent to be critical when assessing patients and investigations undertaken.

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# Presentation, Management, and Outcome of Acute Gastric Dilatation: A Case Series and Literature Review

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**Purpose:** Acute gastric dilatation (AGD) is characterized by the impediment to gastric contents emptying. It is a surgical emergency that requires timely management to prevent gastric necrosis, acute respiratory distress, and septic shock. This requires an insight into its pathophysiology and physiological sequelae that has not been extensively discussed in current literature.

**Methods:** This is a case series of 11 patients with AGD at The Canberra Hospital and Calvary Hospital where the presenting clinical features, pathophysiology, radiological, and histopathology findings are reviewed.

**Results:** These cases illustrate a spectrum of mechanical and non-mechanical aetiologies for AGD. The symptomatology ranges from dysphagia, dyspnea, acute abdominal pain, and distension. Vomiting and succussion splash were not always observed in these patients. The overall mortality in this series was 20%.

**Conclusion:** AGD can present with either respiratory or abdominal symptoms. They should be managed with nasogastric tube (NGT) insertion with appropriate fluid resuscitation, prompt assessment with radiological X-rays or computed tomography, and commencement of enteral feeding for selected patients. Surgical referral should not be delayed, especially in the context of failed NGT insertion, due to the high risk of gastric necrosis. Some patients with AGD recover after conservative management. Surgical management ranges from major resectional-, staged- to laparoscopic approaches.

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# Bizzare Spectrum of Giant Solitary Juvenile Polyp From Obstructed Defaecation Syndrome to Incontinence

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**Purpose:** Juvenile polyps (JPs) are the most common polyps found among pediatrics which consists of JP syndrome or simple JPs (<5 polyps). We present a case of solitary giant JP in an 18-year-old male patient with initial presentation resembling solitary rectal ulcer syndrome (SRUS). Initially, he presented with rectal bleeding preceded by history of constipation and other symptoms suggestive of obstructed defaecation syndrome.

**Methods:** Colonoscopy examination revealed a polypoidal mass arising from anorectal junction with the biopsy suggestive features of SRUS. During subsequent follow-up after 12 months, his symptoms were unresolved and noticed a mass protruding out from the anus associated with fecal incontinence. He underwent a sigmoidoscopy showing a huge polypoidal mass arising from anorectal junction. Magnetic resonance imaging of the pelvis demonstrated a pedunculated mass occupying the rectum causing mass effect on the posterior urinary bladder wall.

**Results:** Transanal resection of the rectal mass was performed with uneventful perioperative recovery. The histopathological report showed giant solitary JP with high-grade dysplasia. After resection, his symptoms of incontinence resolved with improved quality of life. His fecal continence was restored with no soiling.

**Conclusion:** The progression of SRUS to JP is poorly understood, it may be a coincidence in our patient. He has fecal incontinence because the anal canal is unable to close completely at rest due to the long-standing mass effect, hence indicated for complete resection of the benign rectal tumor.

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# Extraperitoneal Rectal Perforation With Pneumoretroperitoneum During Colonoscopy: Case Report and Literature Review

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**Purpose:** Iatrogenic colonoscopy perforation (ICP) is a rare complication but carries risk of significant morbidity and mortality if not managed promptly. It can be divided into intraperitoneal, which is most frequently seen, the rarer extraperitoneal or combination of both. We present a rare case of extraperitoneal rectal perforation successfully managed nonoperatively.

**Case Presentation:** A 78-year-old female patient underwent her first colonoscopy for altered bowel habit. During colonoscopy, difficulty was encountered due to acute angulation at rectosigmoid junction. Upon further manipulation of colonoscope, noted full thickness perforation at rectum, which was instantly clipped endoscopically. Patient complained of lower abdominal pain post procedure. Abdomen mildly distended, tender over right iliac fossa without guarding, with sluggish bowel sounds. Abdominal X-ray revealed retroperitoneal free air, delineating the right kidney and psoas muscle. Whereas, erect chest X-ray did not show air under diaphragm. She was kept nil by mouth for 4 days with intravenous hydration and antibiotics. Her symptoms improved and she remained afebrile with no peritonism throughout admission. Biochemical markers also improved. Liquid to solid diet was gradually reintroduced based on daily clinical assessment. She was passing stools by day 4 post colonoscopy. She was discharged well after 7 days of admission.

**Discussion:** There are 3 mechanisms of ICP, direct mechanical trauma, barotrauma, and therapeutic procedure induced—thermal or electrical injury. Risk factors for ICP are elderly female, low body mass index, comorbidities, diverticulosis, bowel obstruction, etc. Rectum is reported as least common site among all ICP, but commonest extraperitoneal site. Extraperitoneal ICP may be complicated with pneumothorax, pneumomediastinum, and subcutaneous emphysema.

**Conclusion:** Management approach varies based on time of diagnosis, site, bowel preparation, patient's general condition, presence of peritonism or sepsis, surgeon's experience, and device availability. Hence, nonoperative treatment with or without endoscopic intervention of extraperitoneal ICP is recommended in selected patients.

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# Transverse Colon Volvulus: A Comprehensive Review of Demography, Presentation, Radiological Features, Diagnosis, Management and Outcome

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**Purpose:** Transverse colon volvulus (TCV) is a rare surgical entity. Contrary to its sigmoid counterpart, it is often difficult to diagnose TCV, and management is challenging and controversial. In addition, it is postulated that endoscopic detorsion often fails. We aim to determine the demography, presentation, radiological features, diagnosis, management, and outcome in patients with TCV.

**Methods:** A systematic search of published articles in English from PubMed was performed. Two independent reviewers identified relevant publications, extracted data, performed analysis, and evaluated the methodological quality based on a validated tool.

**Results:** Sixty-eight articles were included, reporting 86 cases from the year 1950 to 2021. Sex distribution is equal and has a bimodal age pattern, with peaks at the 3rd and 8th decade of life. Pre-morbid conditions commonly reported are mental retardation (n = 11) and a history of chronic constipation (n = 16). TCV almost always (94%) presents with cardinal symptoms of intestinal obstruction. As contrast enemas and computed tomography scans have a sensitivity of only 60.7% and 40%, respectively to diagnose TCV, the majority of the cases (66.3%) were diagnosed intraoperatively. Endoscopic detorsion has a high failure rate (87.5%) but is not reported to cause complications when attempted. The mean duration of hospital stay is 14.5 days, and the mean follow-up is 23 months. The recurrence rate is 18.2% and 60% in patients who underwent detorsion with and without colopexy, respectively, and 0% in patients who underwent colectomies. The index-admission mortality rate is similar in the 3 groups, ranging from 10% to 12%.

**Conclusion:** TCV is a rare surgical emergency that requires prompt recognition and treatment. Radiological diagnosis is challenging due to the low sensitivities of various imaging modalities. Mortality rates are similar for patients who underwent resection and those who underwent detorsion with or without colopexy but recurrence rates are higher in the latter group.

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# The Sorrowful Island: Mucocutaneous Separation

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**Purpose:** Stoma complications can have a negative impact on an ostomate's quality of life, especially those involving the peristomal skin, which is critical to maintain appliance integrity and prevent effluent leakage. Almost half of new ostomates suffer from peristomal skin complications, which could make psychological adjustment more challenging. Mucocutaneous separation is one of the commonest complications, affecting up to a quarter of new ostomates. Mucocutaneous separation occurs when the integrity of suture between the bowel and the skin is compromised, and it separates. Mucocutaneous separation develops within the first month of surgery because of the breakdown in the wound healing process. The resultant cavity between the stoma and peristomal skin causes pain and discomfort while limiting appliance adhesion and increasing the likelihood of leaks.

**Methods:** A 67-year-old female patient was referred from open surgical ward for mucocutaneous separation of her stoma. She was diagnosed with sigmoid colon carcinoma and underwent trephine transverse colostomy. The size of mucocutaneous separation was 8 × 9 cm and it was not possible to apply the stoma bag due to large open wound. Hydrocyn was used to clean the wound followed by application of alginate (Kaltostat) to the wound bed. Subsequently, stomahesive paste was applied and hydrocolloid (size, 10 × 10 cm) was used to cover the entire wound. Lastly, the stoma was covered with stoma bag.

**Results:** Stoma bag was successfully applied, and there were no more frequent leaks. Stoma bag can be used for at least 5 days without leaking. The mucocutaneous separation was 8 × 9 cm in the 1st week and reduced in size to 5 × 4 cm in the 4th week.

**Conclusion:** Proper management of stoma can reduce the risks of stoma and peristomal complications and ultimately improve patients' quality of life. Therefore, it is vital to provide stoma care education to all ostomates prior to discharge. The presence of specialized stoma care unit with ease of access is also a step forward to ensure quality care is provided to these group of patients as practiced in our unit.

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# Risk Factors for Nonclosure of Temporary Defunctioning Stoma in Mid-to-Low Rectal Cancer Patients Underwent Low Anterior Resection: A 12-Year Experience From a Tertiary Care Center

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**Purpose:** Stoma creation has been proved to reduce the rate and severity of anastomosis leakage, especially in mid-to-low rectal cancer patients who underwent restorative proctectomy. However, a portion of patients cannot take down the temporary stoma and use it as a permanent stoma. This study aims to identify risk factors for non-reversal of intended temporary stomas created during the curative-intent resection of mid-to-low rectal cancer with primary anastomosis.

**Methods:** The consecutive patients with rectal cancer who underwent curative sphincter-preserving surgery between 2000 and 2012 have been collected and analyzed. The patients with a stoma, even protective or secondary to anastomosis leakage, are both included.

**Results:** A total number of 784 patients with stoma creation have been included after exclusion. Ninety-one patients (11.6%) were failed to get stoma reversal. In comparison to patients with stoma reversal, patients without stoma reversal were elderly in age, higher Clavien-Dindo grade III–IV anastomosis leakage (23.1% vs. 8.4%,  $P < 0.001$ ), advanced T and N stage, poorly differentiated in histology (15.4% vs. 7.4%,  $P = 0.015$ ), circumferential involvement (41.8% vs. 28.6%,  $P = 0.03$ ), and a higher rate of delayed adjuvant chemotherapy than 8 weeks (17.6% vs. 5.7%,  $P = 0.011$ ). After adjusted with multivariate regression, stoma nonclosure were still related to anastomotic leakage (odds ratio [OR], 3.195;  $P = 0.028$ ), N2 stage (OR, 4.015;  $P = 0.043$ ), delayed adjuvant chemotherapy  $> 8$  weeks (OR, 5.434;  $P = 0.011$ ) and involved circumferential margin (OR, 3.151;  $P < 0.001$ ).

**Conclusion:** Cancer progression and anastomotic leakage are both the main factors for stoma nonreversal. Therefore, patients with those factors should be considered with a permanent stoma instead of a temporary one.

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# Mutation Spectra of Sporadic Microsatellite Unstable Colorectal Cancer According to the Status of CpG Island Methylator Phenotype

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**Purpose:** The 5-C-phosphate-G-3 island methylator phenotype (CIMP) is a specific phenotype of colorectal cancer (CRC) associated with microsatellite instability-high (MSI-high) tumors. In this study, we will clarify the clinicopathological and molecular features of CIMP tumors. In this study, we clarified the clinicopathological and molecular features of CIMP tumors.

**Methods:** We determined the CIMP status using 8 methylation markers in 92 MSI-high CRC patients after excluding 5 germline mismatch repair gene mutations analyzed by next-generation sequencing (NGS) and confirmed by Sanger sequencing. The mutation spectra of 22 common CRC-associated genes were analyzed by NGS.

**Results:** Of the 92 sporadic MSI-high tumors, 23 (25%) were considered CIMP-high (expressed more than 5 of 8 markers). CIMP-high tumors showed proximal colon preponderance and female predominance. The mutation profiles of CIMP-high tumors were significantly different from those of CIMP-low or CIMP-0 tumors (i.e., higher frequencies of BRAF, POLD1, MSH3, and SMAD4 mutations but lower frequencies of APC, TP53, and KRAS mutations). For MSI-high tumors, TNM staging but not CIMP status impacts the outcome of patients in multivariable analysis.

**Conclusion:** Sporadic MSI-high CRCs with different mechanisms of carcinogenesis have specific mutation profiles and clinicopathological features.

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# Short-term Outcome of Laparoscopic Versus Open Surgery in Colorectal Cancer Patients With Generalized Obesity

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**Purpose:** Because of the progression of minimally invasive surgery skills and obesity in colorectal surgery, we aimed to evaluate the short-term outcomes of laparoscopic and open colorectal cancer (CRC) resections in patients with generalized obesity at a single teaching hospital with mature surgical techniques and training programs.

**Methods:** We analyzed 547 patients diagnosed with CRC and a body mass index  $\geq 30$  kg/m<sup>2</sup> between January 2009 and December 2019 at a single institution. Of the enrolled patients, 266 underwent open surgery and 271 underwent laparoscopic surgery. Data were analyzed using the Student t-test, univariate analysis, and multivariate binary logistic regression analysis.

**Results:** The laparoscopic group had less blood loss ( $149 \pm 290$  mL vs.  $73 \pm 128$  mL,  $P < 0.001$ ) and a shorter postoperative hospital stay ( $12.5 \pm 14.1$  days vs.  $10.1 \pm 11.9$  days,  $P = 0.036$ ) than the open group. The number of harvested lymph nodes did not significantly differ between the 2 groups ( $30.9 \pm 18.3$  vs.  $30.1 \pm 15.3$ ,  $P = 0.588$ ). Although anastomotic leakage was significantly higher in the laparoscopic group (1.5% vs. 4.8%,  $P = 0.029$ ), there were also similar overall postoperative morbidity and mortality rates between the open and laparoscopic groups for CRC patients with generalized obesity who underwent surgery.

**Conclusion:** Laparoscopic surgery is a safe procedure for CRC patients with generalized obesity, because it does not increase morbidity and mortality rates compared with open surgery. Although the average operative time was longer in laparoscopic surgery, this technique can reduce the blood loss, decrease the length of hospital stay, obtain a similar number of harvested lymph nodes as open surgery, and achieve an acceptable conversion rate. Our study suggests that laparoscopic surgery could become a standard method for CRC treatment in patients with generalized obesity.

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# Short-term Outcomes of Da Vinci Surgical System Versus Senhance Surgical System in Colon Surgery: Results of a Propensity Score-Based Analysis

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**Purpose:** Senhance Surgical System is a new platform in visceral surgery. Currently, there is no study to compare the Da Vinci Surgical System and Senhance Surgical System outcomes in colon surgery. The current propensity score-based retrospective analysis is aimed to compare the short-term outcome of Senhance Surgical System and Da Vinci Surgical System in colon surgery.

**Methods:** This was a retrospective cohort study of patients who had surgery for colon cancer and benign colon lesions from 2015 to 2020. To minimize the differences between the 2 groups, we performed propensity score matching on baseline patient characteristics including body mass index, age, American Society of Anaesthesiology, sex, type of operation, and clinical staging with the match tolerance of 0.02. We used t-test and chi-square analysis with/without Fisher exact tests to assess the operative and postoperative outcomes.

**Results:** Among the 229 patients, 163 patients received colon surgery using Da Vinci Surgical System and 66 patients using Senhance Surgical System. After applying our propensity score matching strategy (1:1), 47 patients were matched into each group. Senhance Surgical System is associated with significant longer docking time (28.5 minutes vs. 6.6 minutes,  $P=0.001$ ) and operation time (275.4 minutes vs. 176.4 minutes,  $P=0.001$ ). But there is no significant difference for blood loss, conversion rate, number of harvested lymph nodes, or positive lateral resection margins. For the postoperative outcomes, there is no difference in length of postoperative hospital stay (7 days vs. 7 days,  $P=0.293$ ). Senhance Surgical System is associated with significant increased total complications (27.7% vs. 8.5%,  $P=0.016$ ) but there is no significant for severe complications, that is, Clavien-Dindo classification  $> III$  (2.1% vs. 4.3%,  $P=1.000$ ).

**Conclusion:** For colon surgery, Senhance Surgical System provides similar short-term outcomes compared with Da Vinci Surgical System, except for a longer operation time. Further studies are needed to clarify the long-term outcome for Senhance Surgical Systems in colon cancer surgery.

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# Robot-Assisted Right Hemicolectomy in Octogenarians: Is Aging and Technology a Good Fit?

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**Purpose:** With an increasing aging population, there is greater need for right-sided colonic resections than its left-sided counterparts. Older age is associated with limited physical and functional status which carries greater operative risk. Improvements in robotic surgery question its role especially in the elderly compared to laparoscopy. The primary aim is to identify if there is an increased risk of 30-day complications in the octogenarian population that undergo robotic right hemicolectomy (robotic-assisted right hemicolectomy, RRH) compared to laparoscopic approaches (laparoscopic right hemicolectomy, LRH). The secondary aim is to ascertain whether age is an independent risk factor, when compared against other factors, for postoperative complications after a right hemicolectomy on multivariate analysis.

**Methods:** Retrospective analysis of a prospectively maintained database on octogenarians who underwent elective RRH and LRH at John Flynn Hospital and The Tweed Hospital over 5 years was undertaken. Complications within 30 days, age, sex, smoking status, immunocompromised status, presence of diabetes, American Society of Anaesthesiology (ASA) physical status classification, preoperative Eastern Cooperative Oncology Group (ECOG) performance status, operative time, method of anastomosis, postoperative length of stay (LOS), need for convalescent care, and short-term oncologic data using the TNM criteria were compared using uni- and multivariate analyses.

**Results:** Seventy-eight patients were included. LRH (29 patients) and RRH groups (49 patients) were similar in median age, sex distribution, and comorbidities. Of which, 61.5% had no 30-day complications. RRH had statistically non-significant shorter operative time but statistically significant shorter LOS (5 days vs. 8 days) and less minor complications (24.5% vs. 34.5%). Major complications and overall complications were statistically not significant between groups on uni- and multivariate analysis. Lower ASA and ECOG status were associated with lower complication rates in both groups. Oncological resection outcomes were similar.

**Conclusion:** RRH does not confer an increased risk of complications in the octogenarians compared to laparoscopic surgery and is a viable minimally invasive option.

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# Comparing the Complication of Loop Transverse Colostomy and Loop Ileostomy Reversal in Mid-to-Low Rectal Cancer Patients Undergoing Sphincter-Preserving Surgery

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**Purpose:** In patients with rectal cancer, a diverting stoma is commonly constructed to reduce anastomotic complications. However, complication of stoma reversal between loop transverse colostomy (LC) or loop ileostomy (LI) are controversial. This study was to compare the morbidity of stoma reversal in mid-to-low rectal cancer patients who received LC or LI closure.

**Methods:** A retrospective review was conducted to analyze the surgical outcome of 628 rectal cancer patients who underwent diverting stoma closure (LC, 524; LI, 104) after sphincter-preserving surgery for rectal cancer between January 2006 and December 2015. Time interval between sphincter-preserving surgery and stoma reversal was similar for both groups. Complications after stoma reversal were compared between the 2 groups.

**Results:** There is no mortality in this study. Overall, stoma reversal complication was found to be comparable in both groups (LC vs. LI, 103/524 [19.6%] vs. 25/104 [24.0%];  $P=0.311$ ). However, closure wound infection was significantly higher in the LC group (LC vs. LI, 47/524 [8.9%] vs. 3/104 [2.8%];  $P=0.036$ ) as well as the intraoperative blood loss (LC vs. LI,  $14.55 \pm 15.11$  mL vs.  $10.04 \pm 13.56$  mL;  $P=0.003$ ) than the LI group. But patients with LI suffered significantly more closure anastomotic leakage events (LC vs. LI, 6/524 [1.1%] vs. 4/104 [3.8%];  $P=0.044$ ) and closure wound hernia (LC vs. LI, 15/524 [2.9%] vs. 8/104 [7.7%];  $P=0.017$ ) that surgical repair was required when comparing to LC group at long-term follow-up.

