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Intraoperative and postoperative diagnosis of anastomotic leak following colorectal resection

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A B S T R A C T

Anastomotic leak is one of the most feared complications following colorectal resection. A great deal of research has been done to identify which patients are at highest risk, as well as which technical considerations may have an impact on mitigating leak risk. Despite these efforts, many patients will still experience anastomotic dehiscence after colorectal resection. The focus of this article is to identify strategies to detect anastomotic leak using both intraoperative and postoperative criteria.

Background

Anastomotic leak is one of the most feared complications following colorectal resection. Reported leak rates are widely variable, ranging from 2% to 51% in the available literature.[1] Overall, the mortality rate following anastomotic leak is 10–15%.[2] Anastomotic leaks are also associated with increasing local recurrence of malignancy, prolonged hospital stays, and often require further surgery to correct.[2–4] Additionally, as many as 20–60% of patients who are diverted due to anastomotic leak never have their ostomy reversed.[1]

Definition of anastomotic leak

One of the main challenges associated with diagnosing and managing anastomotic leak is the development of a consistent terminology to describe what constitutes a leak. Bruce et al.[5] examined 97 studies regarding this topic and observed 56 separate definitions. More recently, the International Study Group of Rectal Cancer attempted to popularize both a definition and a grading system for anastomotic leaks following low anterior resection of the rectum. Anastomotic leak was defined as a "defect of the intestinal wall at the anastomotic site leading to a communication between the intra-luminal and extra-luminal contents." Grade A complications required no change in patients' management, grade B required active therapeutic intervention, such as antibiotics or a percutaneous drain placement, and grade C required an exploratory laparotomy.[6] Although many definitions have been proposed, the definition proposed by the International Study Group of Rectal Cancer is simple to use, and accounts for the effect that the leak has on patient management.

Detection of anastomotic leak

Intraoperative

It is clear that meticulous surgical technique must be utilized in the operating room to potentially mitigate the risk of anastomotic leak. The surgeon must ensure adequate perfusion of both proximal and distal bowel and create an anastomosis, which is tension free, and oriented correctly.[4] Nevertheless, many patients will still experience a leak despite having a tension-free, well-vascularized anastomosis. Surgeons should also be aware of other intraoperative findings associated with a potentially compromised anastomosis. The anastomosis should be inspected for subtle findings, such as serosal damage or constriction, and examined for evidence of appropriate inversion of the anastomosis, equal placement of staples, and uniform luminal diameter.

Rarely, clear evidence of a compromised anastomosis will be present such as clear ischemic changes, visible separation of the anastomosis, or incomplete anastomotic ring when using an end-to-end stapled technique. If the anastomosis is thought to be noticeably compromised, it should be taken down and redone.[4,7] The finding of incomplete anastomotic rings deserves special consideration. Griffith and Hardcastle demonstrated a statistically significant relationship between incomplete rings and anastomotic leakage. In their study of 60 patients with end-to-end stapled anastomosis, 11 had a positive air-leak test. Of these, 7 were found to have an incomplete ring, suggesting a technically compromised

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anastomosis.[8] Although limited literature on the topic exists, the common recommendation in the setting of an incomplete ring is to redo the anastomosis if technically feasible vs. performing a repair and proximal diversion if repeat anastomosis is not feasible.[4,7,8]

Air-leak testing

More commonly, the anastomosis is appreciably normal at the time of surgery with intact anastomotic rings. Intraoperative air-leak testing has been described over the past 20 years with consistent findings in support of its use with left-sided resection.[4,8–14] Reports of the utility of this practice on right-sided anastomoses are lacking. The immediate test of anastomotic integrity is easily performed and may help prevent or identify anastomotic leaks. In the largest reported series, Ricciardi et al.[14] reviewed the outcomes of 825 left-sided resections and found evidence that 8% of those tested were positive for an air leak. Postoperative leaks occurred in 7.7% of anastomoses that tested positive, in 3.8% of those that tested negative and in 8.1% of those that were not tested ($p < 0.03$). When only circular-stapled anastomoses were considered, the leak rate was 21.4% in untested anastomoses vs. 3.6% of airtight anastomoses and 4.8% of those with an air leak ($p = 0.04$). This was the only study to provide insight into the outcomes of patients with an air leak. The anastomotic leak rate was 12.2% when an anastomosis that was initially positive was suture repaired, compared to 0% when they were completely redone or were diverted proximally (p = NS).[14] Beard et al. performed a randomized trial of 145 patients undergoing left-sided and rectal resections to intraoperative air-leak testing vs. no testing. In the test group, 25% of anastomoses leaked air and were repaired. Clinically relevant anastomotic leaks occurred in 4% of the test group and in 14% in the no test group ($p = 0.043$). These authors also obtained a water-soluble contrast enema on POD no. 10 on every patient and demonstrated a radiographic leak rate in 11% of patients who had an air-leak test vs. 29% of those who did not ($p = 0.006$).[10] Air-leak testing has been shown to potentially decrease anastomotic leak rates and aid surgeon decision making without any clear evidence that it causes any harm. This should be a routine part of any left-sided resection with anastomosis.

