Achieving low anastomotic leak rates utilizing clinical perfusion assessment

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Background. *Anastomotic leak after colorectal resection increases morbidity, mortality, and in the setting of cancer, increases recurrences rates and reduces survival odds. Recent reports suggest that fluorescence evaluation of perfusion after colorectal anastomosis creation is associated with low anastomotic leak rates (1.4%). The purpose of this work was to evaluate whether a similar low anastomotic leak rate after left-sided colorectal resections could be achieved using standard assessment of blood flow to the bowel ends.*

Methods. *We performed a retrospective chart review at an academic tertiary referral center, evaluating 317 consecutive patients who underwent a pelvic anastomosis after sigmoid colectomy, left colectomy, or low anterior resection. All operations were performed by a single surgeon from March 2008 to January 2015 with only standard clinical measures used to assess perfusion to the bowel ends. The primary outcome measure was the anastomotic leak rate as diagnosed by clinical symptoms, exam, or routine imaging.*

Results. *The average patient age was 59.7 years with an average body mass index of 28.8 kg/m^2. Rectal cancer (128, 40.4%) was the most common indication for operation while hypertension (134, 42.3%) was the most common comorbidity. In total, 177 operations were laparoscopic (55.8%), 13 were reoperative resections (4.1%), and 108 were protected with a loop ileostomy (34.1%). Preoperative chemotherapy was administered to 25 patients (7.9%) while preoperative chemo/radiation was administered to 64 patients (20.2%). The anastomotic leak rate was 1.6% (5/317).*

Conclusion. *Our data suggests that standard, careful evaluation of adequate blood flow via inspection and confirmation of pulsatile blood flow to the bowel ends and meticulous construction of the colorectal or coloanal anastomoses can result in very low leak rates, similar to the rate reported when intraoperative imaging is used to assess perfusion. (Surgery 2016;160:960-7.)*

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ADVANCES IN TECHNOLOGY, INNOVATIONS IN SURGICAL TECHNIQUE, and a better understanding of physiology and biochemistry have allowed surgeons to decrease mortality and morbidity after intestinal operation in the past 50 years.[1-4] Despite this, anastomotic leak still remains the most significant and feared complication after colorectal resection. An anastomotic leak increases postoperative morbidity, mortality, duration of hospital stay, and costs. In addition, in the setting of a resection for cancer, an anastomotic leak increases local recurrence rates and reduces overall survival rates.[1,5,6] Anastomotic leak rates are reported to range from 1–19% and have changed little over several decades.[5,7-11] Recent studies identify male sex, obesity, preoperative chemotherapy/radiation, and level of anastomosis as important risk factors for anastomotic leak.[5,7,12-15] Poor perfusion of the anastomosis also has been shown to contribute to anastomotic leakage.[16-19] Jafari et al[1] recently reported the results on a novel fluoroscopic, intraoperative "real-time" assessment of perfusion after colorectal anastomosis creation that decreased anastomotic leak rate to 1.4%.[1] The issue for surgeons evaluating this new technology is whether similar low leak rates can be achieved without resorting to the use of this type of intraoperative imaging for patients having a colorectal or coloanal anastomosis.

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We hypothesized that standard evaluation of perfusion and meticulous attention to detail in the construction of the pelvic anastomoses is associated with very low leak rates.

METHODS

We performed a retrospective review of a consecutive series of patients undergoing a colorectal resection to include a colorectal or coloanal anastomosis between March 1, 2008, and January 1, 2015, at a single institution by a single surgeon (K.A.L.). The study was conducted in accordance with the ethical principles of the Human Research Protection Program, and Institutional Review Board approval was obtained. Patients were eligible for inclusion in the study if they were at least 18 years old and had undergone a low anterior resection, a sigmoid resection, or a left colectomy with creation of either a colorectal or a coloanal anastomosis. Data was obtained from review of the electronic medical record.

Demographic and treatment information was collected, including the following: age, sex, body mass index (BMI), primary diagnosis, preoperative chemotherapy and radiotherapy, history of tobacco use, and comorbidities. Operative factors assessed included planned operative procedure, anastomotic location and type, and presence of diverting ostomy. Postoperative data collected included documented evidence of complications both during and after discharge, hospitalization duration, and the need for reinterventions.

In all cases, patients underwent a mechanical and antibiotic bowel preparation. The mechanical preparation involved 4 liters of polyethylene glycol in the early morning of the day before operation, followed in the afternoon and evening by 3 doses of neomycin (1 g) and metronidazole (500 mg). When operations were being conducted for malignancy, the rectum was routinely irrigated with sterile water, until clear, and an iodine solution, in the operating room.

The technical conduct of these operations includes routine mobilization of the splenic flexure. When the operation is performed for malignancy the inferior mesenteric artery is taken at the aorta, the left colic artery is taken at its origin off the inferior mesenteric artery, along with the inferior mesenteric vein, and the inferior mesenteric vein is taken a second time at the inferior edge of the pancreas. The transverse colon mesentery is taken along the inferior edge of the pancreas over to the middle colic vessels, and the mesentery beneath the marginal vessel is excised to allow the left colon to straighten out completely so that the bowel will go easily, and without any tension, to the pelvis. For benign disease, most commonly, diverticular disease, the sigmoid mesentery is taken above the inferior mesenteric artery, but in most cases the left colic artery is taken off the inferior mesenteric artery and the inferior mesenteric vein is taken at the inferior edge of the pancreas, simply to allow the descending and transverse colon to fall into the lower abdomen for a tension-free anastomosis. In cases where there is dramatic thickening in the sigmoid mesentery from diverticular disease, the dissection drops behind the inferior mesenteric artery, where the plane is usually preserved, and the vessels are taken as they would be for malignant disease.

All colorectal anastomoses were double stapled. In the period before 2012, these were all conducted with a 28 mm Covidien CEEA stapler (Covidien, Dublin, Ireland). After 2012, these were all constructed with an Ethicon 29 mm circular stapler (Johnson & Johnson, Somerville, NJ). For coloanal anastomoses, 80 were constructed using a double stapled technique, 45 were hand-sewn through the anus, and 20 of these were intrasphincteric resections with a hand-sewn anastomosis at the dentate line. All but one of the redo low anterior resection anastomoses were hand-sewn through the anus. For the double stapled coloanal anastomosis, the distal staple line was constructed with a Covidien PI-30 staple gun (Covidien, Dublin, Ireland).

A routine leak test was performed for all colorectal anastomoses (air insufflated into the rectum with a rigid proctoscope, with no attempt made to visualize the staple lines with the scope). Coloanal anastomoses were not subjected to a leak test when the anastomosis was diverted. A double stapled coloanal anastomosis is, however, subjected to a careful digital exam to confirm the intactness of the circular staple line.

The primary endpoint was the presence of anastomotic leak. Anastomotic leak was defined by any of the following: clinical suspicion as documented by the surgeon, physical exam findings, proctoscopic findings, or imaging results, whether these occurred in the early postoperative period while the patient was still hospitalized or in the late postoperative period, after hospitalization. Our standard practice is to evaluate every diverted colorectal or coloanal anastomosis 4 to 6 weeks postoperatively, by digital rectal exam, rigid proctosigmoidoscopy, and then a water soluble contrast enema in the setting of an asymptomatic patient. Physical examination, proctoscopic evaluation, and radiographic imaging are performed sooner for patients with signs or symptoms or suspicion of a leak. In patients who are not diverted, physical