**Conclusion:** Taking down a stoma is routinely performed by colorectal surgeons. However, patients with either LC or LI could still experience different kinds of complications after stoma reversal. Causation should be taken to reduce the morbidity rate as low as possible.

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# The Characteristics of Patients Who Have Potentially Cured From Stage IV Colorectal Cancer

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**Purpose:** The prognosis of stage IV colorectal cancer patients have been improved with development of multimodal therapy. Although surgical resection for resectable liver or lung metastases is recommended in the guideline, limited patients can be cured from their disease. To date, the characteristics of patients who have been cured from stage IV colorectal cancer have not been investigated in detail. The purpose of this study was to compare the characteristics of patients who have potentially been cured from stage IV colorectal cancer with patients who have finally recurred.

**Methods:** This study was a retrospective cohort study conducted at 2 tertiary referral hospitals in Japan. Between 2005 and 2011, patients with stage IV colorectal cancer who received curative surgery were included. We defined potentially cured patients as patients who have been alive without recurrence more than 5 years after complete removal of colorectal cancer. We compared characteristics of potentially cured patients with finally recurred patients in terms of primary disease, organ of distant metastases, number of metastatic lesions.

**Results:** A total of 105 patients were included in this study. Among them, 36 patients were potentially cured and 52 patients finally recurred. Median follow-up time in potentially cured group was 96 months after last surgery and median times of surgery for metastatic lesion was once. M1a was the only significant predictor for cure in logistic regression analysis, while age, sex, location of primary disease, tumor differentiation, tumor depth, and nodal stage were not associated with cure.

**Conclusion:** Cure can be achieved with aggressive surgery even for stage IV colorectal cancer patients. However, all of the cured patients had only small number of metastases in single organ, and patients with multivisceral metastases could not be finally cured in our institutions. This study is limited by its retrospective design and small number of patients.

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# Negative Pressure Wound Management in Perineal Wound Status Post Abdominoperineal Resection and Extralevator Abdominoperineal Excision: A Meta-Analysis and Trial-Sequential Analysis

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**Purpose:** Abdominoperineal resection and extralevator abdominoperineal excision are indicated surgical interventions for low rectal cancer and inflammatory bowel disease. The episode of postoperative perineal wound complication is often complicated by surgical site infection (SSI) and may prolong length of stay (LOS). Recent evidence-based publications disclosed that negative-pressure wound therapy (NPWT) may reduce incident rate of complication compared with conventional drainage.

**Methods:** Eligible randomized controlled trials, retrospective and prospective studies published before June 2021 were retrieved from databases. We calculated the odds ratio (OR) and mean difference (MD) with 95% confidence intervals (CIs). The measure outcomes included SSI and LOS.

**Results:** Eight articles, involving 547 patients, met the selection criteria. Compared to conventional drainage, NPWT was associated with a significantly lower rate of SSI (fixed-effect; OR, 0.29; 95% CI, 0.18–0.45;  $I^2=0\%$ ) in 8 studies and 547 patients. Besides, NPWT was associated with a shorter LOS (fixed-effect; MD, -2.00; 95% CI, -2.60 to -1.39;  $I^2=0\%$ ) compared to conventional drainage in 3 studies and 305 patients. In trial sequential analysis, the cumulative number of patients of both outcomes exceeded the required information size, surpassed the significance boundary in favor of NPWT, suggesting conclusive results.

**Conclusion:** The results of the meta-analysis suggest that NPWT is superior to conventional drainage in both SSI and LOS, and the statistical power of SSI and LOS are confirmed using trial sequential analysis.

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# Analysis of *In Situ* Colorectal Tumor Headspace for the Assessment of Cancer-Specific Volatile Organic Compounds Release

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**Purpose:** Colorectal cancer (CRC) is one of the leading malignancies worldwide, and surgical resection remains standard treatment with possibly best prognosis. Recently, with the improvement of endoscopic submucosal dissection and concurrent chemoradiotherapy (CCRT), nonsurgical treatment has been an alternative therapy. However, it is difficult to distinguish early-stage cancer or advanced polyp directly under colonoscopy. Also, there is no fast diagnostic tool to evaluate the therapeutic effect of CCRT. Therefore, another diagnostic biomarker may be needed. Metabolomics is a new topic in recent years. CRC can alter metabolism and might release specific compounds into bowel lumen or bloodstream. These compounds can be a potential biomarker for the diagnosis of CRC and its status of disease. Online analysis of intra-luminal air may be helpful for future endoscopic diagnosis. The aim of the study is to analyze cancer headspace air samples and see if any specific compounds can be a biomarker for further assessment of cancer status.

**Methods:** Headspace air samples would be collected from theatre where cancer resection was performed. Air samples would be collected with thermal desorption tube and further analyzed with proton-transfer-reaction mass spectrometry.

**Results:** Twenty CRC patients received elective operation from January 2019 to December 2020 were enrolled. Three samples were collected from room air, normal colonic mucosa, and tumor headspace. High variation could be found from the 3 samples in the concentration of acetone, hexanoic acid, benzene, and 2-butanone. The concentration of phenol and acetone increased with the stage of tumor.

**Conclusion:** Early results from cancer headspace analysis revealed that intraluminal air samples can be a potential biomarker. Further sample collection may give stronger evidence.

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# Efficacy and Safety of Transrectal Natural Orifice Specimen Extraction Compared With Conventional Laparoscopy for Selected Colorectal Cancer Patients: A Propensity Score Matching Analysis

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**Purpose:** Current conventional laparoscopy (CL) surgery for colorectal disease requires a mini-laparotomy to extract the pathological specimen. In the advancement of laparoscopy techniques, the natural orifice specimen extraction (NOSE) surgery incorporates the opening of a hollow viscus that already communicates with the outside world and completely avoids the large incision. This study aims to analyze the safety and efficacy of NOSE in comparison to CL surgery in colorectal cancer.

**Methods:** We conducted a retrospective analysis of 1,189 patients who underwent surgery for primary malignant lesions between cecum to upper rectum from January 2015 to December 2019. Propensity score analyses were applied for the NOSE and CL groups in a 1:1 matched cohort.

**Results:** Propensity score matching was performed, after which 201 patients were included each in the NOSE and CL group. NOSE group had shorter time to first flatus passage ( $1.6 \pm 0.8$  days vs.  $2.0 \pm 1.2$  days;  $P < 0.001$ ), first stool passage ( $2.7 \pm 1.5$  vs.  $4.1 \pm 1.9$ ;  $P < 0.001$ ), tolerate liquid diet ( $2.3 \pm 1.3$  days vs.  $3.6 \pm 1.8$  days;  $P < 0.001$ ) and tolerate soft diet ( $3.9 \pm 2.0$  days vs.  $5.2 \pm 1.9$  days;  $P < 0.001$ ). NOSE group had a shorter hospital stay ( $5.1 \pm 3.5$  days vs.  $7.4 \pm 4.8$  days;  $P < 0.001$ ). The 30-day morbidity, mortality, and readmission rates had no significant differences between the groups. NOSE group showed lower mean pain intensity on postoperative day (POD) 1, POD 2, and POD 3. NOSE group also showed lower highest pain intensity on POD 1, POD 2, and POD 3. Higher percentage of patients in the NOSE group received only enteral analgesics on POD1, POD2, and POD3.

**Conclusion:** NOSE can be safely performed on patients with tumors located between cecum to upper rectum. NOSE results in reduced time to oral intake, less postoperative pain, and shorter hospital stay.

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# Pattern of Tumor Recurrence in Stage II Colorectal Cancer: A Single-Center Study

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**Purpose:** Stage II colorectal cancer (CRC) had about 10% of disease recurrence. Several clinicopathological risk factors were found to be associated with recurrence. In this study, we tried to describe the pattern of tumor recurrence in stage II CRC.

**Methods:** A total of 728 stage II CRC patients who underwent curative resection between January 2010 and December 2015 were extracted from a prospectively collected database. We assessed the relationship between risk factors and different recurrent patterns using Cox's proportional hazards model.

**Results:** Seventy-seven stage II CRC patients (10.6%) suffered from recurrence. Nine patients (1.24%) were local recurrence, 60 patients (8.24%) were distance metastasis. In distance metastasis, 15 patients (2.06%) were lung metastasis and 32 patients (4.40%) were liver metastasis. Independent risk factors for recurrence including rectal cancer ( $P=0.008$ ), early elevated carbohydrate antigen 19-9 (CA19-9) ( $P=0.015$ ) and perineural invasion ( $P=0.011$ ). Independent risk factors for distant metastasis including early elevated CA19-9 ( $P=0.005$ ) and perineural invasion ( $P=0.012$ ). Independent risk factors for lung metastasis including rectal cancer ( $P=0.023$ ) and early elevated carcinoembryonic antigen (CEA) ( $P=0.005$ ). Independent risk factors for liver metastasis including early elevated CA19-9 ( $P=0.002$ ) and obstruction ( $P<0.001$ ).

**Conclusion:** Early elevated tumor markers (both CA19-9 and CEA), tumor location, perineural invasion, and tumor obstruction are excellent indicator of prognosis in stage II CRC. Intensive follow-up and prescribing adjuvant chemotherapy for patients with these risks factors may improve patients' outcome.

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# Preoperative Serum CA125 Levels for Predicting Peritoneal Dissemination of Colorectal Cancer

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**Purpose:** The 8th edition of the American Joint Committee on Cancer staging system expanded the classification of the M category with the addition of M1c for peritoneal dissemination (PD) due to its worse prognosis compared to other visceral organ metastases. However, the lack of specific symptoms and varying sensitivities of imaging studies leads to difficulty in PD detection. This study aimed to analyze the association between tumor makers and PD detection in patients with colorectal cancer (CRC).

**Methods:** A total of 1,109 patients with CRC who underwent tumor resection between June 2000 and December 2017 were included in this retrospective study. Serum tumor markers, including carcinoembryonic antigen (CEA), carbohydrate antigen 19-9 (CA19-9), and CA125, were analyzed preoperatively. The grading of PD was performed based on the findings during surgical exploration and further confirmed by pathology.

**Results:** CA125 had the lowest sensitivity; however, it showed the highest specificity and diagnostic accuracy compared to CEA and CA19-9. Based on the analysis of tumor marker levels in advancing stages, the levels of CA125 did not rise until stage IVC. CEA and CA19-9 levels increased significantly at stage IV; however, it was not possible to differentiate between stage IVC and other organ metastases.

**Conclusion:** Among the 3 tumor markers, CA125 levels were closely correlated with PD compared to CEA and CA19-9 levels. The present analysis of tumor markers poses a better chance of diagnosis of stage IVC preoperatively.

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# Intracorporeal Anastomosis Reduces Operative Time in Laparoscopic Right Hemicolectomy: A Single-Center Experience

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**Purpose:** Laparoscopic right hemicolectomy (LRHC) techniques have varied in the approach to anastomosis. Some studies reported better outcomes in intracorporeal anastomosis (IA) than extracorporeal anastomosis (EA), but scientific evidence is lacking. The aim of this study is to compare the short-term outcomes and potential benefits of IA compared with EA.

**Methods:** The following data from our institution-maintained database were reviewed to identify patients with colon cancer who underwent LRHC from January 2017 to January 2020: demographic and disease-related characteristics, pTNM stage, intraoperative outcomes (operative time, blood loss, and number of harvested lymph nodes), and postoperative outcomes (postoperative complications, anastomotic leakage, and total number of days of hospital stay).

**Results:** A total of 242 patients were enrolled, of whom 61 underwent IA and the remaining 181 underwent EA. There was no significant difference in patient demographic and disease-related characteristics. Mean operative time was shorter in the IA group than in the EA group (133.20 minutes vs. 162.76 minutes,  $P < 0.001$ ); mean measured blood loss was also less in the IA group than in the EA group (31.97 mL vs. 58.18 mL,  $P = 0.003$ ). No significant difference was detected in terms of the number of harvested lymph nodes, postoperative complication rate, and anastomotic leakage rate.

**Conclusion:** IA is safe and results in shorter operative time and less blood loss in performing LRHC.

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# A Prediction Model for Metachronous Peritoneal Carcinomatosis in Patients With Stage T4 Colon Cancer After Curative Resection

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**Purpose:** Patients with pT4 colon cancer are at a high risk for developing metachronous peritoneal carcinomatosis (mPC). However, these individuals may have different risk profiles, including multiple clinicopathological factors. The study is to develop a prediction model for assessing the individual risk of mPC in patients with pT4 colon cancer.

**Methods:** A total of 2,003 patients with pT4 colon cancer undergoing R0 resection were categorized into the training or testing set. Based on the training set, 2,044 Cox prediction models were developed. Next, models with the maximal C-index and minimal prediction error were selected. The final model was then validated based on the testing set using a time-dependent area under the curve and Brier score, and a scoring system was developed. Patients were stratified into the high- or low-risk group by their risk score, with the cutoff points determined by a classification and regression tree (CART).

**Results:** The 5 candidate predictors were tumor location, preoperative carcinoembryonic antigen value, histologic type, T stage, and nodal stage. Based on the CART, patients were categorized into the low-risk or high-risk groups. The model has high predictive accuracy (prediction error  $\leq 5\%$ ) and good discrimination ability (area under the curve  $> 0.7$ ).

**Conclusion:** The prediction model quantifies individual risk and is feasible for selecting patients with pT4 colon cancer who are at high risk of developing mPC.

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# Will Aspirin Increase Postpolypectomy Bleeding Risk and Prevent Colorectal Adenoma or Carcinoma Development?

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**Purpose:** Colonoscopies are being frequently performed in patients receiving regular anticoagulation or antiplatelet. The recent recommendation by the Australia Cancer Council for all patients aged 50–70 years who are at average risk of colorectal cancer to actively receive aspirin as a chemoprophylaxis to prevent colorectal cancer will increase the occurrences of patients we meet in hospital that are on blood thinner. On the other hand, one of the most common complications from colonoscopy is postpolypectomy bleed. The incidence of postpolypectomy bleeding after a colonoscopy varies in each study, however, generally approximately 0.3%–6%. In our study, we plan to investigate the association between blood thinners and postpolypectomy bleed, aspirin's role in chemoprevention and to ascertain polyp factors contributing to postpolypectomy bleed in our population in a regional Australia. To ascertain an association between blood thinners and postpolypectomy bleed, aspirin's role in chemoprevention and polyp risk factors contributing to postpolypectomy bleed in our population in regional Australia.

**Methods:** Retrospective study was carried out in Bundaberg Hospital, Bundaberg, QLD, Australia from October 1, 2016 to September 30, 2017. Data such as patient's demographics, past medical history, medication, colonoscopy findings, and pathology results were obtained from patient records and our web-based application.

**Results:** There was a statistically significant association between the aspirin group ( $P=0.0217$ ) the antiplatelet group ( $P=0.0276$ ) and the blood thinner group ( $P=0.0002$ ). Nine patients (1.2%) had postpolypectomy bleed with 5 patients being on blood thinners prior. All 5 patients that rebled had aspirin prior. There was also no protective statistically significant association between aspirin use and colonic polyp prevention ( $P=0.1056$ ) or colorectal cancer prevention ( $P=0.0555$ ) in our sample study. In terms of polyp factors, there was only significant association noted between polyp more than 10 mm with postpolypectomy bleed ( $P=0.0476$ ). No statistically significant association was noted between pedunculated polyp, right-sided colon polyp, number of polyps resected (up to 3) with postpolypectomy bleed.

**Conclusion:** In our sample size in regional Australia, it was noted that use of aspirin, antiplatelet, blood thinners, and polyp size of > 10 mm has an association with postpolypectomy bleeding risk. Although there is limitation to our study, we would still recommend exercising caution prior to commencing patient on aspirin.

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# The Negative Prognostic Impact of Lymph Node Skip Metastasis in Stage III Colon Cancer With pN1 Disease: A Single-Center and Retrospective Cohort Study

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**Purpose:** Lymph node skip metastasis is a subgroup of lymph node metastatic patterns with low incidence in node-positive colon cancer. Its clinical significance is still unclear. This study aimed to investigate the prognostic impact of lymph node skip metastasis in stage III colon cancer.

**Methods:** The study was conducted at Taipei Veterans General Hospital. The subjects are the patients with stage III colon cancer who underwent D3 lymphadenectomy between 2006 and 2015. The patients were divided into a lymph node skip metastasis positive group and a negative group. Recurrence-free survival and overall survival were compared using Kaplan-Meier curves and log-rank test. Cox regression was applied to identify related risk factors influencing survival.

**Results:** A total of 461 patients were reviewed, and lymph node skip metastasis positive patients represented 13.2% of our sample. Patients with lymph node skip metastasis tended to present with a higher proportion of right-sided cancer, lower positive lymph nodes, lower lymph node ratio, and higher mean body mass index. Liver recurrence was more prevalent in the lymph node skip metastasis group ( $P=0.028$ ) than in the negative group. The presence of lymph node skip metastasis was a negative prognostic factor for 5-year recurrence-free survival (51.4% vs. 68.7%;  $P=0.002$ ) and 5-year overall survival (66.4% vs. 80.4%;  $P=0.024$ ) in Kaplan-Meier curves and multivariate Cox regression. Subgroup analysis revealed the survival significance of recurrence-free survival ( $P=0.001$ ) and overall survival ( $P=0.011$ ) in lymph node skip metastasis with pN1 disease.

**Conclusion:** Lymph node skip metastasis is an independent negative prognostic factor in stage III colon cancer with pN1 disease. More intensive surveillance may be necessary for patients of this subgroup.

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# Predicting Metachronous Metastasis in Stage I–III Colorectal Cancer by a Multilayer Perceptron Network

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**Purpose:** There are several risk factors for us to predict poor colorectal cancer outcomes. The prediction accuracy using neural network with these factors is not well known. The study assesses whether an artificial neural network can improve accuracy of our instinct practice without compromising the sensitivity.

**Methods:** A retrospective study reviewing 536 consecutive pathological stage I–III colorectal cancer in a single medical center from 2012–2018. Non-recurrence group is disease free for at least 5 years and recurrence group is metachronous metastasis in 5 years after surgery. Tumor size, positive nodes, carcinoembryonic antigen (CEA) levels before and after surgery, carbohydrate antigen 19-9 (CA19-9) before surgery, tumor location, differentiation, T, Braf V600E mutation, lymphovascular invasion, and perineural invasion (PNI) were considered as Multilayer perceptron (MLP) parameters. Any elevated CEA levels before or after surgery, elevated CA19-9 before surgery, lymph node involvement, PNI, T4, pStage, and differentiation were considered positive for risk of metastasis as instinct predict.

**Results:** In training set, 25% had recurrence and 75% had no recurrence. Instinct predict had 96% sensitivity level, 47% accuracy, and 46% F1-score. MLP model had 47% accuracy and 46% F1-score in validation at a target of 96% sensitivity. In final model testing set, Instinct predict had 92% sensitivity level, 53% accuracy, and 51% F1-score. MLP model had 88% sensitivity level, 66% accuracy, and 69% F1-score in validation with a 96% sensitivity target setting. In non-recurrence, 67% had high similarity in characteristic with the recurrence.

**Conclusion:** At a comparable sensitivity level, the MLP and instinct predict had little improvement in accuracy. The sensitivity is great to screen patients with risk of metastasis with our instinct predict or MLP. The improvement of accuracy of MLP is limited by the surprising similarity in the 2 groups.

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# Complications After Colorectal Surgery in Patients Who Have Received Bevacizumab: A Nationwide Database Study

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**Purpose:** The current treatment guidelines for colorectal cancer (CRC) indicate surgical resection for primary colorectal tumors and distant metastasis, if possible, after targeted therapy with bevacizumab. Bevacizumab-associated adverse effects include delayed wound healing as it inhibits physiological endothelial repair mediated by vascular endothelial growth factor. We aimed to assess the difference in surgical timing of bevacizumab-associated wound complication outcomes to inform clinical decision-making.

