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The effect of mechanical bowel preparation on anastomotic leaks in elective left-sided colorectal resections

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Abstract

BACKGROUND: Routine preoperative mechanical bowel preparation (MBP) for left-sided colorectal resections remains controversial. This study aims to evaluate the association between MBP and 30-day anastomotic leaks.

METHODS: A retrospective cohort study was conducted using data from the National Surgical Quality Improvement Program from 2011 to 2012. Multiple imputation was used for missing data, and a multivariable logistic regression was performed to adjust for clinically relevant variables. A propensity score–adjusted model was performed as a sensitivity analysis.

RESULTS: A total of 2,581 patients (57%) received preoperative MBP, whereas 1,935 (43%) did not. The 30-day anastomotic leak rate with and without preoperative MBP was 3.1% and 5.1%, respectively. After covariate adjustment, MBP omission was significantly associated with a 40% increased odds of 30-day anastomotic leaks (odds ratio 1.41, $P = .04$, 95% confidence interval 1.01 to 1.93).

CONCLUSIONS: MBP omission was associated with a higher rate of 30-day anastomotic leaks. A large, well-designed, randomized controlled trial is needed to further evaluate this relationship.

Disclaimer: American College of Surgeons' National Surgical Quality Improvement Program (ACS NSQIP) and the hospitals participating in the ACS NSQIP are the source of the data used here; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors.

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Surgeons commonly use mechanical bowel cleansing agents, such as polyethylene glycol and sodium phosphate, as a preoperative strategy to reduce postoperative infectious complications after colorectal anastomoses.[1,2] Infectious wound complications, and especially anastomotic leakage, are considered major causes of morbidity after colorectal resections and can result in prolonged hospital stays.[3,4] The widespread application of mechanical bowel preparation (MBP) has been attributed to its effect on decreasing intraluminal bacterial count, eliminating passage of solid feces, and improving bowel handling during construction of the anastomosis.[3] As well, MBP is considered very beneficial in cases where colonic tumors are small, and performing an intraoperative colonoscopy may be necessary.[5]

The routine practice of MBP became controversial after several studies, including retrospective series and prospective randomized trials that demonstrated the safety and feasibility of colorectal surgery without preoperative bowel cleansing.[3] Support against the use of MBP was further promoted based on better patient experience and the avoidance of side effects, such as preoperative dehydration, nausea, vomiting, and electrolyte abnormalities.[5] As well, the advent of enhanced recovery programs and "fast-track" surgery has encouraged the practice of omitting MBP. However, with a higher risk of anastomotic leakage after left-sided colorectal resections, the routine omission of MBP in this specific subgroup warrants further evaluation.[6] Additionally, MBP might offer better protection than diversion in the event of a leak by eliminating contamination from the potential column of stool above the anastomosis.

Our primary study objective was to determine whether omission of MBP before elective colorectal resections with a left-sided anastomosis was associated with a higher rate of 30-day anastomotic leaks. Our secondary objective was to compare the postoperative length of stay (LOS) between groups.

Methods

Study population

We used data from the American College of Surgeons' National Surgical Quality Improvement Program (ACS-NSQIP) and colon-targeted participant use data files for the year 2011 and 2012 to conduct a retrospective cohort study. The ACS-NSQIP is a nationally validated, risk-adjusted database that captures 30-day clinical outcomes on patients undergoing major operations, and its methodology has been well described.[7–11] Our study protocol was approved by the University Health Network Research Ethics Board.

Our study population included patients who underwent an elective colorectal resection with a left-sided anastomosis in 2011 and 2012. Eligible operations included subtotal colectomies, partial left-sided resections, and low anterior resections. Operations were identified based on the following current procedural terminology codes: 44,207, 44,208, 44,210, 44,145, 44,146, and 44,150. Diverting stomas (ie, ileostomy or colostomy) were identified either as part of the principal operative code (ie, 44,146 and 44,208) or a separate secondary code (ie, 44,310 and 44,320). Operations with noncolonic anastomoses (ie, ileoanal anastomoses) were excluded from the study.

Outcomes

The main outcome of our study was the 30-day anastomotic leak rate. The secondary outcome was the postoperative LOS.

Covariates

We considered the following clinically relevant variables:

- Demographics:
  - Age
  - Sex
  - Body mass index (BMI)
  - Current smoker within 1 year (yes/no)
  - Functional health status (dependent/independent)
- Comorbidities:
  - American Society of Anesthesiologists (ASA) classification ($\geq$3, 1 to 2)
  - Diabetes requiring oral agents or insulin (yes/no)
  - Renal failure (yes/no)
  - Coronary artery disease (yes/no)
  - Congestive heart failure (yes/no)
  - Hypertension requiring medication (yes/no)
- Preoperative factors:
  - Low-serum albumin level ($<$3.5 g/dL) (yes/no)
  - Chronic steroid use greater than 10 days (yes/no)
  - Chemotherapy within 90 days of surgery (yes/no)
  - Radiotherapy within 90 days of surgery (yes/no)
  - Oral antibiotic preparation (yes/no)
  - Operative approach (laparoscopic/open)
  - Colorectal cancer (yes/no)
  - Inflammatory bowel disease (yes/no)
  - Diverticular disease (yes/no)
- Operative factors:
  - Operative time
  - Intraoperative transfusion (yes/no)
  - Enterocolic anastomosis (yes/no)
  - Diverting stoma (yes/no)

Statistical analysis

Patients satisfying the inclusion criteria were selected for analysis, and descriptive statistics were computed to define the study population. We performed a series of bivariate analyses to compare the 2 cohorts with respect to patient characteristics and study outcomes. Based on tests of normality, all continuous distributions (ie, age, BMI, and