Whether the operation is performed using laparoscopic or open techniques, the leak test is performed using the same principles. The pelvis is filled with saline, and the bowel proximal to the anastomosis is gently occluded using the surgeon's hand in an open case or an atraumatic grasper in a laparoscopic case. The distal bowel is then gently insufflated with air using a proctoscope or flexible sigmoidoscope while the surgeon observes for evidence of air leakage. Some authors recommend using flexible endoscopy due to better visualization of the anastomosis and better identification of any anastomotic bleeding.[12]

Postoperative diagnosis

Since the clinical presentation of anastomotic leak is often nonspecific, there are very few clinical criteria that are pathognomonic for the development of anastomotic leak. The vast majority of studies examining anastomotic dehiscence describe general signs and symptoms, such as fever, early diarrhea, abdominal or pelvic pain, leukocytosis, elevated CRP, and tachycardia.[1–4,15–17] Other studies in which patients had a drain placed at the time of surgery used purulence, fecal material, or gas coming from the drain as criteria for anastomotic leak.[18] Many leaks will be clinically apparent based on clinical deterioration and peritonitis, necessitating an early return to the operating room. However, numerous leaks may also present following an insidious course. Hyman et al.[2] demonstrated that the mean day of diagnosis was 12.7 in their series from Fletch Allen in Vermont. A subset of patients ($n = 21$) were diagnosed based on radiographic criteria only, with a mean day of diagnosis of 16. Moreover, 4 (12.1%) of the patients who experienced an anastomotic leak were diagnosed after postoperative day 30. This data underlines the importance of close follow-up for patients undergoing colon and rectal surgery. The surgeon must continually assess the progress of their patient following surgery and become alerted by changes in vital signs, physical exam, or laboratory values in the immediate and extended postoperative period. When a clinical suspicion for leak becomes evident, radiographic imaging may be helpful to make the correct diagnosis and guide the surgeon's choice in management.

Ideal radiologic test

The ideal radiologic test for anastomotic leak should have a high sensitivity and specificity, be immediately available at all hours of the day, pose minimal risk to the patient, and be able to guide the choice in therapeutic options. Although there are a variety of imaging options available, most studies have evaluated the role of computed tomography (CT) scan or water-soluble contrast enema (WSE) for diagnosis of a colorectal anastomotic leak.

A CT scan has several advantages over water-soluble enema such as of the ability to rule out other intra-abdominal pathology remote from the anastomosis, including a hematoma or leakage from another source such as a missed enterotomy. CT scan may also identify the presence of a peri-anastomotic collection or abscess that may be percutaneously drained if deemed appropriate by the surgical team. CT findings suggestive of an anastomotic dehiscence include the presence of extra-luminal air, localized fluid collection near the anastomosis, and leakage of rectally administered contrast (Figs. 1–3). When interpreting a postoperative CT scan, the presence of intra-peritoneal free air may be difficult to interpret. Free air following an abdominal procedure is quite common occurring in 60% of laparotomies and 25% of laparoscopic procedures. However, 67% of these will resolve by POD 2, and 97% of them will resolve by POD 5. The majority of anastomotic leaks will occur between POD 5 and 7 in which case, intra-peritoneal free air is unlikely to be residual deposits from the initial surgery performed.[19]

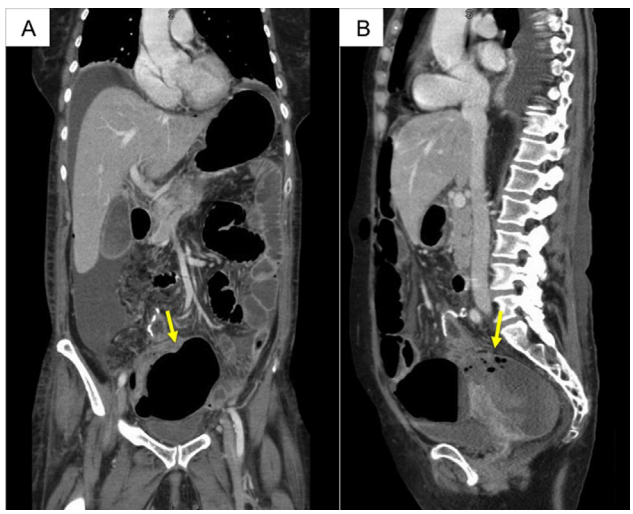

Fig. 1. Uncontained leak of ileorectal anastomosis. (A) Large air cavity is visible below the staple line (arrow) with fluid tracking over the liver. (B) Large well-circumscribed fluid collection with air bubbles.