**Method:** Using the Taiwanese National Health Insurance Database and Taiwan Cancer Registry, we identified patients with metastatic CRC (mCRC) treated with bevacizumab who underwent surgery within 1 year after treatment with bevacizumab from January 1, 2010, to December 31, 2017. The index date was defined as the date of receipt of the first surgical procedure during  $\leq 28$  days, 29–90 days, and  $> 3$  months after the last cycle of bevacizumab. The primary outcomes were 30- and 60-day mortality postoperatively and in-hospital death. The secondary outcomes were the postoperative length of stay in hospital; readmission after discharge; and surgical complications during 30 days, including re-operation within 30 days of surgery, intra-abdominal infection, wound complications, sepsis, thromboembolism, and hemorrhage. These outcomes were adjusted using multivariable analysis.

**Results:** We identified 10511 patients who received bevacizumab for mCRC treatment. Among these, 2047 (19.47%) underwent surgery within 1 year of bevacizumab treatment and were included in this study. In the multivariate analysis, compared with patients who underwent surgery 29–90 days after bevacizumab treatment, there were significant differences in 60-day mortality (OR = 2.05; 95% CI, 1.2–3.51) and in-hospital deaths (OR = 2.02; 95% CI, 1.11–3.68) among patients who underwent surgery  $\leq 28$  days after receiving bevacizumab. Also, compared with those who underwent surgery 29–90 days after receiving bevacizumab, there was no difference between patients who underwent surgery  $\leq 28$  days or  $> 3$  months after receiving bevacizumab.

**Conclusion:** A minority of mCRC patients require colorectal surgery after exposure to bevacizumab within  $\leq 28$  days and are at a high risk of death. However, we found no association between the time since the last bevacizumab dose and the odds of a complicated postoperative course. Consequently, whereas bevacizumab exposure should be considered in surgical decision-making, it is not a contraindication to surgery when surgery is otherwise indicated.

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# Comparative Effectiveness of Bevacizumab Versus Cetuximab in Metastatic Colorectal Cancer Patients Without Primary Tumor Resection

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**Purpose:** Surgical resection of primary colorectal tumor might not be feasible in a great proportion of patients with metastatic colorectal cancer (mCRC) in clinical settings. To inform clinical decisions, it is important to assess the difference in survival outcomes between bevacizumab and cetuximab among patients without primary tumor resection (PTR). To assess the effectiveness of bevacizumab and cetuximab in mCRC patients without PTR on survival outcome or conversion surgery, and examine the interaction between PTR and survival outcome among mCRC patients receiving bevacizumab or cetuximab-based therapy using a Taiwan population database.

**Methods:** Using the Taiwanese National Health Insurance Database and Taiwan Cancer Registry, we identified patients with mCRC who received first-line targeted agent-based therapy from January 1, 2009, through December 31, 2019. Overall survival of patients without PTR was assessed after receiving bevacizumab or cetuximab plus chemotherapy. The multivariable analysis for survival and conversion surgery after first-line targeted agent-based therapy was performed via Cox regression. We matched the cetuximab group to the bevacizumab group by propensity scores (PS) matching and weighting.

**Results:** Overall, 8,466 patients with mCRC were retrieved in our study; 7,140 and 1,326 patients received bevacizumab or cetuximab-based therapy as first-line treatment, respectively. Also, 3,667 patients (43.3%) with mCRC (2,161 male [59%] and 1,506 female [41%]) did not undergo PTR before targeted therapy, including 3,094 and 573 patients treated with bevacizumab and cetuximab-based therapy, respectively. Compared with bevacizumab-based therapy, cetuximab resulted in less mortality among mCRC patients without PTR (hazard ratio [HR], 0.75; 95% confidence interval [CI], 0.68–0.83), whereas cetuximab-based therapy did not significantly reduce the mortality rate among patients with PTR (HR, 0.95; 95% CI, 0.75–1.20) after PS weighting. Among patients treated with targeted agents, PTR was associated with lower mortality among patients who received both bevacizumab (HR, 0.60; 95% CI, 0.57–0.63) and cetuximab (HR, 0.75; 95% CI, 0.62–0.91), compared with patients without PTR. Among patients without PTR, multivariable analysis for conversion surgery showed that cetuximab group (HR, 1.82; 95% CI, 1.43–2.40) was significantly associated with a higher rate of metastasectomy.

**Conclusion:** In patients without PTR, cetuximab-based therapy was associated with significantly better survival compared with bevacizumab. Cetuximab also yielded a higher conversion surgery rate. Our results underscore the importance of stratification by PTR in applying current treatment guidelines and for future clinical trials.

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# Neoadjuvant Radiotherapy and Laparoscopic Selective Lateral Pelvic Lymph Node Dissection: Our Strategy for Advanced Low Rectal Cancer

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**Purpose:** There is a difference in the treatment of low advanced rectal cancer between Western countries and Japan. The standard treatment for advanced low rectal cancer in Western countries is neoadjuvant radiotherapy (NART) followed by total mesorectal excision (TME). Recently, it was shown that lateral pelvic recurrence after NART was the major cause of local recurrence by some reports. We thought that it was not enough NART and followed TME in case of lateral pelvic lymph node (LPLN) metastasis, so our strategy of advanced lower rectal cancer was NART and followed by laparoscopic TME when LPLN metastasis was suspected, laparoscopic LPLN dissection (LPLD) was performed. We investigate safety and feasibility of our strategy.

**Methods:** From April 2010 to December 2016, 196 patients with advanced low rectal cancer underwent curative surgery after NART. Long-course NART (45 Gy) is generally selected; however, short-course NART(25 Gy) is chosen depending on individual circumstances. LPLD was performed even for the patients whose LPLN was decreased after long-course CRT. We performed using 5-port and a 10-mm flexible scope. We investigated them divided into 2 groups, enlarged LPLN (enlarged group) and non-enlarged LPLN (nonenlarged group), respectively.

**Results:** There was no open conversion. Enlarged group was 73 patients and LPLD was performed for 71 patients. Nonenlarged group was 123 patients. Median operative time was 466 and 312 minutes, respectively, and median blood loss was 72.5 mL and 50 mL, respectively. Pathological stages of enlarged group included 6 ypStage 0, 19 Stage I, 18 ypStage II, and 30 ypStage III. LPLN metastasis was pathologically proven in 21 patients. Pathological stages of nonenlarged group included 8 ypStage 0, 37 Stage I, 43 ypStage II, 35 ypStage III. Postoperative complications greater than Clavien-Dindo grade III of enlarged group was 3 patients (5%), nonenlarged group was 2 patients (1.9%). Recurrence was detected in 34 patients (17.3%). Overall local recurrence of enlarged group and nonenlarged group was detected in 7 cases (15.2%) and 3 cases (2.4%), respectively.

**Conclusion:** Our treatment strategy for low rectal cancer is safe and oncologically feasible.

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# Retrospective Cohort Study of Primary Tumor Resection in Asymptomatic Stage IV Colorectal Cancer

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**Purpose:** There is no consensus on the appropriate management of asymptomatic and minimally symptomatic patients with stage IV colorectal cancer (CRC) and irresectable metastasis. This study compared treatment outcomes between primary tumor resection (PTR) and no PTR in CRC patients with unresectable metastasis.

**Methods:** A cohort study of patients with asymptomatic stage IV CRC between September 1, 2006 and August, 31 2016 was analyzed. The primary outcome was complications that occurred during the treatment period such as obstruction, perforation, bleeding, and severe tenesmus. The secondary outcome was median survival time.

**Results:** There were 135 patients with asymptomatic stage IV CRC who were included in the final analysis. The median survival time was 46.45 and 45.2 months in PTR and no PTR groups, respectively. There were 22 of 82 (26.82%) and 8 of 53 (15.09%) deaths in PTR and no PTR groups ( $P=0.554$ ). Adverse outcomes from the primary tumor occurred in 13.64% in PTR group, 50% in no PTR group, and 52.63% in non-PTR with diversion ostomy groups, respectively ( $P=0.001$ ). Gut obstruction was found in 2 patients (2.44%) and 10 patients (29.41%) in the PTR and no PTR groups, respectively ( $P<0.001$ ). Metastasis complications were found in 33 patients (47.14%) in the PTR, 11 patients (33.33%) in no PTR groups and 8 (42.11%) in no PTR group but divert ostomy group, respectively ( $P=0.414$ ).

**Conclusion:** No statistically significant and clinically relevant survival benefit was found in patients who underwent PTR in our cohort. However, more complications occurred in the no PTR.

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# Clinical Outcome of Local Treatment and Radical Resection for pT1 Rectal Cancer

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**Purpose:** Colorectal cancer is mainly cured by radical resection (RR) with adjuvant chemotherapy, including neoadjuvant chemoradiation followed by radical surgery for locally advanced rectal cancer. As the early-stage rectal cancer, T1 lesions can be managed by local treatment (LT) and/or radiotherapy thereafter, fewer morbidity is the key benefits of these LTs. Since nodal metastasis is important for staging, RR should be suggested. Rectal cancer has more surgical morbidity than colon cancer, such as anastomosis leakage, and a higher possibility of permanent stoma, so LT has been patient's preferred choice.

**Methods:** Between January 2008 and December 2018, we retrospectively collected data of 244 patients with pT1 rectal adenocarcinoma in our hospital. Of these, 202 patients (82.78%) underwent RR, including low anterior resection (LAR) and abdominoperineal resection, and 42 patients (17.22%) underwent LT, including transanal excision, transanal endoscopic microsurgery, and colonoscopic polypectomy.

**Results:** In this study, 7 patients (16.67%) had loco-regional and distant recurrence from the LT group while 8 patients (4%) had distant metastasis without loco-regional recurrence from the RR group. The lymph node metastasis rates in RR group were 8.42% (17 of 202). The 47 patients (24.22%) underwent LAR with temporary stoma, the stoma reversal rate was 100%. In the RR group, postoperative complication rate was 11.88% (22 of 202), and postoperative mortality rate was 0.49% (1 of 202). Recurrence-free survival was 95.65% for RR and 80.17% for LT (P=0.001), and overall survival was 93.69% for RR and 69.98% for LT (P=0.001).

**Conclusion:** This study found that recurrence-free survival and overall survival in patients of pT1 rectal cancer that had received RR were better than LT. This is because the RR group had 8.42% lymph node metastasis, who can undergo further adjuvant chemotherapy. A higher recurrence rate after LT must be balanced against the morbidity and mortality associated with RR.

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# A Subcentimeter Distal Rectal Margin and Its Impact on Local Recurrence in Rectal Cancer Patients Undergoing Curative Surgery After Preoperative Chemoradiotherapy

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**Purpose:** A 1-cm distal rectal margin (DRM) was recommended as the shortest clearance margin in clinical guidelines. Controversy still exists if we can obtain DRM less than 1 cm in order to achieve goal of sphincter-saving, especially in patients who had preoperative chemoradiotherapy (CRT). Our study aimed to determine the clinical outcomes of rectal cancer patients who had subcentimeter DRM and the cutoff point that may affect the oncological outcomes.

**Methods:** A total of 740 patients with rectal cancer were assessed from a prospective cancer database institution from January 2015 to December 2019. One hundred and forty-five patients with locally advanced rectal cancer underwent curative resection after preoperative CRT were included. The DRM and other factors were reviewed for their effect on recurrence and survival. The median follow-up time was 28 months.

**Results:** Of 145 patients, the DRM ranged from 0–11.3 cm (median, 2 cm). Thirty-six patients (24.8%) had DRM of < 1 cm. Local recurrence occurred in 27 patients (18.6%). Overall recurrence was significantly higher in patients with DRM of  $\leq 0.4$  cm than DRM of  $> 0.4$  cm (50% vs. 16.1%;  $P=0.015$ ). Moreover, patients who had DRM of  $\leq 0.4$  cm were significantly associated with higher local recurrence than systemic recurrence ( $P=0.037$ ). Disease-free survival (DFS) of patients with DRM of  $> 0.4$  cm was significantly higher than that of patients with DRM of  $\leq 0.4$  cm ( $P=0.002$ ). In patients with DRM of  $< 0.5$  cm and  $> 0.5$  cm, there were no statistically significant differences in recurrence ( $P=0.068$ ) and DFS ( $P=0.107$ ).

**Conclusion:** The results suggest that cutoff point at 0.5 cm was a minimally acceptable DRM. Minimizing DRM to < 1 cm to increase chance of sphincter-saving procedures should be balanced with compromising the oncological outcomes. Intense adjuvant therapy should be used in these patients to reduce recurrence.

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# Clinical Outcomes of Transanal Total Mesorectal Excision for Middle and Low Rectal Cancer: A Single-Center Study

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**Purpose:** Transanal total mesorectal excision (TaTME) is a novel approach to radical resection for middle and low rectal cancer. Although its oncological safety remains unclear, TaTME has been emerged to improve the quality of laparoscopic TME. The aim of this study is to evaluate the clinical outcomes of TaTME for mid and low rectal cancer of a high-volume center.

**Methods:** From April 2015 to June 2020, patients with middle or low rectal cancer who received TaTME procedure using GelPOINT Path platform were identified. Data were retrospectively collected including operative details, postoperative morbidity, pathological results, and oncological outcomes.

**Results:** In total, 185 patients received TaTME surgery, 2 of them were robotic-assisted, 2 of them were Senhance-assisted, and the remaining 181 underwent laparoscopic TaTME. One patient converted to open surgery due to severe adhesion and internal iliac vein injury. Postoperative complication rate was 23.2% (43 of 185) and postoperative mortality rate was 0.5% (1 of 185). Fifteen (8.1%) complications were graded as severe (Clavien-Dindo grade  $\geq$  III) and needed re-intervention. The mean operative time was 291.5 minutes ( $\pm$  99.0 minutes). The median length of postoperative hospital stay was 11 days (range, 5–33 days). The mean distal margin was 21.2 mm ( $\pm$  9.9 mm). A positive circumferential resection margin ( $\leq$  1 mm) was observed in 7 patients (3.7%). The median follow-up time was 38.1 months (range, 4–76 months) and local recurrence was observed in 8 patients (4.3%).

**Conclusion:** In a high-volume center, the TaTME procedure for mid and low rectal cancer is feasible and its oncological outcomes were acceptable.

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# Comparison of Outcomes Between Colonic Stenting and Surgical Ostomy as Palliative Treatment for Incurable Malignant Colonic Obstruction

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**Purpose:** Self-expandable metal stent (SEMS) is a favorable therapeutic option in patients with incurable malignant colonic obstruction. However, the long-term efficacy and safety of SEMS compared with surgical ostomy have not been well investigated. This study aimed to compare patency and outcomes of colonic stenting with surgical ostomy in patients with incurable malignant colonic obstruction.

**Methods:** This retrospective cohort included patients with incurable malignant colonic obstruction who underwent SEMS insertion (n=105) and surgical ostomy (n=97) between January 2009 to December 2019. The primary outcomes were to compare the patency after procedure and re-intervention rates within 1 year. The secondary outcomes were success rates, complication rates, hospital stay, and time to initiation of chemotherapy.

**Results:** The patency of the SEMS group was lower than that in the surgical ostomy group (85.5% vs. 93.6% in 6 months, 78.9% vs. 90.9% in 12 months, and 61.3% vs. 90.9% in 18 months; log-rank test,  $P=0.003$ ), but 1-year re-intervention rates were not different (11% vs. 11%,  $P=0.945$ ). Technical and clinical success were comparable between SEMS and surgical ostomy groups (98% vs. 100%,  $P=0.498$  and 95% vs. 99%,  $P=0.214$ , respectively). The rate of early complications did not differ between the 2 groups ( $P=0.503$ ). Although the late major complication rates were not different ( $P=0.860$ ), the surgical ostomy group had more late minor complications than the SEMS group (18% vs. 4%,  $P=0.002$ ). The patients underwent palliative SEMS insertion had shorter hospital stay and shorter time to initiation of chemotherapy than those underwent surgical ostomy ( $P<0.001$  and  $P=0.011$ , respectively).

**Conclusion:** SEMS insertion is a safe and effective treatment for patients with incurable malignant colonic obstruction. Although SEMS had lower patency than surgical ostomy, the 1-year re-intervention rates were not different.

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# The Role of Tumor Suppressor Gene Mutations in the Wnt Pathway in the Occurrence and Development of Colorectal Cancer

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**Purpose:** The Wnt pathway is already a well-known signaling pathway that can trigger tumors. To explore and analyze the role of tumor suppressor gene mutations in the Wnt pathway in the occurrence and development of colorectal cancer.

**Methods:** Retrieved and read articles related to the Wnt pathway and colorectal cancer, and summarized the latest research progress of tumor suppressor gene mutations in the Wnt pathway.

**Results:** The prominent role of APC as a gate-keeping gene was first revealed in 1991 by multiple research groups. They jointly showed that mutation and inactivation of the APC gene can cause familial adenomatous polyposis with a high risk of colorectal cancer development. Recent studies have shown that KRAS, TP53, SMAD4, and/or PIK3CA driver mutations and APC mutations cooperate to promote the progression from “adenoma” to “cancer.” Through large-scale sequencing, it was found that colorectal cancer patients were subdivided into 4 molecular subtypes, and Wnt pathway mutations in colorectal cancer were separated into different molecular subtypes, indicating that the types of Wnt pathway mutations and the biological background of the tumor There is a relationship between. On the other hand, RNF43 mutation and ZNRF3 mutation are related to the serrated pathway of colorectal cancer development and RNF43 mutation is also abundant in signet ring cell carcinoma. APC and RNF43 mutations are also associated with different primary tumor locations in the colon. APC mutations are mainly found in left colon cancer, while RNF43 mutations are mainly found in right colon cancer.

**Conclusion:** Mutation-induced activation of WNT- $\beta$ -catenin signaling is a common driving event in colorectal cancer. The driver mutations in APC and RNF43 play an important role in the occurrence and development of colorectal cancer and have the potential to become targets for targeted therapy.

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# Aspirin-Assisted Oxaliplatin Chemotherapy Regulates the Immune Microenvironment of Colon Cancer

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**Purpose:** More and more studies have found that cyclooxygenase is the driving factor of immunosuppression, and regular use of aspirin, a cyclooxygenase inhibitor, is associated with a better prognosis in patients with colon cancer. In addition, oxaliplatin, as the first-line drug of colon cancer chemotherapy, has been found to cause immunogenic death of tumor cells, which is conducive to induce antitumor immunity. We are committed to exploring the effect of aspirin combined with oxaliplatin on the immune microenvironment of colon cancer.

**Methods:** Using BALB/c mice with sound immunity, we established a subcutaneous colon cancer model and treated mice with oxaliplatin and aspirin. The tumor size of mice was monitored, the immune cells of tumors and lymph nodes were analyzed by flow cytometry, and the content of immune factors at tumor sites was detected by ELISA kit.

**Results:** The tumor growth rate of mice in dual drug treatment group was lower than that in the normal saline control group and 2 single treatment groups. Flow cytometry showed that tumor-infiltrating cytotoxic T lymphocytes increased and myeloid-derived suppressor cells decreased in dual drug combination group. Moreover, the contents of interferon gamma, tumor necrosis factor alpha, interleukin (IL)-2, and IL-12 increased at the tumor site.

**Conclusion:** Aspirin-assisted oxaliplatin chemotherapy induced antitumor immunity, which may be a potential chemotherapy regimen for colorectal cancer.

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# Psychosocial Impact of Colorectal Cancer on Young-Onset Patients: A Systematic Review

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**Purpose:** The incidence of young-onset (< 50 years) colorectal cancer (CRC) has been increasing internationally. The psychosocial experience of younger cancer patients is vastly different from older patients, especially in domains such as financial toxicity, body image, and sexual dysfunction. What is unknown is the cancer type-specific experience. The aim of the current systematic review was to examine (1) the psychosocial factors and/or outcomes associated with young-onset CRC and (2) other determinants that influence these outcomes.

