
Abstract

Objective: The purpose of this study was to identify patient, clinical, and surgical factors that may predispose patients to anastomotic leak (AL) after large bowel surgery.

Background: Anastomotic leak is still one of the most devastating complications following colorectal surgery. Knowledge about factors predisposing patients to AL is vital to its early detection, decision making for surgical time, managing preoperative risk factors, and postoperative complications.

Methods: This was a prospective observational, quality improvement study in a cohort of 616 patients undergoing colorectal resection in a single institution with the main outcome being AL within 30 days postoperatively. Some of the predictor variables were age, sex, Charlson Comorbidity Index (CCI), radiation and chemotherapy, immunomodulator medications, albumin, preoperative diagnoses, surgical procedure(s), surgical technique (laparoscopic vs. open), anastomotic technique (staple vs. hand-sewn), number of major arteries ligated at surgery, surgeon’s experience, presence of infectious condition at surgery, inoperative adverse events, and functional status using 36-Item Short Form General Health Survey.

Results: Of the 616 patients, 53.4% were female. The median age of the patients was 63 years and the mean body mass index was 25.9 kg/m2. Of them, 80.3% patients had laparoscopic surgery and 19.5%
had open surgery. AL occurred in 5.7% (35) patients. In multivariate analysis, significant independent predictors for leak were anastomoses less than 10 cm from the anal verge, CCI of 3 or more, high inferior mesenteric artery ligation (above left colic artery), intraoperative complications, and being of the male sex.

**Conclusions:** Multiple risk factors exist that predispose patients to ALs. These risk factors should be considered before and during the surgical care of colorectal patients.

**Critical appraisal**

1. The results of this prospective single institutional (high volume colorectal surgery), observational study confirm that despite many advances in surgery, the incidence of anastomotic leak after colorectal surgery remains greater than 5% (3% upper anastomoses, 13.9% in lower anastomoses < 10 cm anal verge), with a mortality rate statistically significantly higher for patients who have leaks.

2. The authors confirm once again that more than 50% of all leaks occur after low rectal anastomoses (<6 cm from the anal verge), but their original contribution is based on multivariate analysis: male sex, Charlson Comorbidity Index (CCI) >3, high inferior mesenteric artery (IMA) ligation (proximal to the left colic artery) and intraoperative complications represent independent predictors for anastomotic leak and collectively reach a value of 0.87 of the area under receiver operating characteristics (ROC). In particular, the two most relevant independent predictors are the anastomotic level < 10 cm (Odds Ratio 3.5) and high IMA ligation (Odds Ratio 3.8) suggesting that the current practice of high IMA ligation (whether with the intent to increase lymph node clearance or to create a tension-free low rectal anastomosis), per
se, increases the risk of leak.

3. The authors provide a precise but large definition of anastomotic leak: (1) leakage of bowel content and/or gas from the surgical connection between the two bowel ends into the abdomen or pelvis with either spillage and/or fluid collection around the anastomotic site or extravasation through a wound, drain site, or anus; (2) clinical manifestation causing fever, abscess, septicemia, peritonitis, and/or organ failure; and (3) confirmation by imaging technique (e.g. radiograph, endoscopy, computerized tomography scan, magnetic resonance imaging, sonography) or by digital rectal examination or anoscopy and/or proctoscopy for low rectal anastomoses. The detection of anastomotic leak by imaging without clinical manifestations was recorded as “asymptomatic” and excluded from the study group. The data were collected prospectively by research nurses without medical supervision.

4. Of note is the conclusion of this prospective study (conducted in a highly reputed academic center), designed to evaluate predisposing factors for anastomotic leaks: the authors argue that the results of the study could allow the development of a mathematical predictive model that ponderers the value of each independent variables. The surgical community will appreciate this for their daily clinical practice.

5. The weak points of this study are:
   • the heterogeneity of the population including the wide spectrum of colon and rectal diseases in both the elective and emergent setting;
   • the bias represented by diverting stoma: the authors could have excluded patients with diverting stoma (18.3%) to obtain a more homogeneous study group and to carry out the statistical analysis of
perioperative period at 30 days in all cases. Furthermore, the reasons of diverting stoma are not reported and discussed. It would have been interesting to know the results without this bias.

• Their multivariate analysis concerned only laparoscopic vs. open, thus integrating hand-assisted laparoscopic surgery (hybrid technique) (39.4%) into the “pure” laparoscopy group. This might have been another source of bias, as the utility of hand-assisted laparoscopy is still controversial.

• The lack of clear recommendations for clinical practice: considering the weight of high IMA ligation (OR 3.8) and low rectal anastomosis (OR 3.5) as independent predictors of anastomotic leak, a routine diverting stoma might be of benefit in this subgroup of patients.

6. Last, this prospective study demonstrates the impact of the preoperative comorbidities (assessed by a validated score, the Charlson co-morbidity index or CCI) on anastomotic leak. The CCI score is simple and could be a useful tool for the global assessment of patient comorbidities before surgery aiding pre-, intra-, and post-operative decisions. The results highlight that when comorbidities were evaluated as single entities, no significant differences were detected between patients with or without leaks. On the contrary, when the comorbidities were evaluated together, significant differences was found. Furthermore CCI score was very useful to assess the number and severity of comorbidities.