**Methods:** A systematic search was conducted on 4 databases (PubMed, CINAHL, Scopus, and PsycINFO) from inception to December 2020 using key terms and combinations. Primary literature that examined the psychosocial impact of young-onset CRC were included.

**Results:** A total of 1,389 records were assessed by 4 reviewers, with a total of 7 studies meeting inclusion criteria (quantitative, n = 5; qualitative, n = 1; and case series, n = 1). All studies indicated there was significant psychosocial impact in younger CRC patients, including emotional impact, social impact, physical burden, sexual impact, work impact, unmet needs, financial impact, and global quality of life. Three studies explored other determinants that influenced the psychosocial experience and found that socioeconomic background such as being female and having lower education, CRC treatment such as chemotherapy, and health status were associated with worse psychosocial impact.

**Conclusion:** Young-onset CRC patients face severe psychosocial impact unique to this age group, such as self-image and sexual functioning. However, there remain unexplored domains reported in other cancers but not found in the included studies, such as cognitive impairment. Most of the scales used by the included studies were also not specific to CRC. Social support services and resources need to be uniquely tailored. More empirical investigations are required to understand its long-term impact and influence on other psychosocial domains.

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# Can Colorectal Cancer Patients Advocate for Colorectal Cancer Screening to Their Siblings?

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**Purpose:** Siblings of colorectal cancer (CRC) patients are at increased risk of developing CRC. However, sibling CRC screening rates remain low. This study aimed to determine if providing patients with a tailored educational package to advocate CRC screening to their siblings would improve siblings' screening rates.

**Methods:** CRC survivors at 2 study sites (National University Hospital [Singapore] and Ng Teng Fong General Hospital [Singapore]) were recruited for the randomized behavioral intervention. Participants were randomized into receiving either a brief counseling session on the Ministry of Health screening guidelines (control group), or tailored materials with weekly phone reminders (intervention group) to educate their siblings. Interested siblings could respond to the study team to learn more about CRC screening. The outcomes were advocacy rates between both groups and sibling response rates.

**Results:** Between May 2017 to March 2021, 219 CRC patients with a median age of 63 years were randomized to the control (n = 109) and intervention group (n = 110). Advocacy rates were high and did not differ significantly between the 2 groups. Based on the adjusted odds ratio (aOR), siblings of patients from the intervention group were more likely to respond (aOR, 1.8; 95% confidence interval [CI], 1.1–3.0). After controlling for potential confounders, older siblings were significantly less likely to find out about CRC screening (aOR, 0.3; 95% CI, 0.2–0.7).

**Conclusion:** This study demonstrated that CRC patients are willing advocates of CRC screening to their siblings and can be tapped on to engage their siblings to go for CRC screening, but sibling response rates leave much to be desired. Siblings contacted by patients from the intervention group were also more likely to reach out to the study team. Further studies are necessary to address the low colorectal screening rates amongst family members.

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# Determining Risk Factors for Permanent Stomas in Patients Undergoing Sphincter-Saving Operations for Rectal Cancer

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**Purpose:** This study aimed to identify the risk factors for permanent stoma (PS) in patients who underwent sphincter-saving operations for rectal cancer.

**Methods:** We retrospectively reviewed 597 consecutive patients with rectal cancer from January 2012 to December 2020 at Taipei Medical University Hospital. There were 391 patients who underwent sphincter-saving surgery, including 239 cases of low anterior resection and 152 cases of intersphincteric resection. Univariate and multivariable analyses were used to analyze risk factors for PS.

**Results:** After a median follow-up of 47.3 months (range, 7–114 months), 59 patients (15.1%) were alive with a PS, including 46 patients who did not undergo reversal surgery and 13 patients who underwent stoma recreation after reversal surgery. The median period between primary surgery and stoma reversal was 6.0 months. Multivariate analysis revealed that the risk factors for PS were local recurrence (odds ratio [OR], 25.58; 95% confidence interval [CI], 4.428–147.761;  $P < 0.001$ ), perirectal abscess (OR, 154.34; 95% CI, 15.806– $>999$ ;  $P < 0.001$ ), anastomosis site stenosis (OR, 187.081; 95% CI, 22.193– $>999$ ;  $P < 0.001$ ), perineural invasion (OR, 4.782; 95% CI, 1.22–18.736;  $P = 0.025$ ), and operation time (minutes) (OR, 1.008; 95% CI, 1.002–1.014;  $P = 0.01$ ).

**Conclusion:** Local recurrence, perirectal abscess, anastomosis site stenosis, perineural invasion, and operation time were independent risk factors for PS. Therefore, before a patient undergoes surgery for rectal cancer, surgeons should consider the possibility of the need for a PS, and patients should be informed before the operation that closure of the temporary stoma may not always be possible.

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# Are There Any Survival Difference Between Resectable Synchronous and Metachronous Liver Metastatic Colon Cancer: A 7-Year Cohort of National Health Insurance Research Database in Taiwan

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**Purpose:** Colorectal cancer is the 3rd most common malignancy worldwide. Among patients who were first diagnosed with colorectal cancer, up to 25% of patients had metastatic disease. Liver first approach, new concepts of treatment for colorectal cancer liver metastasis (CRLM) had emerged since 2000. Whether synchronous or metachronous CRLM had better survival benefits was still in debate and lack of large number cases study. To investigate survival, patient characteristics and differences of treatment between resectable synchronous CRLM and metachronous CRLM in Taiwan population.

**Methods:** We analyzed data retrospectively on National Health Insurance research database between January 2003 to December 2010. All patients with CRLM with liver and colorectal resection were identified. Synchronous liver CRLM was defined as any CRLM identified within 6 months after colorectal cancer was detected. Clinical variables were compared between the patient groups, and survival outcomes were characterized.

**Results:** There were 1,593 patients notified in synchronous CRLM and 990 patients notified in metachronous CRLM group. In Kaplan-Meier curve, resectable metachronous CRLM has superior survival probability than synchronous CRLM. In multivariable analysis, age older than 80 years, synchronous CRLM, and adjuvant chemotherapy may have significant risk to patient survival. However, right- or left-sided colorectal cancer, sex and comorbidities as diabetes mellitus, hypertension, coronary artery disease, or hepatitis show an increased risk for survival.

**Conclusion:** Patients with synchronous colorectal liver metastases had significantly lower 5-year overall and disease-free survival, comparing to patients with metachronous liver metastases. Further factors as resection strategies and neoadjuvant therapy regimens should be evaluated in the future.

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# Prognostic Importance of Colon Cancer Laterality in Patients Treated by Cytoreductive Surgery With or Without Intraperitoneal Chemotherapy: A Systemic Review and Meta-Analysis

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**Purpose:** Evidence supporting the use of cytoreduction and intraperitoneal chemotherapy in colon cancer has been supported in various randomized clinical trials. Left-sided and right-sided colon has different biological, histological, and prognostic differences. As recent literature has called into question the survival benefit of the addition of intraperitoneal chemotherapy to cytoreductive surgery identifying differences in treatment outcomes can maximize benefits while minimizing associated risks of cytoreduction surgery with heated intraperitoneal chemotherapy. To identify the prognostic effect of the laterality of primary colon cancer in patients treated with cytoreductive surgery with or without intraperitoneal chemotherapy.

**Methods:** Systematic review from January 2000 to March 2021 on articles reporting prognostic outcomes of right and left colon cancer patients with peritoneal spread undergoing cytoreductive surgery with or without intraperitoneal chemotherapy.

**Results:** Of the 2,998 articles screened, 6 studies were selected for analysis containing 2,137 patients. Of these patients, 53.2% had right-sided colon cancer, 52.4% were female, and their median age ranged from 55 to 61.5 years. The percentage of metachronous presentation of peritoneal colon cancer spread was 49.7%. Among the total, 88.8% of tumors had a complete cytoreduction score of 0. Four studies reported peritoneal cancer index (PCI) of the intraperitoneal tumor spread with the median PCI score ranging from 8.6 to 10.1. The pooled hazard ratio of the risk to disease-free survival and overall survival was 0.66 (95% confidence interval [CI], 0.49–0.89) and 0.70 (95% CI, 0.58–0.84), respectively. Publication bias was suggested with smaller studies possessing larger effect sizes.

**Conclusion:** When the existing data on the prognostic significance of left vs. right-sided colon cancer treated with cytoreductive surgery with or without intraperitoneal chemotherapy is pooled right-sided colon cancer possesses a far worse prognosis.

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# Renal Metastasis From Mucinous Adenocarcinoma of the Colon: A Rare Case Report

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**Purpose:** Distant metastases from colorectal cancer (CRC) most frequently spread to the liver and lungs. CRC metastasis to the kidney is extremely rare and may be associated with an unfavorable prognosis. We present a case of a 40-year-old female patient who underwent laparoscopic left hemicolectomy and partial hepatectomy for synchronous colon cancer liver metastasis. A new left renal metastasis from regular follow-up abdominal computed tomography was found at postoperation 22 months.

**Methods:** The pathological result was mucinous adenocarcinoma, poorly differentiated with all-RAS wild type, BRAF negative and mismatch repair preserved. She received adjuvant chemotherapy with FOLFOX+panitumumab. New onset renal metastasis was found during regular follow-up images.

**Results:** She received left nephrectomy and had disease free for 6 months till now.

**Conclusion:** Renal metastasis is a rare condition for CRC and usually has no symptom. Aggressive surgical intervention and adjuvant chemotherapy will provide better outcome.

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# Laparoscopic Versus Open Resection for the Treatment of Colorectal Cancer in Patients Aged $\geq 80$ Years: A 10-Year United States Nationwide Inpatient Sample Analysis

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**Purpose:** People aged 80 years and older, also called octogenarian, are the most rapidly growing age group worldwide. The aim of this study is to compare in-hospital outcomes of laparoscopic and open resections for patients aged  $\geq 80$  years with primary colorectal cancer using a nationwide database of the United States. This population-based, retrospective uses data from the Nationwide Inpatient Sample, the largest all-payer United States inpatient care database. From 2005 to 2014, a total of 45,374 patients aged  $\geq 80$  years undergoing laparoscopic or open resection for colorectal cancer were included as the primary cohort.

**Methods:** Demographics, comorbidities, and hospital-related characteristics were compared between patients receiving laparoscopic and open resection.

**Results:** After adjustment for confounding factors, colorectal cancer patients aged  $\geq 80$  years undergoing laparoscopic cancer resection had significant lower risk of in-hospital mortality (odds ratio [OR], 0.43), postoperative complications (OR, 0.82), adverse discharge (OR, 0.66), and shortened length of stay than open resection.

**Conclusion:** Compared to open resection, laparoscopic cancer resection is associated with favorable in-hospital outcomes in colorectal cancer patients aged  $\geq 80$  years.

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# Relationship Between Abdominal Aortic Calcification With 30 Days Postoperative Outcome in Patient Underwent Colorectal Surgery

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**Purpose:** Anastomotic leakage in colorectal surgery remains a devastating complication with its associated postoperative morbidity and mortality. Various risk factors have been described, such as American Society of Anaesthesiology (ASA) classification, left-sided anastomosis, or emergency surgery. However, the rate remained high. Thus, risk factors for colorectal anastomotic leakage and associated postoperative morbidities remain incompletely understood and yet to be discovered. This study describes the use of abdominal aortic calcification score (ACS) as a prognostic factor for colorectal anastomotic leakage and its associated postoperative morbidities.

**Methods:** This is a retrospective review of patient clinical data at Hospital Universiti Sains Malaysia from January 2012 until June 2017. Cases were all patients who underwent colorectal surgery with left-sided anastomosis including benign and malignant disease performed in elective or emergency settings. All cases either open or laparoscopic approaches were included in this study. Abdominal ACS were determined by preoperative computed tomography scan and its association with early postoperative outcome (30 days) was analyzed.

**Results:** A total of 78 patients were included in this study in which 42 patients (53.8%) were female and 36 patients (46.2%) were male. The mean age of the subject is 56.47 years. Majority had been diagnosed with hypertension (42.3%) and diabetes mellitus (24.4%), while some others were diagnosed with hyperlipidemia (17.9%) and ischemic heart disease (11.5%). Thirty-six patients (46.2%) were ASA II, 32 patients (41.0%) were ASA I while the other 10 patients (12.82%) were ASA III. As for abdominal ACS, the majority had a score of 1 (37 patients, 47.4%). Twenty-four patients (30.8%) had no aortic calcification (ACS score 0) while the remaining 17 patients (21.8%) had ACS of 2. There was significant association between hypertension and ACS ( $P=0.002$ ). There was also significant association between ASA grade and ACS ( $P=0.001$ ). In our study, majority of subjects had no postoperative morbidity (48.7%) such as wound infection, atelectasis, or even major postoperative morbidity such as sepsis and death. Thirty-one patients (39.7%) had minor complications (Clavien-Dindo grade I and II) and 9 patients (11.6%) had major complications (Clavien-Dindo grade III–V). However, there was no significant correlation between ACS with postoperative morbidity ( $P=0.921$ ). Postoperative anastomotic leakage was diagnosed in 10 patients (12.8%). There was 1 postoperative mortality recorded. Otherwise, there was no significant relationship between ACS and anastomotic leakage ( $P=0.572$ ).

**Conclusion:** This study demonstrates that abdominal ACS does not correlate with postoperative morbidity or influence the colorectal anastomotic leakage. However, future prospective study is suggested with a larger sample size.

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# How Can We Choose the First-Line Regimen for KRAS-Wild Type Patients Who Have Resectable or Suboptimal Resectable Liver Metastases From Colorectal Cancer?

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**Purpose:** Liver resection is the treatment of choice for resectable liver metastases from colorectal cancer. Addition of cetuximab to chemotherapy use with perioperative setting showed disadvantages of overall survival (OS) in NEW-EPOC trial. However, the real-world outcomes for these patients are still unclear. Our primary aim was to analyze prognosis in patients with KRAS wild-type colorectal cancer who are undergoing curative-intent liver metastasectomy and primary tumor resection. Analyzing first regimens administration for either adjuvant nor perioperative setting could assess the effect on OS and recurrence-free survival (RFS).

**Methods:** This is a retrospective cohort study and patients were enrolled from 2010 to 2017 at Taichung Veterans General Hospital. We enrolled the patients who meet the selection criteria, OS and RFS were calculated with Kaplan-Meier method. We also tried to find prognostic factors using univariate and multivariate analysis.

**Results:** Sixty-three patients were eligible and enrolled in the study between January 2010 to December 2017. It disclosed better OS (81 months) and RFS (41 months) in the group receiving chemotherapy combined with bevacizumab.

**Conclusion:** Despite the regimen selection is not a decisive prognostic factor for these patients, it shows relatively better OS and RFS benefits in the group of chemotherapy with bevacizumab as 1st regimen. We provide a different thought about choosing regimen in resectable colorectal cancer liver metastasis patients.

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# Efficacy of Assessing Intraoperative Anastomosis Site Bowel Perfusion With Near-Infrared Camera in Colorectal Cancer Surgery

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**Purpose:** Anastomotic leaks after colorectal surgery result in significant morbidity and mortality. Insufficient blood supply to the site of anastomosis is the most important factor that contributes to anastomotic leakage. During surgery, the surgeon selects an optimal site for anastomosis is dependent on subjective clinical indicators. During traditional surgery, we observe the change in color of the colonic wall with the surgeon's naked eye and observe the pulsation of colonic bowel wall artery to evaluate the blood perfusion. During these years, Near-infrared fluorescence imaging allows surgeons to visualize the tissue perfusion and had been adapted in several surgical fields. With the development of indocyanine green (ICG)-enhanced fluorescence-guided imaging system capable of real-time monitoring, objective assessment of blood flow to the colon has become possible. It had been adopted during colorectal surgery in these years to evaluate the anastomosis site bowel wall perfusion. But, it is still unclear whether intraoperative fluorescence angiography offers a benefit in colorectal resections to prevent anastomotic leak. For now, the literature which was published were less of case numbers. So, our purpose was to determine whether the use of intraoperative fluorescence angiography can affect the anastomotic leak rate in colon and rectal cancer surgery patients with large case numbers in 1 single institute. The main purpose was to determine the relationship between intraoperative angiography usage and colorectal anastomotic leaks in colorectal cancer patients, and to evaluate other risk factors which related to anastomotic leakage.

**Methods:** We performed a retrospective review of all of the patients who underwent colon and rectal cancer surgery with primary anastomosis from March 2016 through March 2020 by colorectal surgeons at our hospital. No matter if they had received ICG test or not were all included. Patient with stage IV colorectal cancer, incomplete data, who received open or emergency surgery and American Society of Anaesthesiology score greater or equal to IV were all excluded. The primary outcome was anastomotic leak occurring within 60 days of the initial operation.

**Results:** A total of 802 patients were diagnosed with colorectal cancer and received colorectal surgery were studied. Of these patients who underwent elective resections, 400 (49.8%) had evaluated the anastomosis site with intraoperative fluorescence angiography and 402 (50.2%) did not undergo intraoperative angiography. The anastomotic leak rate was no significant difference in patients with intraoperative angiography and those in whom it had not been used (3.2% vs. 4.2%;  $P=0.466$ ). Univariate analysis revealed that preoperative pelvic radiation ( $P<0.001$ ) and lower rectal anastomosis ( $P<0.001$ ) were positively associated with anastomotic leak.

**Conclusion:** Our study revealed that there was no strong relationship between the use of intraoperative fluorescence angiography to detect the perfusion of the colon anastomosis with preventing postoperative anastomotic leak. Many factors may affect the result of anastomosis and not only anastomosis site perfusion. Therefore, large prospective, randomized controlled trials are required to show if ICG test can really help to prevent anastomotic leaks.

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# The Impact of Multidisciplinary Surgical Team on Colorectal Cancer Operation: A Retrospective Study From a Would-Be Medical Center in Taiwan

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**Purpose:** Since distant metastasis and local recurrence were the most common cause of colorectal cancer death, we believed that when distant metastasis or locally advanced tumor was observed, 2 or more than 2 operating surgeons (combined surgery) participated at the operation can improve the prognosis and outcome of patients. This study aimed to confirm performing multidisciplinary surgical team operation when the above indications occurred would improve the survival and other outcomes of patients using the database at our institution.

**Methods:** A retrospective observational study was conducted, that involved all colon cancer patients between November 2015 and December 2019 at 1 would-be medical center. Patients were divided into 3 cohorts: those who were complicated cases and had combined surgery (C\_2S), those who were complicated cases and had surgery performed by a single surgeon (C\_1S), and those who were not complicated cases and had surgery performed by a single surgeon (NC\_1S). Overall survival and disease-free survival were compared among the 3 groups.

**Results:** A total of 296 patients with colon cancer during the study period, of which 35 patients were group C\_2S, 87 patients were group C\_1S, and 174 patients were group NC\_1S. Patients in the group NC\_1S had significantly higher 12-, 24-, and 36-month overall survival rates compared to the patients in C\_1S ( $P=0.004$ ). In contrast, there was no significant difference in overall survival rates among patients in NC\_1S and C\_2S ( $P=0.151$ ). In parallel, a significant difference between NC\_1S and C\_1S in disease-free survival rates was observed ( $P=0.004$ ); there was no significant difference in disease-free survival rates among patients in NC\_1S and C\_2S ( $P=0.253$ ).

**Conclusion:** The quality of surgery must impact the prognosis, especially in the individual who was complicated case, the survival in patients who had surgery performed by multidisciplinary surgery team would be improved.

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# Role of Preoperative Neutrophil Lymphocyte Ratio in Predicting Lymph Node Involvement in Colorectal Malignancy

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**Purpose:** Accurate preoperative predictors of lymph node involvement in colorectal malignancy are currently lacking. Hence in this study, we sought to evaluate the usefulness of preoperative NLR in predicting the lymph node metastasis in patients with colorectal malignancy. The aim of this study was to determine the role of neutrophil-lymphocyte ratio (NLR) as a predictor of lymph node metastasis in colorectal malignancy.

**Methods:** A retrospective study was conducted at a tertiary care hospital in southern India, with pretreatment of complete haemogram to determine the NLR and was correlated with the histopathological TNM staging between January 2016 to December 2020.

**Results:** A total of 136 cases were studied, with male:female ratio of 2.2:1. The average age of the patients was 50–60 years. The average preoperative NLR was 4.25. With respect to the tumor staging of TNM, there was no significant statistical difference between low grade (T1/T2) and high grade (T3/T4) tumors, with mean NLR of 4.22 in low-grade tumors and 4.38 in high-grade tumors. However, there was a significant statistical difference between NLR among patients with nodal involvement and those without. Mean NLR was 3.6 among patients without nodal involvement on histopathological examination while it was 5.01 in patients with nodal metastasis ( $P=0.03$ ). However, there was no correlation between NLR and number of lymph nodes positive for metastasis on histopathological examination.

**Conclusion:** There is a positive correlation between high preoperative NLR and lymphovascular/lymph node metastasis (on histopathological examination) in colorectal malignancy.

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# Survival Rate Between Intravenous Adjuvant Chemotherapy in Inpatient and Outpatient Department Settings for Patients With Stage III Colorectal Cancer

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**Purpose:** Adjuvant chemotherapy with oxaliplatin plus fluoropyrimidine for 6 months has become the standard treatment for stage III colorectal cancers for more than 15 years. Some patients receive intravenous chemotherapy at the inpatient department (IPD) rather than the outpatient department (OPD) because of several reasons, such as commercial health insurance. In addition, the limited availability of beds causes delayed admissions for those patients who received inpatient treatment. Thus, this retrospective study aimed to evaluate the effects of delayed admissions for adjuvant chemotherapy on oncologic results.

**Methods:** Patients with stage III colorectal cancer who had received more than 6 cycles of intravenous chemotherapy of FOLFOX or XELOX from January 2010 to December 2014 at Taichung Veterans General Hospital, Taichung, Taiwan were enrolled in this retrospective study. SPSS ver. 28.0 was used as the statistics program. The Kaplan-Meier method was used to analyze the disease-free survival (DFS) and overall survival (OS) rates. Statistical results were considered significant when the P-value was less than 0.05.

**Results:** A total of 257 patients were enrolled. Among them, 211 patients were in the OPD group, and 46 patients were in the IPD group. The age between these groups showed a statistically significant difference, and the median age of OPD:IPD was 58 (51–67):53 (46–66) ( $P=0.024$ ). The median total number of cycles of chemotherapy showed no significant difference between the 2 groups (12 [10–12]:12 [10–12],  $P=0.932$ ). Meanwhile, the total duration of chemotherapy and the standardized total duration of chemotherapy were significantly longer for the IPD group than the OPD group (5.75 months [5.32–6.21 months] vs. 6.44 months [5.75–7.85 months],  $P<0.001$  and 5.98 months [5.52–6.67 months] vs. 7.15 months [6.21–8.15 months],  $P<0.001$ ). No significant difference in 3-year DFS rate (71.3% vs. 65.7%,  $P=0.697$ ), 5-year DFS rate (63.1% vs. 58.9%,  $P=0.697$ ), and 5-year OS rate (80.7% vs. 84.3%,  $P=0.306$ ) was found between the OPD and IPD groups.

**Conclusion:** The treatment duration showed a significant difference between the OPD and IPD groups. However, no statistically significant difference in 3-year DFS and 5-year OS was found between the 2 groups. Therefore, even though patients with IPD would have to prolong the interval of the entire treatment, the outcome is non-inferior to that of the OPD group.

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# Effect of Post Operative Adjuvant Chemotherapy on 5-Year Relapse-Free Survival and 10-Year Overall Survival in Patients With Stage IIIA Colon Cancer

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**Purpose:** A good survival has been observed in stage IIIA colon cancer; therefore, we investigated the effect of adjuvant chemotherapy on survival of this stage. In this study, we hypothesized that even patients with stage IIIA colon cancer who do not receive adjuvant chemotherapy have a low risk of cancer relapse because pericolic or epicolic lymph node metastasis, which has a limited range in this stage, can be completely resolved through surgery. Patients with stage IIIA colon cancer probably receive limited benefits from adjuvant chemotherapy after curative surgery. We aimed to determine the effect of adjuvant chemotherapy on the prognosis and survival outcomes of patients with stage IIIA colon cancer.

**Methods:** We retrospectively studied 215 of 3,378 patients with stage III colon cancer who underwent cancer resections between 1995 and 2016.

**Results:** Among these patients, 137 (63.7%), 76 (35.3%), and 2 patients (0.9%) had N1a, N1b, and N2a lymph node metastasis, respectively. Two groups, namely adjuvant chemotherapy (resection followed by chemotherapy, n = 166) and cancer-resection-only (n = 49) groups, were compared. The cancer-resection-only group had significantly more patients with comorbidities than did the adjuvant chemotherapy group. The physical grades of American Society of Anesthesiologists classification ( $\geq$ III) were significant in the cancer-resection-only group than in the adjuvant group (40.8% vs. 19.0%;  $P = 0.007$ ). The 5-year relapse-free survival nonsignificantly differed between the adjuvant chemotherapy and cancer-resection-only groups (91.8% vs. 93.3%;  $P = 0.809$ ). A multivariate analysis revealed a significant difference between the groups in terms of relapse-free survival at T2 disease ( $P = 0.030$ ). Furthermore, the 10-year overall survival was significantly higher in the adjuvant chemotherapy group than in the cancer-resection-only group only among patients aged  $\geq 65$  years or with T2 stage of stage IIIA cancer (92.3% vs. 71.7% and 92.7% vs. 70.5%, respectively;  $P < 0.001$  in both comparisons).

**Conclusion:** Patients with stage IIIA colon cancer had favorable outcomes. Adjuvant chemotherapy did not improve the better relapse-free survival. The difference in overall survival between the 2 groups might be attributable to confounding factors, such as patient age and T2 status.

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# Left-Sided Colonic Lengthening for Infraperitoneal Colorectal Anastomosis With 3 Stepwise Maneuvers: How Much Do We Gain?

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**Purpose:** Adequate lengthening of left-sided colon is one of the most important factors influencing tension-free colorectal anastomosis. This study aimed to evaluate the gain of colonic lengthening following 3 stepwise maneuvers: high ligation of the inferior mesenteric artery at its origin (H-IMA), mobilization of the splenic flexor (M-SP), and high ligation of the inferior mesenteric vein (H-IMV) at the inferior border of pancreas.

**Methods:** Patients undergoing open low anterior resection (with infraperitoneal colorectal/coloanal anastomosis) for rectal cancer in a university hospital between April 2018 and December 2020 were included. The gain of colonic lengthening was measured by the distance between the middle point of sigmoid colon and the pubic symphysis (as a reference point). If a tension-free anastomosis was achieved by the first 2 maneuvers, H-IMV can be omitted. Clinical outcomes including anastomotic leakage were also determined.

**Results:** This study included 31 patients (male, 58%) with average age of 62 years and body mass index of 22.8 kg/m<sup>2</sup>. Five patients (16%) had neoadjuvant chemoradiation. Distal border of rectal cancer was located at 6.3 ± 2.1 cm from the anal verge. Eleven patients (35%) had diverting colostomy after the operation. The average gain of colonic lengthening was 3.9 ± 1.4 cm for H-IMA (range, 2–8 cm), 5.5 ± 1.7 cm for M-SP (range, 3–10 cm), and 6.5 ± 1.5 cm for H-IMV (range, 8–19 cm). Notably, only 19 cases (61%) needed H-IMV to achieve tension-free anastomosis. Total left-sided colonic lengthening was 13.4 ± 2.5 cm (range, 8–19 cm). There was 1 (3%) wound infection and 1 (3%) anastomotic leakage—successfully treated by intravenous antibiotics. Length of postoperative stay was 4.4 ± 1.4 days.

**Conclusion:** H-IMV gained the longest distance of left-sided colonic lengthening, followed by M-SP and H-IMA. However, only about 60% of cases needed to have H-IMV for tension-free anastomosis.

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# Clinicopathologic Analysis and Surgical Outcomes of Emergency Versus Elective Colon Cancer Surgery

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**Purpose:** In spite of screening initiatives for colon cancer, emergency surgeries for colon cancer are still performed and are associated with poor surgical outcomes. Clinical signs and symptoms of colon cancer at the time of diagnosis reflect tumor disease progression, and in patients who undergo emergency surgeries, they are predicted to have advanced pathologic stage and high-risk pathologic features which correlate to poor outcomes. This study aims to compare the clinicopathologic features and surgical outcomes of elective and emergency colon cancer surgeries in a single tertiary center in the Philippines.

**Methods:** This is a retrospective cohort of 148 colon cancer resection surgeries between 2017 and 2019. Of which, 104 (70%) were elective and 44 (30%) were emergency. Clinical and histopathologic data were compared between elective and emergency surgeries. The main outcomes identified were postoperative morbidity, intensive care unit (ICU) transfer, 30-day readmission, 30-day reoperation, and in-hospital mortality.

**Results:** Emergency colon cancer patients presented with obstruction ( $n=34$ ,  $P<0.001$ ), bleeding ( $n=11$ ,  $P=0.004$ ) and anemia ( $n=9$ ,  $P=0.22$ ). For both surgeries, more than half of patients had a sigmoidal location (55%). Tumor diameter and adequate lymph node harvest showed no significant difference in between elective and emergency surgeries. Emergency surgeries showed higher primary tumor (pT), mostly T3 and above ( $P=0.008$ ). TNM stage ( $P=0.163$ ), regional node metastasis ( $P=0.287$ ), and distant metastasis ( $P=1.00$ ) showed no significant difference for both elective and emergency. Presence of perineural growth ( $P=0.002$ ) is the only high-risk feature associated with emergency surgeries. Emergency colon cancer surgeries were observed to have higher risk for postoperative morbidity ( $P=0.006$ ), ICU transfer ( $P=0.004$ ) and in-hospital mortality ( $P=0.028$ ).

**Conclusion:** Acute symptoms in cases of emergency colon cancer surgery reflect the pathologic advancement of the pT. When performing emergency surgeries, this is associated with poor short-term surgical outcomes including postoperative morbidity and in-hospital death.

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# Closed Loop Large Bowel Obstruction Secondary to Signet Ring Cell Cancer of the Appendix: A Case Report

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**Purpose:** Primary appendiceal malignancy is a relatively rare entity, constituting <0.5% of all gastrointestinal neoplasms. Of these, signet ring cell cancer is the least common. Patients with these tumors usually present with non-specific symptoms, ranging from vague abdominal pain to localized peritonism often mimicking appendicitis. We describe an unusual presentation of closed loop large bowel obstruction secondary to signet cell ring cancer of the appendix.

**Case report:** A 62-year-old male presented to the emergency department with a 2-day history of colicky lower abdominal pain, bloating, and obstipation. Examination revealed a distended abdomen with peritonism in the right lower quadrant. Patient was also febrile to 39°C and tachycardic to 110 beats per minute. Computed tomography demonstrated a distended large bowel extending from caecum to a transition point in the distal sigmoid colon with pneumoperitoneum. Patient was taken to theatre for emergency laparotomy. Findings included a closed loop obstruction of the large bowel with sigmoid colon densely adhered to caecum. A near obstructing mass was found in the sigmoid colon. Additionally, there was a full thickness tear of the caecum with feculent contamination. A subtotal colectomy was done to manage the sigmoid lesion and the caecal perforation.

**Conclusion:** Appendiceal malignancy has 5 main subtypes with signet cell cancer the least common subtype. Ninety-three percent of patients with signet cell cancer have distant metastases at the time of diagnosis. Certainly, this was the case in our patient. To our knowledge, there are no other reports of signet cell appendiceal malignancy presenting as a closed loop large bowel obstruction. Our case demonstrates that appendiceal tumors present in a variety of ways, some mimicking appendicitis while others present in a much more sinister manner.

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# Relationship Between Lymph Node Ratio and Survival Rate in Preoperative Chemoradiation Rectal Cancer Patients

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**Purpose:** Number of positive lymph nodes is one of the most-important prognostic factors in rectal cancer. Rectal cancer patients who undergo colorectal surgery following neoadjuvant chemoradiation therapy are sometimes unable to retrieve an adequate amount of lymph nodes. We proposed to confirm the new way to predict outcome of rectal cancer patients based on positive lymph node ratio.

**Methods:** This is a retrospective, single-centered study, collecting data of patients from January 2011 to December 2017. Data from 149 patients with rectal cancer who underwent colorectal surgery following neoadjuvant chemoradiation were analyzed. Cox regression and Kaplan-Meier survival analysis were used to determine the prognostic values of lymph node ratio, total lymph nodes harvested, and TNM staging.

**Results:** A higher positive lymph node ratio is significantly related to poorer survival rate of patients with rectal cancer who received neoadjuvant chemoradiation. There was no statistically significant difference between total lymph nodes harvested and survival rate. There was no statistical difference in survival rate among pathological stages II, IIIA, IIIB, and IIIC. Five-year survival rates after neoadjuvant chemoradiation therapy were 86.18%, 75%, 86.50%, and 83.33% in rectal cancer patients stage II, IIIA, IIIB, and IIIC, respectively.

**Conclusion:** The lymph node ratio can be used as predictor for survival in post-surgery rectal cancer patients who received neoadjuvant chemoradiation therapy. Future research is needed to find the optimum cutoff value.

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# Systematic Review and Meta-Analysis of the Prevalence of Colon Cancer in Right-Sided Diverticulitis

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**Purpose:** Acute right colonic diverticulitis (ARCD) is inflammation of the colon proximal to the splenic flexure. No consensus guidelines for ARCD exist and is guided by the management principles of acute left colonic diverticulitis. Diverticulitis is a risk factor for colon cancer with 1.6%–1.9% prevalence within the first year on a background prevalence of 0.4% for screening colonoscopy. However, new studies disagree in Asian populations where ARCD is more common and advocate no role for routine colonoscopy post ARCD. A systematic review and meta-analysis of the literature was conducted to investigate the prevalence of colon cancer in ARCD.

**Methods:** Review of Medline, EMBASE, PubMed, Cochrane, World Wide Web identified abstracts which were independently reviewed to meet specified criteria and assessed with PRISMA Checklist guidelines. Pooled analysis was conducted with Stata/SE and MetaXL utilizing random effects model to account for heterogeneity.

**Results:** A total of 179 abstracts were shortlisted with 9 articles selected for final review. This study examined 32,524 patients with ARCD with mean age of 48.8 years (standard deviation, 7.4 years). Prevalence of colon cancer was 1.3% (95% confidence interval [CI], 0.4%–2.8%). Subgroup analysis of Asian studies (n = 32,433) showed prevalence of 1% (95% CI, 0.1%–2.6%) and non-Asian (n = 91) of 3% (95% CI, 0.1%–8.4%). Sensitivity analysis to exclude 1 study with significant selection bias showed a prevalence of 0.9% (95% CI, 0.1%–2.1%).

**Conclusion:** Prevalence of colon cancer in ARCD was not significantly increased overall or in subgroup analysis of ethnicity. These findings suggest no role for routine colonoscopy post ARCD; however, studies were heterogenous with concerns for selection bias in studies that examined only patients chosen for colonoscopy. Future prospective case-control studies with ethnicity subgroup analysis will be required to establish the role for colonoscopy post ARCD.

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# PCOLCE2 Is a Prognostic-Related Biomarker and Correlated With Clinical Pathologic Features and Immune Infiltrates in Colorectal Cancer

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**Purpose:** Procollagen C-endopeptidase enhancer 2 (PCOLCE2) has different expressions in various tumors, and has been seen as a poor predictive biomarker in ovarian cancer. We aim to investigate the molecular connections between PCOLCE2 and colorectal cancer (CRC) remains unclear.

**Methods:** The information of PCOLCE2 gene expression in CRC was collected from The Cancer Genome Atlas (TCGA) database, and further validated the result with Oncomine databases, Genotype-Tissue Expression (GTEx), TIMER database, and Human Protein Atlas (HPA). Kaplan-Meier survival curves and Cox regression model was utilized to analyze the influence of PCOLCE2 expression on overall survival and clinicopathologic features of CRC correspondingly. Enrichment analysis of PCOLCE2 was performed by GO, KEGG, and GSEA. Finally, we analyzed the association between immune infiltration and PCOLCE2 expression through TIMER database.

**Results:** It was demonstrated that PCOLCE2 gene expression was significantly lower in CRC samples compared with normal tissues ( $P < 0.001$ ). However, the survival curve indicated that the high PCOLCE expression had a poor overall prognosis ( $P < 0.001$ ). Besides, the up-regulated PCOLCE2 was significantly correlated with the pathologic stages, T stages, N stages, and the carcinoembryonic antigen levels. Multivariate analysis confirmed that PCOLCE2 remained an independent tumor risk factor for CRC patients. GSEA revealed that the calcium signaling pathway, focal adhesion, neuroactive ligand-receptor interaction, and cytokine receptor interaction showed differential enrichment in the positive correlation with PCOLCE2 expression. For immune infiltration, the PCOLCE2 expression was positively correlated with M2 macrophages infiltration and polarization in CRC, especially in colon cancer.

**Conclusion:** PCOLCE2 is possibly a clinically valuable predictive biomarkers for CRC patients. Although the gene expression level of PCOLCE2 was relatively lower in CRC tissue, the downregulation of PCOLCE2 was associated with a better prognosis.

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# Gut Microbiota Serve as Prognostic Biomarker for Predicting the Survival of Colorectal Cancer Patients

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**Purpose:** Emerging evidences have shown that dysbiosis could promote the progression of colorectal cancer (CRC). However, the association of dysbiosis and prognosis of CRC is barely investigated. To explore the pathological process of how microbiota could affect the prognosis of CRC patients.

**Methods:** Emerging evidences have shown that dysbiosis could promote the progression of CRC. However, the association of dysbiosis and prognosis of CRC is barely investigated.

**Results:** We found that *Fusobacterium nucleatum* and *Bacteroides fragilis* were more abundant in worse prognosis groups, while *Faecalibacterium prausnitzii* displayed higher abundance in survival group. Kaplan-Meier and Cox proportional regression analyses exhibited that high abundance of *F. nucleatum* and *B. fragilis* were independent indicators of poor patient's survival. Besides, the expression of major inflammatory mediator showed that high abundance of *F. nucleatum* was associated with increased expression of tumor necrosis factor- $\alpha$ ,  $\beta$ -catenin and nuclear factor (NF)- $\kappa$ B, while cyclooxygenase-2, matrix metalloproteinase (MMP)-9 and NF- $\kappa$ B were positively related with high *B. fragilis* level, and high level of *F. prausnitzii* showed lower expression of  $\beta$ -catenin, MMP-9, and NF- $\kappa$ B. Moreover, immunohistochemical analysis indicated that KRAS and BRAF expression were prominent in *F. nucleatum* and *B. fragilis* high abundance group, while MLH1 showed lower expression.

**Conclusion:** *F. nucleatum*, *B. fragilis*, and *F. prausnitzii* can be identified as useful prognostic biomarkers for CRC, and dysbiosis might worsen the patients' prognosis by up-regulating gut inflammation level.

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# A Pilot Study on Clinicopathological Features and Intestinal Microflora Changes in Colorectal Cancer Patients Born Over a 9-Year Period Encompassing 3 Years Before and After the Great Chinese Famine

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**Purpose:** Exposure to energy restriction during childhood is associated with a lower risk of developing colorectal cancer (CRC). To date, the association between this critical period of growth and prognosis of CRC has rarely been investigated. Changes in microbiota and epigenetic dysregulation may be key underlying mechanisms. Using a patient population from the period of the “Great Famine” in China to investigate the associations between energy restriction in childhood and CRC prognosis as well as risk of developing CpG island methylator phenotype (CIMP) tumors in later life.

**Methods:** Tissues collected from patients born between 1956 and 1964 were grouped based on time-period. The differences in overall survival among patients from the 3 time-periods were examined via univariate analysis. The 16S rRNA gene sequencing approach was to determine differences in microbiota among the groups. Samples were randomly selected to detect BRAF mutations, microsatellite instability (MSI), and promoter CIMP status. The chi-square test was to assess the relationship between alterations in these molecules and microbiota differences.

**Results:** Patients from the 3 groups differed in terms of location of CRC ( $P=0.034$ ) and carcinoembryonic antigen level ( $P=0.036$ ). A survival advantage was observed in the famine group compared with the other 2 groups. *Fusobacterium nucleatum*, *Bacteroides fragilis*, and *Escherichia coli* were more abundant in the 2 comparing groups. Abundance of *B. fragilis* was associated with BRAF mutations, MSI, and abundance of *E. coli*. Moreover, the incidence of CIMP and MSI was higher in patients with greater abundance of *F. nucleatum*.

**Conclusion:** Limitation of energy intake during childhood may affect the composition of gut microbiota, resulting in persistent epigenetic changes that subsequently influence the prognosis of patients with CRC.

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# Robotic Versus Laparoscopic Right Hemicolectomy: Is It Worth It?

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**Purpose:** Colorectal cancer is the third most common malignant disease worldwide and the second commonest cause of cancer death in Australia. Surgery remains the definitive curative treatment for right-sided colon cancer. Most right hemicolectomies are performed laparoscopically, and the technique is safe and proven. Robotic surgical platforms have been available for many years, but only recently has there been substantial growth within the field of colorectal surgery, though debate has arisen as to their advantages and around cost/benefit ratios. Robotic right hemicolectomy (RRC) may have technical advantages over the conventional laparoscopic right colectomy (LRC). There is growing literature describing advantages of RRC compared to LRC; however, there is a lack of evidence about safety, oncologic quality of surgery, and cost. This study aimed to analyze complication rates, length of stay (LOS), and lymph node harvest (LNH) in patients undergoing minimally invasive right hemicolectomy for colon cancer from a prospective Australasian colorectal cancer database.

**Methods:** This was a retrospective cohort study using nearest neighbor matching. The Binational Colorectal Cancer Audit (BCCA) provided the data for analysis. The primary outcome was LOS. Secondary outcomes were LNH count, anastomotic leak, postoperative hemorrhage, abdominal abscess, postoperative ileus, wound infections, and nonsurgical complications.

**Results:** A total of 4,977 patients who underwent RRC (n=146) or LRC (n=4,831) for right-sided colon cancer were included. For RRC, LOS was shorter (5 days vs. 6.9 days; P=0.01) and LNH was higher (22 vs. 19; P=0.04). For RRC, lower surgical complications (5.9% vs. 14.2%; P<0.004) and lower nonsurgical complications (4.6% vs. 11.7%; P=0.007) though no difference in return to theatre or inpatient death.

**Conclusion:** RRC is associated with a shorter LOS and marginally higher LNH, though this may reflect anastomotic technique rather than surgical platform. Longer-term studies are required to establish differences in overall survival, incisional hernia rates, and cost-effectiveness.

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# A Rare Case of Synchronous Colon Adenocarcinoma

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**Purpose:** Synchronous tumor is defined as the presence of more than 1 primary malignant lesion in the same patient at the indexed diagnosis. It is a rare occurrence, especially in the spectrum of colorectal cancer which accounts for less than 4%. The underlying pathology of a synchronous tumor is thought to be due to genomic factor, which is microsatellite instability with the involvement of BRAF, KRAS, and GSRM1 gene. There are no specific sites of occurrence for the colorectal synchronous tumor, but many studies have shown that a synchronous tumor has about 43% predominance in the ascending colon with rarity in sigmoid colon. We reported a case of a young female patients in the middle of her 30s with no family history of colorectal cancer that was diagnosed with a synchronous adenocarcinoma at the descending colon and recto-sigmoid region. The patient's presentation was quite perplexing as she presented to the district hospital initially with simple uncomplicated hemorrhoids and constipation. She was then referred to our center for further management as she developed a 'football' sized right gluteal swelling with a complete intestinal obstruction and bilateral lower-limb paralysis. We performed a computed tomography scan and biopsy of the lesion which found out that the tumor engulfed the sacrococcygeal region with more than 1 primary lesion in the colon as well as secondaries in the liver. The patient was operated on after a multidisciplinary meeting was held. Pelvic exenteration with tumor debulking and anterior resection was performed. Postoperatively, she was referred to the oncology team for chemotherapy. She had tremendous recovery in 8 months' time with a partial regain of her lower limb power. The patient is still under our follow-up with an improved quality of life postintervention. To investigate the incidence of synchronous tumors in colorectal cancer.

**Methods:** Retrospective review of patient that had a descending colon and rectosigmoid synchronous tumor.

**Results:** Very low incidence of synchronous tumor especially in a descending and sigmoid Adenocarcinoma compared to other sites of the colon.

**Conclusion:** Synchronous tumor occurrence in large colon has no specific region and its incidence in descending and sigmoid colon is very rare.

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# Pathological Response Has Survival Benefits for Rectal Cancer Following Neoadjuvant Therapy

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**Purpose:** Studies reporting the results of associated factors of pathological completed response (PCR) and tumor regression response in patients with rectal cancer following neoadjuvant chemoradiation therapy (nCRT) are inconsistent. The purpose of this study was to identify the prognostic factors of tumor response and outcome in rectal cancer patients.

**Methods:** We retrospectively reviewed the medical records of patients with newly diagnosed rectal cancer who underwent nCRT followed by surgery at Taipei Medical University Hospital in Taiwan from January 2010 to July 2014. Patients were followed July 2019 with 5 years follow-up duration. Patients who received the short course of neoadjuvant radiation therapy were excluded from the study.

**Results:** A total of 169 rectal cancer patients were included. The PCR rate was 17.8%, and the downstaging rate was 60.9%. Patients with a histology type of adenocarcinoma associated with PCR, and patients positive for clinical N stage were associated with downstaging. Kaplan-Meier analysis showed the PCR group performed better to a statistically significant level both in overall survival and disease recurrence-free survival than the no PCR group ( $P=0.033$  and  $P=0.025$ , respectively). Patients with a downstaging response also showed better overall survival benefits and disease recurrence-free survival benefits than their counterparts (both  $P<0.001$ ). After controlling confounding variables, the risk factors of overall survival were downstaging (hazard ratio, 0.40; 95% confidence interval, 0.21–0.74), male, abnormal post-nCRT carcinoembryonic antigen level, and abnormal hemoglobin level. In addition, the protective factors of recurrence were downstaging and having received adjuvant chemotherapy.

**Conclusion:** Among rectal cancer patients who received neoadjuvant therapy, histology type and clinical N stage were associated with PCR and downstaging, respectively. Downstaging was an important protective factor for better overall survival and recurrence-free survival.

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# Expression of LRG5 and CD44 in Colorectal Polyps and Adenocarcinomas

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**Purpose:** Although the precise mechanism is still not understood, they arise through a multistep process in which genetic and epigenetic alterations accumulate in a sequential order; so the better-defined precursor lesions are adenomatous polyps. The aim of this study is to detect presence of cancer stem cell-related markers LGR5 and CD44 in hyperplastic and adenomatous polyps and also in colorectal carcinomas.

**Methods:** Paraffin blocks of formalin-fixed tissue specimens from 50 archival cases that were comprised of 25 hyperplastic polyps, 25 tubular adenomas, 25 villous adenomas, and 25 colonic adenocarcinomas were included in this study. Specific antibodies against LGR5; a G-protein coupled receptor and CD44; and a cell-surface glycoprotein were used to assess the stem cell properties via immunohistochemistry. The H-score method assigned a score of 0–300 to each patient, based on the percentage of cells stained at different intensities viewed at various magnifications.

**Results:** The difference in H-score between the hyperplastic polyps, adenomas, and adenocarcinomas was statistically significant with either antibody. Villous adenomas showed the highest H-score with LGR-5 immunoreactivity mostly in a diffuse and moderate-to-strong manner when compared to hyperplastic polyps ( $P < 0.05$ ), tubular adenoma ( $P < 0.01$ ), and adenocarcinoma ( $P < 0.05$ ). CD44 expression was nearly identical between villous and tubular adenomas with moderate to strong staining. H-scores for both of these adenomatous lesions were determined as  $154 \pm 247$  for villous and  $156 \pm 243$  for tubular adenomas. Hyperplastic polyps demonstrated reactivity mainly in a weak or focal staining pattern while adenocarcinomas showed rather weak or moderate immunoreaction ( $P < 0.05$ ).

**Conclusion:** These data suggest that expressions of stem cell markers are not well correlated during adenoma progression. We also noted these markers do not seem to be as closely related to dysplasia or invasive malignancy. However, targeting therapy toward CD44 and LGR5 will bring benefits at adenomatous stage of tumorigenesis.

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# Investigate Learning Curve of Converting Laparoscopy to Robotic Surgery in Colorectal Disease and Related Primary Surgery Outcomes

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**Purpose:** Microinvasive surgery bring minor pain, faster recovery, and comparable oncological outcome. Robotic surgery was widely adapted in surgery for its endo-wrist advantage. However, robotic colorectal surgery was thought to be time-consuming and needs long learning curve. Nowadays, Intuitive 4th generation robotic system da Vinci Xi which is more flexible and ergonomic. This study aims to know the learning curve of converting laparoscopy to robot and primary surgical outcomes. From January 1, 2016 to June 30, 2021, this study included robotic colorectal surgery done by Xi system. The surgical outcomes were compared with 65 laparoscopy cases in the same distribution in the same period.

**Methods:** Videos were reviewed and each time point was recorded to describe the completion of surgery. Primary endpoint was surgical outcomes between robot and laparoscopy surgery. Secondary endpoint was learning curve of robot surgery.

**Results:** There were 120 cases that underwent robotic surgery. Of which, 102 cases were done by Xi system and were mainly conducted by surgeon A (CFF) and B (LCY) (A, 68; B, 28; 96 of 102). There were 78 cases with complete video records (A, 52; B, 26). The cases lost video were randomly distributed on the list. Median operation time (op time) were 213:285.5:258 minutes (laparoscopy:robotic surgery:2nd robotic surgery), and median hospital stay were 7:5:4 days (laparoscopy:robotic surgery:2nd robotic surgery). Robotic surgery median op time of 270 minutes (NO. 65–75 minutes) is an obvious shorten point. Robotic surgery para-op time of 136 minutes (NO. 65–75 minutes) is an obvious shorten point. For rectum (n=35), robotic surgery (NO. 84–96) median op time of 265 minutes is similar to 249.5 minutes (laparoscopy). For colon (n=43), robotic surgery (NO. 59–66), median op time of 184 minutes is shorter than 190 minutes (laparoscopy).

**Conclusion:** Robotic colorectal surgery was convertible for experience laparoscopy surgeons. Using da Vinci Xi friendly helps surgeon transfer platform. Rectum surgery takes longer learning curve than colon. Robotic surgery potentiated faster recovery and brings comparable surgical outcomes.

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# Group Practice Based on Enhanced Recovery After Surgery Protocol Compared With Solo-Practice in Patients Receiving Elective Minimal Invasive Colorectal Surgery

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**Purpose:** Enhanced Recovery After Surgery (ERAS) programs are evidence-based protocols designed to standardize medical care, improve outcomes, and lower health care costs. Multimodal care pathways include multiple interventions within the preoperative, intraoperative, and postoperative course of the patient's care journey. To evaluate the result of group practice based on ERAS protocol comparing with traditional solo practice, we would like to find out the difference such as hospital stay and morbidity. In addition, we would also like to look for factors affecting hospital stay.

**Methods:** A retrospective review was performed for patients who received elective minimally invasive colorectal resection at Linkou Chang Gung Memorial Hospital from November 2017 to December 2018. The chi-square test is used for categorical variables. Binary logistic regression is used for ascertaining factors affecting hospital stay.

**Results:** A total of 724 patients were enrolled. Of which, 256 patients were in the group-practice (GP) group and 468 patients were in the solo-practice (SP) group. Median days of postoperative stay were  $6.6 \pm 3.2$  days in GP group and  $8.6 \pm 5.5$  days in SP group ( $P < 0.05$ ). Thirty-six patients in GP group had grade II (28, 10.9%) and III (8, 3.1%) morbidity after operation comparing with 100 patients in SP group, grade II (73, 15.6%) and III (27, 5.8%) ( $P = 0.048$ ). Univariate and multivariate analyses revealed that group practice (odds ratio [OR], 2.84; 95% confidence interval [CI], 1.99–4.05;  $P < 0.001$ ) and natural orifice specimen extraction procedure (OR, 3.49; 95% CI, 2.33–5.10;  $P < 0.001$ ) independently impacted discharge within 5 days positively.

**Conclusion:** Group practice based on ERAS protocol is a safe and effective method for perioperative patient care which shortens hospital stay and reduced morbidities.

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# Early and Delayed Anastomotic Leakage After Colorectal Surgery

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**Purpose:** The delayed anastomotic leakage is still a challenging issue for colorectal surgeon. Anastomotic leakage is a major complication following colorectal surgery. It increases the patient's morbidity and mortality. One-third of all postoperative mortality is related to anastomotic leakage. Delayed anastomotic leakage is hard to detect compared to early leakage. The aim of this study was to compare the risk factors and the management between early and late anastomotic leakage after colorectal resection.

**Methods:** This is a retrospective study. All patients who received colorectal resection with anastomotic leakage between January 2012 to September 2019 at Taipei Veterans General Hospital were included. The early and late anastomotic leakages are defined as anastomotic leakage diagnosed before and more than 30 days after surgery, respectively. The demographic data, neoadjuvant chemotherapy, neoadjuvant radiotherapy, operative methods, relaparotomy rate, anastomotic methods, tumor location, disease stage, and management after leakage were reviewed and compared between 2 groups.

**Results:** Among 5,592 patients who received colorectal resection, 228 patients had anastomotic leakage, with a leakage rate of 4.07%. Among them, 205 patients had early leakage and 23 patients had delayed leakage. There was no difference between the 2 groups in age, history of diabetes mellitus or chronic kidney disease, use of laparoscopic operation, anastomosis by hand or stapler, tumor location, disease stage, albumin level, or the existence of protective stoma. Delayed leakage was significantly associated with female sex (odds ratio [OR], 5.99; 95% confidence interval [CI], 2.20–16.34;  $P < 0.001$ ), use of neoadjuvant radiotherapy (OR, 6.56; 95% CI, 2.13–20.14;  $P = 0.001$ ) and emergent operation (OR, 7.64; 95% CI, 1.21–42.21;  $P = 0.031$ ). The re-laparotomy rate after anastomosis leakage was similar between the 2 groups (22.1% vs. 19.2%;  $P = 0.742$ ).

**Conclusion:** The delayed anastomotic leakage is associated with female sex, neoadjuvant radiotherapy, and emergent operation. Even there were no early leakage episodes, we still need to be aware of the possibility of delayed anastomotic leakage.

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# Comparison of Continuous Preperitoneal Infiltration Versus Patient Controlled Analgesia for Pain Control in Elective Colorectal Surgery

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**Purpose:** Postoperative analgesia is crucial in enhanced recovery after surgery and minimizing postoperative complications. There remains data paucity on the efficacy of preperitoneal analgesia (PPA) compared to patient-controlled analgesia (PCA). This study aims to examine the efficacy of preperitoneal infusion as analgesia following elective colorectal surgery and inform practice.

**Methods:** This is a prospective review in a tertiary surgical referral center with dedicated colorectal unit. Patients from May 2017 to April 2021 who underwent elective colorectal surgery were included in this study. Pain scores were reviewed at regular intervals postoperatively. The chi-square and independent t-test were used for analysis of categorical and continuous data, respectively.

**Results:** Among 200 patients included, 174 patients in the PPA arm and 26 patients with PCA. Patients who received PPA were older age (63.29 vs. 56.00,  $P=0.003$ ). A total of 118 patients in PPA cohort (67.8%) and 21 (80.8%) from PCA cohort underwent open surgery, with remaining undergoing laparoscopic surgeries. While postoperative pain scores were consistently below 5 and reduced in trend from 2 hours to 96 hours postoperatively in both groups, the pain scores on coughing were less in PPA group when compared PCA alone. The total dosage of opioid required in PPA cohort was also significantly lesser when compared to PCA group at the first 24 hours postoperatively 12.21 ( $\pm 13.0$ ) vs. 20.0 ( $\pm 14.43$ ) ( $P=0.048$ ).

**Conclusion:** PPA is effective for analgesia after elective colorectal surgery, reducing the opioid requirement postoperatively for adequate pain control. PPA should be considered to enhance postoperative recovery and minimize postoperative complications.

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# Stoma Impacts Quality of Life at 1-Month Post-Surgery but Not Beyond: Preliminary Findings From an Ongoing Longitudinal Study

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**Purpose:** Colorectal cancer (CRC) is the top cancer in Singapore. About 25% of CRC patients who undergo surgery will require a stoma. CRC patients with stoma experience adverse impact on their quality of life (QOL) even 1 year after their surgery. However, there is a lack of studies on the long-term impact of stoma on QOL in an Asian context. Given the increased experience of stigma associated with stoma, the current study seeks to explore the long-term impact of stoma on QOL in CRC patients in Singapore.

**Methods:** QOL scores using the EORTC QLQ-C30 were obtained from 130 CRC patients alongside their baseline demographics/clinical characteristics at diagnosis and 1-, 3-, and 6-month timepoints after surgery. Among the sample, 53 CRC patients had a stoma while 77 did not. Using multiple regression, the effect of having a stoma on QOL over time for 122 patients was examined, after controlling for confounders and baseline QOL scores.

**Results:** Having a stoma significantly predicted poorer QOL ( $P < 0.05$ ) compared to those without at 1-month post-surgery timepoint, adjusting for baseline demographics/clinical characteristics. At the 3-month and 6-month post-surgery timepoint, having a stoma no longer predicted QOL, although the scores of those with stoma remained lower than those without.

**Conclusion:** The findings suggest that at the 1-month post-surgery timepoint, CRC patients with stoma will experience the largest impact on their QOL and would thus require greater clinical attention and care during that time. Interestingly, from the 3rd month onward, stoma does not influence the QOL scores of CRC patients in our local context. The scope of the current study did not explore possible cultural influence that may explain the recovery of QOL scores. Hence, future studies can consider examining the buffering effects of cultural factors.

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# Effectiveness of Undergraduate Virtual Clinical Teaching During COVID-19 Pandemic

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**Purpose:** Coronavirus disease 2019 (COVID-19) has changed medical education delivery around the world due to suspension of clinical attachment and on-campus activities. Clinical teaching needed to be continued virtually despite all the restrictions. We aimed to evaluate the final year undergraduate medical students' perspective of virtual clinical teaching that was carried out by the unit during the pandemic.

**Methods:** The methodology of online virtual clinical teaching varies from simulated objective structured clinical examination (OSCE), case-based discussion, and real patient encounter via an online platform. An online survey was sent to the final year medical students at the end of the virtual clinical teaching week.

**Results:** A total of 31 students participated in the survey. Out of these, 31% (n = 19) perceived that the virtual clinical week teaching as what they have expected. All of the students agreed that clinical scenario, physical examination, investigations, and management discussed by the lecturer for each case to be useful and realistic. Most of the students were able to identify their gaps in knowledge through these sessions (agree, 54%; strongly agree, 46%), They were also agreeable that these sessions were very relevant to the examination (agree, 41%; strongly agree, 41%). Reemerging theme when being asked on the most important lesson from the virtual clinical week was "correct OSCE technique" and "focused group teaching." When given a choice of the best virtual clinical teaching pedagogy, students were undecided as all the pedagogies have their own strengths and weaknesses.

**Conclusion:** Despite the pandemic, the students were able to adopt the new learning methodology and apply their clinical techniques virtually. This current COVID-19 pandemic changes not only the utilization of technology in education but the pedagogy strategies in the future. Moving forward, hybrid clinical teaching could be the future of clinical medical education.

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# Infiltrating the Curriculum: Integrating Surgical History With Existing Learning Activities in MBBS Curriculum

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**Purpose:** Most medical schools in Australia have little to no formal teaching on surgical history. One common reason is that the curriculum is already at capacity and no space exists for seemingly superfluous topics. To assess medical students' perspective on surgical history embedded into a pre-existing learning module.

**Methods:** Perspectives on surgical history were incorporated into existing surgical pathology tutorials. These tutorials covered thyroid, breast, hepatobiliary, and colorectal pathology with various heroes of surgical history intertwined throughout the lesson. Students completed a survey on surgical history before and after the lecture series. The survey used both qualitative and quantitative measures to assess students' perception of the utility of surgical history and how it was taught in this project. It also assessed students' views on whether history made them better clinicians and whether it changed their outlook on current medical practice.

**Results:** On the initial questionnaire, students indicated they believed surgical history would help make them better doctors and enhance their learning of pathology. In the final questionnaire, students agreed that learning surgical history was important in becoming a well-rounded doctor. Students enjoyed the content and found the integration of history and pathology beneficial to learning.

**Conclusion:** This study demonstrates one method by which to increase surgical history teaching without major alterations to an already saturated medical curriculum.

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# Implementation of an Enhanced Recovery After Surgery Program in Elective Minimally-Invasive Surgery for Colorectal Surgery: An Outcomes and Learning Curve Analysis

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**Objectives:** The distinct advantage of minimally-invasive surgery can be reinforced with the aid of Enhanced Recovery After Surgery (ERAS) implementation. The ERAS program for colorectal surgery was established in our institute in 2019. We present the real-world data and analyzed the learning curves.

**Methods:** We retrospectively reviewed the 180 patients receiving elective minimally-invasive surgery for colorectal resection under ERAS programs during the period of June 2019 to July 2021. Patient demographics and intraoperative data including operative time, surgical techniques, conversion rate, and postoperative outcomes were collected. Additionally, the learning curves analysis of ERAS compliance and clinical results were conducted.

**Results:** An overall 161 patients (89.5%) abided by the postoperative care according to ERAS protocol when the rest need to be discontinued according to clinical judgment. Growing trend to enrolled patients in robotic group due to fewer complications noted. The average intravenous fluid amount on the day of operation was 2,749 mL. The average time of first stool passage and Foley removal was respectively 1.5 and 1.76 days after operation. The average hospital stay for robotic group was 4.99 days. The incidence of reoperation rate was 1.8%. The data in laparoscopic group will be compared and analyzed.

**Conclusion:** After the period of learning curved, our experiences revealed elective minimally-invasive colorectal resection within ERAS program achieved a significantly beneficial outcome. Nevertheless, the detection of postoperative complications and the timing of withdrawing ERAS program are crucial.

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# Treatment Strategy of Laterally Spreading Tumor Adjacent to Anal Verge

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**Purpose:** Management of laterally spreading tumor (LST) adjacent to anal verge is difficult due to hemorrhoidal vessels, risk of anal sphincter injury, and poor endoscopic maneuverability. Before 2018, we mainly used transanal approach with/without endoscopic assistance. After 2019, we introduced endoscopic submucosal dissection (ESD) technique for this kind of LST.

**Methods:** We compared outcomes between these 2 groups.

**Results:** There are total of 10 patients with LST adjacent to anal verge. All patients had *en bloc* resection.

**Conclusion:** Being a colorectal surgeon with mastering ESD technique, we can offer more treatment options for the patient with more favorable outcomes.

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# Size Does Not Matter! Adenoma Detection Rates Are No Different With the Use of a Higher Resolution or Larger Colonoscopy Monitor

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**Purpose:** High definition (HD) and larger screens may help with visual clarity, and earlier adenoma detection leads to improved colorectal cancer-free survival. The aim of the study is to investigate if colonoscopy adenoma detection rates could be increased with the use of a larger HD viewing monitor.

**Methods:** A single-center prospectively collected database between January to December 2018 was analyzed to identify if monitor size and resolution impacted adenoma detection rates. Eighteen endoscopists (gastroenterologists, nurse endoscopists, and colorectal surgeons) performed the procedures across both rooms. The comparative screens were a 26-inch HD (1,920 × 1,080 pixels) Olympus monitor or a 41-inch HD (3,840 × 2,160 pixels) Phillips Monitor.

**Results:** Overall, data from 4,392 colonoscopies were collated. Excluding trainee performed scopes, therapeutic procedures, patients with inflammatory bowel disease, incomplete or abandoned procedures, a total of 3,571 colonoscopies were analyzed. There was no baseline difference between the 2 arms (large screen vs small screen) based on age, sex, withdrawal times, or bowel preparation scores. Univariate analysis on adenoma detection rate appears to suggest that the screen size (larger,  $P=0.018$ ), sex (male,  $P=0.049$ ), bowel preparation (Boston bowel preparation scale  $>5$ ,  $P<0.05$ ), withdrawal time (longer,  $P<0.05$ ) and certain indications (polyp surveillance or fecal occult blood test positive patients,  $P<0.05$ ) positively influence rates. Multivariate logistic regression analysis, confirms that monitor size does not influence adenoma detection rates. Patients undergoing polyp surveillance have the greatest likelihood of adenoma detection ( $P=0.028$ ). Subset analyses within the indication categories show that withdrawal time ( $P=0.007$ ) is the second greatest factor impacting adenoma detection rates.

**Conclusion:** The use of a larger and higher resolution viewing monitor does not lead to an increase in adenoma detection rates. Further research should be devoted to improvements in technique and reinforces that time spent in withdrawal improves adenoma detection rates especially in patients with previous adenoma burden.

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## Is Sex a Risk Factor for Colonic Polyp Detection?

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**Purpose:** Several studies conducted internationally reflected more males developed colorectal cancer (CRC) compared to females. CRC usually begins as a polyp on the inner lining of colon and grows slowly over a period of 10 to 20 years. Advanced adenoma is defined as adenoma that is 10 mm or more in size, exhibits high-grade dysplasia, contains substantial villous component, and forms part of the small subpopulation of adenomas considered most likely to progress to CRC. Hence, we would like to investigate the association between sex and characteristic of polyp such as size (> 10 and < 10 mm), morphology (sessile and pedunculated), and location (right- and left-sided colon). Due to the higher prevalence of colonic tumor in men, we planned to extrapolate this data in order to investigate whether the male sex predominance also exists in polyps detected in colonoscopy.

**Methods:** This is a retrospective study of a total of 1,744 colonoscopies and flexible sigmoidoscopy performed between October 1, 2016 to September 30, 2017 at Bundaberg Hospital, Queensland, Australia.

**Results:** Despite having similar percentage of colonoscopy participation (male, 52.3%; female, 47.7%), there were significantly more male patients (64%) that had polyp resected compared to their female counterparts (36%) ( $P < 0.0001$ ). There was also 3.7% of male patients that were diagnosed with new colon cancer compared to 2% in female ( $P = 0.0457$ ). A significant association was noted between female and polyp that are sessile in nature ( $P = 0.0094$ ). There was no statistically significant association between sex and size of polyps (> 10 and < 10 mm) and the location of polyp (right- and left-sided colon).

**Conclusion:** Our study in population in regional Australia concludes that there is a significant association between male with polyp resection and colorectal adenocarcinoma detection on colonoscopy. We believe that greater awareness of sex differences on polyp detection and colorectal cancer detection rate will help improve screening tool for colon cancer as screening in most parts of the world starts from 50 to 75 years of age irrespective of sex.

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# Metastatic Mixed Adenoneuroendocrine Carcinoma of the Anus: A Case Report

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**Purpose:** Mixed adenoneuroendocrine carcinoma (MANEC) is a rare disease which is diagnosed when the neuroendocrine and non-neuroendocrine components each comprise at least 30% of the neoplasm and are both high grade. Most of the available literature describe individual cases and not all provide information on treatment regimes and disease course. The World Health Organization classification was updated in 2019 to account for the biologic activity of each component, to better represent the spectrum of neuroendocrine non-neuroendocrine tumors. Patients with MANEC tend to present with advanced disease, either with local or constitutional symptoms; hormonal syndromes are less common. Given that there is a paucity of clinical trials studying this disease, the chance for sampling errors, and earlier controversies regarding disease definition, MANECs tend to be underdiagnosed, and its malignant potential is underestimated. Best practice management is unclear, and many patients experience disease recurrence with distant metastasis. We hope to add to the body of clinical cases so that more clinicians can be made aware of the various manifestations and disease course of MANECs.

**Methods:** We present a case of a patient who came to the emergency department with anal pain and underwent a wide local excision which revealed poorly differentiated MANEC. We will present the histopathological findings and immunohistochemical analysis used to make the diagnosis, and discuss the treatment plan formulated by a multidisciplinary team at a tertiary referral and teaching hospital in Australia.

**Results:** Despite adjuvant chemotherapy with cisplatin and etoposide, as well as pelvic radiotherapy, the patient developed bi-lobar liver metastases within 9 months of initial presentation, and eventually succumbed to colonic perforation a month later.

**Conclusion:** MANECs are rare but highly aggressive. Treatment decisions should not underestimate the disease's malignant potential, while also maintaining patient-centered care.

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# Calcifying Fibrous Pseudotumour of Jejunal Diverticulum in a Young Male Patient: A Case Report

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**Purpose:** Diverticula are intestinal outpouchings formed secondary to wall weakening and usually affect the large bowel. It is extremely rare for jejunal diverticulum to form and mainly affects the elderly without causing symptoms. To our best of knowledge, there have been no published reports on jejunal diverticulum found in young patients.

**Methods:** We herein describe a 25-year-old man who presented with 5-days of migratory right iliac fossa pain associated with nausea and anorexia. He has no comorbidities and no significant family history. His C-reactive protein was elevated (33.7 mg/L) and an abdominal ultrasound was suggestive of appendicitis.

**Results:** During the laparoscopy, he was found to have a normal appendix and there was a jejunal diverticulum with a firm mass adhering to the pelvic sidewall. On histopathologic examination, the jejunal diverticulum was creamy brown in color. The cross-sections contain a calcified cream structure with hyalinized fibrous stroma, bland spindle cells, dystrophic calcification, and chronic inflammatory infiltrates. On immunohistochemistry, it was positive for vimentin and factor XIIIa. Overall, the morphology and immunoprofile are of calcifying fibrous pseudotumor occurring within the jejunal diverticulum. This patient remains well and symptom-free at the 1-year follow-up period.

**Conclusion:** To our knowledge, this is a unique first case report on symptomatic calcifying fibrous pseudotumor within a jejunal diverticulum in a young patient. Therefore, although jejunal diverticulum is an uncommon entity especially in the younger population, it could present with unspecific symptoms leading to delayed diagnosis that could result in fatal complications including bleeding, obstruction, and perforation.

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# Distal Ileum Neuroendocrine Tumor Presented as Intermittent Abdominal Pain: A Case Report

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**Purpose:** Neuroendocrine tumor (NET) is a neoplasm that arises from enterochromaffin cell. NETs most commonly occur in gastrointestinal tract, predominantly found in small bowel. Small bowel NET is one of the rare type of small bowel malignant tumors and it usually occurs in ileum. The diagnosis of small NET is usually delayed due to nonspecific presentations and vague symptoms. Patients with small bowel NET can be presented with intermittent abdominal pain, small bowel intestinal obstruction, carcinoids syndromes.

**Case report:** A 65-year-old female patient presented with on and off abdominal pain for past 1 month. Abdominal examination showed mild tenderness over right iliac fossa and right lumbar, otherwise abdomen was not distended and bowel sound was normal. Ultrasound of abdomen showed right mild hydronephrosis with no renal/ureter stone. Contrast enhanced-computed tomography abdomen and pelvis revealed heterogenous mass at distal ileum with infiltration to distal right ureter; however, no liver or lung metastasis was noted. Patient was planned for operation under elective setting. Rigid cystoureterography was performed and double J stent was inserted to right ureter prior to exploratory laparotomy to aid in identification of right ureter. Intraoperative findings were distal ileum tumor with infiltration to right ureter. Thus, right hemicolectomy, segmental resection of right ureter with end to end anastomosis was performed. Histopathology report revealed NET. Patient was then referred to oncology team for further management.

**Conclusion:** Patient with small bowel NET tend to present at late stage due to indolent course and vague symptoms. Prognosis of small bowel NET can be improved with early diagnosis. Surgery is the only modality that can offer curative treatment in small bowel NET and should be performed whenever possible. Thus, it is imperative to think of small bowel NET as an important differential diagnosis in patients presenting with vague abdominal symptoms.

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# Mesenteric Cystic Lymphangioma Masquerading as Ovarian Neoplasm

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**Purpose:** Lymphangioma is a rare benign neoplasm, occurring predominantly in childhood. Cystic lymphangioma of the mesentery in adulthood is exceptionally rare, comprising less than 1% of all lymphangioma. We would like to present a case of a 62-year-old female who presented with 6-month history of bloating and abdominal distension. Initial sonographic examination revealed a 132×134×98 mm cyst in the right iliac fossa, indistinguishable from right ovary.

**Methods:** She underwent a laparotomy which revealed a large cystic mass which was adherent to caecum and mesentery of terminal ileum. Right hemicolectomy was performed. Histopathology examination revealed cystic lymphangioma, measuring 135 mm, with histological confirmation using ERG, D2-40, and CD31 markers.

**Results:** We would like to present preoperative sonographic images, intraoperative photographs, and histopathology slides.

**Conclusion:** Despite being benign in nature, surgical resection of mesenteric cystic lymphangioma is recommended to provide patients with symptomatic relief.

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# Caecum, an Extremely Rare Site of Breast Cancer Metastasis: Review of Reported Cases and Literature

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**Purpose:** Breast cancer is the most common malignancy in women. The caecum is an extremely rare site of metastasis in breast cancer, and only 5 cases have been reported in literature. To date, there have not been reviews on the reported cases. This study aims to conduct a review on the reported cases of the caecal metastases in breast cancer as well as a case experienced in our local facility. We aim to conduct a review of cases on caecal metastases from breast cancer and discuss management options, and hopefully to provide guidance to management of this rare pathology.

**Methods:** We identified all case reports on caecal metastases from breast cancer using PubMed (1950–2021) and Medline (1950–2021). The search strategy included the following keywords: caecum (title/abstract) AND breast cancer (title/abstract) AND metastases (title/abstract). The search did not include letters, systemic reviews, meta-analysis, and editorials. An additional case encountered in our local healthcare facility was included in the results.

**Results:** A total of 6 cases on caecal metastases from breast cancer were identified (5 published and 1 local case). The age of patients at time of diagnosis ranged from 38 to 76 years. One of the patients was male and 5 patients were female. The presentations included large bowel obstruction at caecum, positive fecal occult blood test, rectal bleeding, symptomatic anemia, acute appendicitis, and caecal bowel perforation. Four patients underwent right hemicolectomy and 2 patients were treated with chemotherapy only. Five patients were alive at 12 months of follow-up.

**Conclusion:** The current review of cases suggests a potential guidance on management of caecal metastasis in breast cancer with surgery and hormone therapy. Further research is warranted.

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# A Rare Case of Small Bowel Tuberculosis Flare Up Secondary to Chronic Idiopathic Myelofibrosis

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**Purpose:** Idiopathic myelofibrosis is a myeloproliferative disorder in which blood cell development is abnormal. It causes scarring and fibrotic changes in the bone marrow. Also known as primary myelofibrosis (PMF), this condition is usually chronic and progressive. The exact causative factor is not clear but scientists found that the condition is typically characterized by the mutations in JANUS KINASE 2 (JAK2) gene. Clinical features of PMF include progressive anemia, symptomatic splenomegaly, and other constitutional symptoms. PMF is associated with a poor prognosis and a marked reduction in life expectancy, with median survival ranging from 3.5 to 6 years. There have been reports on the coexistence of PMF with other granulomatous diseases such as tuberculosis. It was reported that the incidence of tuberculosis is much higher in patients having PMF compared to the normal population. PMF is commonly treated with JAK2 inhibitor (ruxolitinib) and prednisolone. Several case reports have shown that PMF treatment may lead to opportunistic infections, such as tuberculosis. We would like to report a case of small bowel tuberculosis flare-up by patients of chronic idiopathic myelofibrosis that leads to bowel perforations, to investigate the correlation between PMF intestinal tuberculosis.

**Methods:** Retrospective review of patient with chronic idiopathic myelofibrosis complicated with intestinal perforation.

**Results:** Patient with chronic idiopathic myelofibrosis has higher incidence of bowel perforations secondary to gut tuberculosis.

**Conclusion:** There is a direct correlation between PMF with intestinal tuberculosis.

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# Metastatic Peritoneal Mesothelioma Presenting With Intussusception

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**Purpose:** While malignant mesothelioma of the pleura is the most common manifestation, mesothelioma can also occur in the peritoneal cavity. Hereby we report a case of metastatic peritoneal mesothelioma (MPM) presented with intussusception of hepatic flexure colon.

**Case summary:** A 56-year-old male patient presented to the hospital with complaints of chronic nonspecific abdominal pain associated with constitutional symptoms. Physical examination revealed a distended abdomen with minimal tenderness to palpation at right iliac fossa. Tumor markers were normal. Chest radiograph shows left apical lung mass. A computed tomography of the thorax, abdomen, and pelvis revealed ileocecal intussusception with thickened enhancing caecal wall and intramural nodule, and large pleural apical mass with multiple enhancing matted mediastinal lymph nodes. His colonoscopy showed hepatic flexure mass occupying the lumen suspicious of part of intussusception and unable to pass through scope. He underwent exploratory laparotomy and right hemicolectomy performed with intraoperative findings of chronic sign of ileocaecal intussusception and multiple serosal matted lymph nodes. Histopathology findings supported the diagnosis of metastatic peritoneal mesothelioma, composed of poorly differentiated epithelioid cells. Immunohistochemical stains demonstrated cells positive for calretinin, CKAE1/AE3, CK7. After operation, the patient had episodes of seizures and he was discovered to have brain metastasis. Subsequently, the patient was referred for palliative chemotherapy.

**Discussion:** Peritoneal mesothelioma is a rare tumor which reported to have a poor prognosis, with a median survival of less than 1 year. The most frequently reported symptoms are ascites (29%), abdominal pain (28%), abdominal mass (10%), fatigue (25%), fever (9%), and weight loss (2%). Bowel intussusceptions related to mesothelioma have rarely been reported and were associated with localized malignant peritoneal mesothelioma. The definitive diagnosis of peritoneal mesothelioma depends on histologic and immuno-histochemical examinations. MPM is characterized by positive staining for the following immunohistochemical markers: epithelial membrane antigen, calretinin, Wilms' tumor-1 protein (WT-1), cytokeratin 5/6, antimesothelial cell antibody-1, HBME-1, mesothelin, and thrombomodulin. However, none of the stainings are specific to MPM.

**Conclusion:** Malignant mesothelioma is rare malignancy, which challenge lies on its nonspecific and varied presentations can cause major delays in diagnosis and treatment. Clinicians should always be vigilant to consider intussusception in adults when making diagnosis as laparotomy is the main treatment approach.

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# Synchronous Ulcerative Colitis-Related Dysplasia and Rectal Lymphoma in a Liver Transplant Patient

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**Purpose:** Ulcerative colitis confers an increased risk of colorectal cancer. When dysplasia is detected surgical management by way of a colectomy is indicated. At the same time, it is well described that immunosuppression post-liver transplant confers an increased risk of malignancies, including lymphoma. The purpose of this poster is to demonstrate a complex case of a post-liver transplant patient with ulcerative colitis, including the surgical management as well as adjuvant therapy of a solitary rectal large cell lymphoma.

**Methods:** A case of a 33-year-old female post-liver transplant for autoimmune hepatitis 17 years prior, simultaneously had active treatment for ulcerative colitis. Her immunosuppression post-liver transplant included tacrolimus and azathioprine. Surveillance colonoscopy revealed dysplasia in the caecum as well as a solitary rectal ulcer suspicious for B-cell posttransplant lymphoproliferative disorder (PTLD). Total proctocolectomy, ileal pouch anal anastomosis and covering loop ileostomy was performed. The patient recovered well. The patient proceeded to adjuvant R-CHOP therapy for large cell lymphoma. The patient remains disease free, has active ongoing surveillance, and is awaiting loop ileostomy reversal. A review of the literature was conducted.

**Results:** This is a rare case of a complex patient who underwent a total colectomy for dysplasia of the colon in the setting of ulcerative colitis and a solitary rectal lymphoma in the context of immunosuppression post-liver transplantation. While dysplasia is a well-known complication of ulcerative colitis and PTLD is well described, particularly after liver transplantation this is the only described case of these conditions occurring synchronously.

**Conclusion:** The post-transplant population can develop rare conditions because immunosuppression and management can be complex. It is important to employ a multi-disciplinary approach to manage such complicated cases though good results can be achieved.

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# Goblet Cell Adenocarcinoma of the Appendix: A Case Report

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Goblet cell adenocarcinoma is one of the rare malignant neoplasm of appendix, with 369 cases reported from the SEER database from 1973 to 2001, corresponding to an age-adjusted 0.05 cases/100,000 population per year. A 75-year-old male patient, with underlying hypertension and cerebrovascular accident, presented to us with history of abdominal pain for 1 day. The pain was localized to periumbilical region and associated with fever. Otherwise, he denied any symptoms of nausea, vomiting, diarrhea, constipation, or urinary changes. There was no other pertinent family history. Physical examination revealed he was average build man. He was febrile but other vital signs were within normal range. Per abdomen, examination revealed soft, tenderness over lower abdomen, predominantly right iliac fossa with rebound tenderness. He underwent computed tomography scan of abdomen, which revealed mildly thickened appendix without any intraabdominal free fluid. Laboratory evaluation showed leukocytosis with neutrophil predominant. In view of imaging findings in conjunction with laboratory evaluation, patient was taken to operating theatre for laparotomy and appendectomy. Intraoperative findings revealed perforation over the tip and body of appendix with normal caecum. Pathologic examination revealed perforated appendicitis with presence of goblet-like mucinous tumor cells, that invaded until subserosa layer. There was no evidence of tumor perforation or lymphovascular invasion. The specimen was signed out as low-grade goblet cell adenocarcinoma, pathologic stage (AJCC 8th edition): pT3 Nx Mx. Postoperative recovery was uneventful and he was discharged well. Later, he underwent colonoscopy and positron emission tomography (PET) scan for staging as outpatient. Colonoscopy showed diverticulae of descending colon with no other significant findings. However, PET scan revealed mediastinal lymphadenopathy with adrenal metastasis and lung nodule. We will be discussing regarding hallmark pathological findings and management of goblet cell adenocarcinoma in this case report.

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# Is There an Ideal Technique for Ileocolic Anastomosis?

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**Purpose:** Anastomotic leak after an ileocolic anastomosis is the cause of significant morbidity and mortality. Stapled end-side (ESA), stapled side-side (SSA), and handsewn end-end anastomoses (HSA) are the most common anastomotic techniques. However, there is limited data on the technical superiority of one anastomotic technique over the other. The aim of this study was to compare ESA, SSA, and HSA ileocolic anastomoses.

**Methods:** This was a retrospective cohort study conducted at a tertiary colorectal unit. All patients who underwent an ileocolic anastomosis from October 2008 to May 2020 were included. Patients were excluded if there was missing data on the type of anastomosis or clinicopathological variables. Primary outcomes were anastomotic leak and anastomotic hemorrhage. Secondary outcomes were length of stay and return of gut function. Multivariable logistic regression was used to adjust for confounding factors.

**Results:** A total of 1,490 patients met the inclusion criteria and 27 were excluded due to missing data. Of these, 976 ESA (70%), 308 SSA (22%), and 108 HSA (8%) were performed. Seventeen patients developed anastomotic leak 17 of 1,390 (1.2%), and 54 of 1,390 had an anastomotic bleed (3.9%). On adjusted analysis, ESA was associated with a lower incidence of anastomotic leak compared to the SSA group (odds ratio [OR], 4.93; P=0.005), and no difference when compared to the HSA group (OR, 2.6; P=0.27). There was no difference in anastomotic bleeding when ESA was compared to other techniques, SSA (OR, 1.07; P=0.84), and HSA (OR, 0.24; P=0.76). ESA and SSA were associated with shorter return to gut function with a mean of 3.3 days respectively, compared to 4.2 days for HSA (P<0.001). There was no difference in length of stay.

**Conclusion:** ESA had the lowest leak rate when compared to the other anastomotic techniques without any increased risk of anastomotic bleeding. We consider this configuration to be the ideal anastomotic technique for ileocolic anastomoses.

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# Surgical Treatment for Rectal Prolapse in Recent 10 Years at Taipei Veterans General Hospital

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**Purpose:** The only curative treatment of rectal prolapse is surgery. However, there is still no consensus of choice between different operative methods. The aim of this study is to elucidate the preference of surgical treatment in a single hospital and differences between each procedure.

**Methods:** Patients who had rectal prolapse and received surgical treatment in Taipei Veterans General Hospital from 2010 to 2019 were collected. The medical records and operative notes were reviewed. Demographic data, surgical procedure, surgical complications, and recurrence were recorded retrospectively. Surgical outcomes of abdominal approach (A) and perineal approach (P) were compared. Analysis was performed with P-value setting at 0.05 as significance level.

**Results:** There were 79 patients included with female predominant (male/female, 12/67). Forty-seven patients (59.5%) received abdominal approach shows no significant different with perineal approach in age, body mass index, but while American Society of Anaesthesiology classification is III and IV, patients have more frequently received perineal approach ( $P=0.029$ ). Postoperative complication occurred in 16 patients (34.0%) in A group and 11 patients (34.4%) in P group. Both groups have complications including incontinence, constipation, difficult evacuation, luminal stricture, or delay bleeding. Three patients in A group received another operation due to complication. Median follow-up time was 51 and 62 months in A and P groups, respectively. Recurrent rate is similar in the 2 group (A/P, 14.9%/25.0%;  $P=0.203$ ). Among patients with recurrence, 46.7% of patient received a different approach than the 1st operation, same approach was applied in 33.3% of patients, and others were treated with medical control. In our hospital, case number of operation for rectal prolapse has increased since 2015. Laparoscopic assist has been applied frequently since 2017.

**Conclusion:** Rectal prolapse is rare in current practice. The choices of surgical approaches should be personalized based on patients' medical condition, surgical risks, postoperative complications. Laparoscopic assist is a choice for skilled surgeon.

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# Long-Course Neoadjuvant Radiation on Low Anterior Resection Syndrome and Stoma Status

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**Purpose:** Neoadjuvant radiation has been increasingly associated with postoperative bowel function, known as low anterior resection syndrome (LARS), in patients with locally advanced rectal cancer. Although permanent stoma often results from anticipated or factual severe bowel dysfunction and significantly impacts quality of life, stoma status is rarely reported along with LARS. This study aimed to assess the comprehensive evaluation of bowel dysfunction in long-term survivors.

**Methods:** Patients with locally advanced rectal cancer who underwent long-course neoadjuvant chemoradiotherapy (nCRT) or chemotherapy (nCT) followed by radical proctectomy were recruited from the FOWARC randomized controlled trial. LARS score and stoma status were assessed for postoperative bowel function.

**Results:** Overall, at a median follow-up of 83 months, 48 of 232 patients (21%) reported major LARS, and 53 (23%) had persistent stoma. Compared with the nCT group, the nCRT group reported more persistent stomas (30% vs. 10%;  $P < 0.001$ ), and more major LARS (24% vs. 15%,  $P = 0.003$ ). The combined prevalence of persistent stoma and major LARS was significantly higher in the nCRT group (54% vs. 25%,  $P < 0.001$ ). Long-course neoadjuvant radiation (odds ratio [OR], 2.54; 95% confidence interval [CI], 1.26–5.14;  $P = 0.009$ ), height of anastomosis (OR, 3.00; 95% CI, 1.51–5.95;  $P = 0.002$ ), and anastomotic leak (OR, 7.23; 95% CI, 2.81–18.62;  $P < 0.001$ ) were associated with persistent stoma and major LARS in multivariate analysis.

**Conclusion:** For long-term survivors of rectal cancer, long-course neoadjuvant radiation is likely independent risk factor for persistent stoma and major LARS. Our findings might have implications for alleviating LARS and reducing permanent stoma by informing selection of neoadjuvant treatment.

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# Low Anterior Resection Syndrome Improvement Beyond 2 Years

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**Purpose:** Bowel dysfunction after sphincter-preserving proctectomy, also known as low anterior resection syndrome (LARS), has significant impact on survivors of rectal cancer. However, the evolvement of LARS beyond 2 years after surgery has not been fully studied. This study aimed to assess the temporal change of LARS beyond 2 years after proctectomy.

**Methods:** We longitudinally enrolled consecutive patients who had received total mesorectal excision in a tertiary academic medical center, with preoperative neoadjuvant therapy if indicated. LARS score was longitudinally assessed by 2 serial follow-ups, with a fixed interval of 18 months.

**Results:** Overall, 107 patients responded for the 1st follow-up after a median of 19.8 months, 96 of whom responded for the 2nd follow-up after a median of 37.9 months. At the 1st follow-up, 48 patients (44.9%) reported major LARS, compared with 23 (24.0%) at the 2nd follow-up ( $P < 0.001$ ). Symptoms of “urgency” (12.2 vs. 6.2,  $P < 0.001$ ) and “clustering of stools” (9.7 vs. 7.7,  $P = 0.001$ ) contributed most to the improvement.

**Conclusion:** Bowel dysfunction continues to improve 2 years after total mesorectal excision, especially in urgency and stool clustering.

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Copies of written informed consents should be kept for studies on human subjects. For clinical studies with human subjects, there should be a certificate, agreement, or approval by the institutional review board (IRB) of the author's affiliated institution. If necessary, the editor or reviewers may request copies of these documents to resolve questions about IRB approval and study conduct.

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- **Journal articles:**
    1. Yoo HY, Choi J, Kim J, Chai YJ, Shin R, Ahn HS, et al. Unexpected appendiceal pathologies and their changes with the expanding use of preoperative imaging studies. *Ann Coloproctol* 2017;33:99-105.
    2. Caselli RJ, Dueck AC. Longitudinal modeling of age-related memory decline and the APOE epsilon4 effect. *N Engl J Med* 2009;361:255-63.
    3. Son GM, Ahn HM, Lee IY, Ha GW. Multifunctional indocyanine green applications for fluorescence-guided laparoscopic colorectal surgery. *Ann Coloproctol* 2021 Jun 9 [Epub]. <https://doi.org/10.3393/ac.2021.05.07>.
  - **Entire book:**
    4. Gordon PH, Nivatvongs S, editors. Principles and practice of surgery for the colon, rectum, and anus. 3rd ed. New York, NY: Informa Healthcare USA; 2007.
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    5. Maa J, Kirkwood KS. The appendix. In: Townsend CM Jr, Beauchamp RD, Evers BM, Mattox KL, editors. Sabiston textbook of surgery: the biological basis of modern surgical practice. 19th ed. Philadelphia, PA:

Elsevier Saunders; 2012. p. 1279-93.

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6. Hong GD. The relationship between low serum cholesterol level and cancer mortality [dissertation]. Seoul (KR): Seoul National Univ.; 2017.

- **Conference paper:**

7. Rice AS, Brooks JW. Cannabinoids and pain. In: Dostorovsky JO, Carr DB, editors. Proceedings of the 10th World Congress on Pain; 2002 Aug 17-22; San Diego, CA. Seattle (WA): IASP Press; 2003. p. 437-46.

- **Online sources:**

8. American Cancer Society. Cancer A-Z [Internet]. Atlanta (GA): American Cancer Society; c2017 [cited 2017 Sep 15]. Available from: <https://www.cancer.org/cancer.html>.

9. National Cancer Information Center. Cancer incidence [Internet]. Goyang (KR): National Cancer Information Center; c2016 [cited 2017 Sep 20]. Available from: [http://www.cancer.go.kr/mbs/cancer/subview.jsp?id=cancer\\_040101000000](http://www.cancer.go.kr/mbs/cancer/subview.jsp?id=cancer_040101000000).

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- References cited in the text should be numbered by means of Arabic numbers in the order of their appearance and the Arabic numbers should be written after family names of authors or ends of sentences (periods) with brackets.  
(Ex.) Min [1] reported ---, --- significant [2], --- environment [3-7].
- When authors are one or two, write family names of all authors. When they are more than two, write “et al.” after family name of first author.  
(Ex.) Hwang and Mun [3] found ---, Sim et al. [4] said ---, Wong and Pemberton [3] determined ---, Rothenberg et al. [4] reported ---

## 4. References

- Only references cited in the text should be numbered in the order of their appearance.
- A same reference should not be cited with different numbers.
- Even local literatures also should be written in English.
- For overseas literatures the first letter of name of author following his or her family names should be capitalized.
- All of no more than 6 co-authors should be written. When co-authors are more than 6, end with “et al.” after sixth author.
- Abbreviations of journals should conform to the “List of Journals Indexed in Index Medicus” and “List of journals Indexed in KoreaMed” including the latest abbreviations.
- References should be presented according to Submission Requirements.

## 5. Tables

- Tables should be numbered in the order of their appearance in the text and Arabic numerals in separate pages.
- Tables should be descriptive enough by themselves and the text should not duplicate contents of the tables.
- Horizontal lines are a single line and vertical lines do not exist.
- The titles of table should be written in clauses and phrases and only the first letters of the titles should start with capital letters. Within tables only the first letter of each item should be capitalized.
- Abbreviations should be explained below without changing lines.

(Ex.) PCR, polymerase chain reaction; SD, standard deviation.

- Symbols should be used in the order of <sup>a</sup>, <sup>b</sup>, <sup>c</sup>, <sup>d</sup>, and <sup>e</sup>.  
(Ex.) <sup>a</sup>Statistically significant.
- Check the accuracy of numbers in tables again.

### 6. Drawings and figures (Fig.)

- Drawings and figures should be numbered in the order of their appearance in the text and presented clearly with Arabic numerals.
- Image files should be attached tiff, gif, jpeg, and ppt with minimum width of 107 mm, and a minimum resolution of 300 dpi for color figures, 500 dpi for black and white figures, and 1,000 dpi for line art figures.

- Line drawings should be original. When drawings of other papers are cited, provide permission of the original author(s) principally.
- Explanation on figures should be numbered on other page and their titles and explanations should be presented in clauses and in complete sentences respectively.
- When several drawings or figures are numbered with a same numeral, they are identified with characters of A, B, and C after Arabic numerals.  
(Ex.) Fig. 1A ---, Fig. 1B ---
- Microscopic pictures should be associated with their staining methods and magnification.  
(Ex.) H&E, × 400.

( Please check the boxes above.)

# Common Abbreviations and Acronyms

|                           |  |               |  |
|---------------------------|--|---------------|--|
| <b>α-FP</b>               | alpha-fetoprotein                          | <b>LDH</b>    | lactic dehydrogenase                     |
| <b>ALT</b>                | alanine aminotransferase                   | <b>LDL</b>    | low density lipoprotein                  |
| <b>ANOVA</b>              | analysis of variance                       | <b>M</b>      | molar (mM)                               |
| <b>aPTT</b>               | activated partial thromboplastin time      | <b>meq</b>    | milliequivalent(s)                       |
| <b>AST</b>                | aspartate aminotransferase                 | <b>MHC</b>    | major histocompatibility antigen         |
| <b>ATP</b>                | adenosine triphosphate (CTP)               | <b>min</b>    | minute(s)                                |
| <b>BCG</b>                | bacillus Calmette-Guérin                   | <b>mmHg</b>   | millimeter(s) of mercury                 |
| <b>bp</b>                 | base pair(s)                               | <b>mo</b>     | month(s)                                 |
| <b>BUN</b>                | blood urea nitrogen                        | <b>mol</b>    | mole(s)                                  |
| <b>CA 125</b>             | cancer antigen 125                         | <b>MRI</b>    | magnetic resonance imaging               |
| <b>CA 19-9</b>            | carbohydrate antigen 19-9                  | <b>mRNA</b>   | messenger RNA                            |
| <b>cal</b>                | calorie(s) (kcal)                          | <b>n</b>      | number in study group                    |
| <b>cAMP</b>               | adnosine 3',5'-cyclic monophosphate (cGMP) | <b>No.</b>    | number(s)                                |
| <b>cDNA</b>               | complementary DNA                          | <b>NS</b>     | not significant                          |
| <b>CEA</b>                | carcinoembryonic antigen                   | <b>NSAID</b>  | non-steroidal anti-inflammatory drug     |
| <b>χ<sup>2</sup>-test</b> | chi-square test                            | <b>°C</b>     | degree of Celcius                        |
| <b>Ci</b>                 | curie(s) (mCi)                             | <b>OD</b>     | optical density                          |
| <b>cpm</b>                | count(s) per minute                        | <b>P</b>      | probability                              |
| <b>CRP</b>                | C-reactive protein                         | <b>PET</b>    | positron emission tomography             |
| <b>CT</b>                 | computerized tomography (abdominal CT)     | <b>PCR</b>    | polymerase chain reaction                |
| <b>D</b>                  | Dalton (kD)                                | <b>PSA</b>    | prostate specific antigen                |
| <b>DNA</b>                | deoxyribonucleic acid                      | <b>PT</b>     | prothrombin time                         |
| <b>ELISA</b>              | enzyme-linked immunosorbent assay          | <b>r</b>      | correlation coefficient                  |
| <b>EMG</b>                | electromyography                           | <b>RFLP</b>   | restriction fragment length polymorphism |
| <b>FACS</b>               | fluorescence-activated cell sorter         | <b>RIA</b>    | radioimmunoassay                         |
| <b>FDP</b>                | fibrinogen degradation product             | <b>RNA</b>    | ribonucleic acid                         |
| <b>g</b>                  | gram (kg)                                  | <b>RT-PCR</b> | reverse transcriptase PCR                |
| <b>g</b>                  | unit(s) of gravity                         | <b>sec</b>    | second(s)                                |
| <b>γ-GT</b>               | gamma glutamyltranspeptidase               | <b>SD</b>     | standard deviation                       |
| <b>hr</b>                 | hour(s)                                    | <b>SEM</b>    | standard error of the mean               |
| <b>H&amp;E</b>            | hematoxylin and eosin stain                | <b>t test</b> | Student's t test                         |
| <b>HDL</b>                | high density lipoprotein                   | <b>U</b>      | unit(s)                                  |
| <b>HPLC</b>               | high performance liquid chromatography     | <b>UV</b>     | ultraviolet                              |
| <b>HPV</b>                | human papilloma virus                      | <b>V</b>      | volt(s)                                  |
| <b>Ig</b>                 | immunoglobulin (IgG)                       | <b>vol</b>    | volume(s) (vol/vol)                      |
| <b>IU</b>                 | international unit(s)                      | <b>wk</b>     | week(s)                                  |
| <b>kb</b>                 | kilobase                                   | <b>wt</b>     | weight (wt/vol)                          |
| <b>L</b>                  | liter (mL)                                 | <b>yr</b>     | year(s)                                  |



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