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Analysis of anastomotic leakage after rectal surgery: A case-control study

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HIGHLIGHTS

- Frequency of anastomotic leakage was rather low in our institute.
- Male sex was the only risk factor for anastomotic leakage in rectal surgery.
- Tumor histological type was added in this revision.
- Attentive surgical procedure seems to have lead to less frequent anastomotic leakage.

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ABSTRACT

Background: The incidence of anastomotic leakage in rectal surgery is around 10 percent. Poor blood supply to the anastomosis, high anastomotic pressure and tension, increased operative blood loss, long operative time, and male sex are risk factors of anastomotic leakage. In the present study, we examined anastomotic leakage cases in rectal surgery at our institute and tried to ascertain the risk factors.

Methods: Three hundred fifty-seven consecutive patients who underwent rectal resection with anastomosis between January 2008 and October 2013 were included in the study. Patients were divided into two groups according to the existence of anastomotic leakage. Clinicopathological features, operative procedures, and intraoperative outcomes were compared between the two groups. Regarding intraoperative procedure, we focused on the ligation level of the inferior mesenteric artery, installing a transanal drainage tube in the rectum, and constructing a diverting stoma.

Results: Anastomotic leakage occurred in eight patients. All of them were male ($p = 0.0284$). There were no statistical differences in other characteristics of the patients or tumors, in operative procedures, or in intraoperative outcomes.

Conclusions: In the present study, no statistically significant risk factors for anastomotic leakage in rectal surgery were detected, except for male sex. However, the rate of anastomotic leakage at our institute was revealed to be rather low. Our exertion to preserve good blood flow and to prevent high tension and pressure on the anastomosis in operation may have led to this result.

1. Introduction

The incidence of anastomotic leakage (AL) in rectal surgery is reported to be around 10 percent [1,2]. Male sex, poor blood supply to the anastomosis, high anastomotic tension, high pressure of the bowel, increased operative blood loss, long operative time, and preoperative radiation therapy are the risk factors for anastomotic leakage [3–9]. Regarding short-term operative outcomes, AL is significantly associated with 30-day mortality rate. As for long-

Abbreviations: AL, anastomotic leakage; LCA, left colic artery; IMA, inferior mesenteric artery; LN, lymph node; CT, computed tomography.

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term outcomes, AL is related to worse disease-free or overall survival [2,10–12]. Therefore, reduction of AL is crucial for good operative outcomes. For that purpose, each institution aims to maintain good anastomotic blood flow and reduce anastomotic tension and pressure. Practically, at our institution, we usually ligate the inferior mesenteric artery (IMA) under the level of the bifurcation of the left colic artery (LCA) to maintain good blood flow, put a transanal drainage tube in the rectum to reduce intrarectal pressure, and mobilize splenic flexure to reduce anastomotic tension, if necessary. Here, we retrospectively reviewed our rectal surgery cases, investigated frequency of AL, surgical procedures, and perioperative outcomes, and explored measures to reduce AL in rectal surgery.

2. Patients and methods

The study was conducted with the approval of the Ethics Committee of our hospital.

All patients who underwent high anterior resection, low anterior resection, and intersphincteric resection (ISR) between January 2008 and October 2013 were included in the study. Patients without anastomosis, such as Hartmann's operation or Miles' operation, were excluded. Finally, three hundred fifty-seven patients were the objects of this study. The operations were performed by thirty-eight surgeons; sixteen of them were residents who were six to eight years of experience as a surgeon, and others are surgeons with more years of experience. Patients who suffered from AL were identified and the patients were divided into two groups: anastomotic leakage group (LG) and no anastomotic leakage group (NLG). Characteristics of patients and tumors, presence or absence of preoperative radiotherapy, operative procedures, intraoperative outcomes, and the experience of surgeons were retrospectively investigated and compared between the two groups. The numbers of patients with factors influencing anastomotic leakage, such as LCA preservation, transanal drainage tube, and diverting stoma, were compared between the two groups.

AL was defined as leakage of bowel content from the anastomotic site. AL was diagnosed when there was fecal discharge from the pelvic drain, or when fluid collection or fistula at the anastomotic site was detected radiologically in patients with symptoms, such as peritonitis.

All collected data were entered into the database and analyzed with JMP® Pro 10.0.2 (2012 SAS Institute Inc.). Univariate analysis was performed using the chi-square test or Fisher's exact test for categorical values, and the Student's t-test for numerical values. A value of $p < 0.05$ was considered statistically significant.

3. Results

AL occurred in eight patients. All of them were male patients ($p = 0.0284$). There were no statistical differences in other characteristics of the patients (Table 1). Original illness for surgery was rectal or advanced lower sigmoid colon cancer in all patients, except for one rectal carcinoid case. There was no emergency operation that comes from perforation of the bowel. Cases that showed stenosis due to advanced cancer were treated with transanal ileus tube or colonic stent before surgery in our institute. Perioperative outcomes are shown in the Table 3. LCA was preserved in all patients in the LG. Two of the eight patients showed ileus and two patients without ileus had severe stenosis caused by rectal tumor before surgery. A transanal drainage tube was placed in 150 patients. Though the percentage of patients with a transanal drainage tube in the LG was higher than that in the NLG, there was no statistical significance. Diverting ileostomy or colostomy was performed during the first operation in two patients in the LG. In the other six patients with AL, four recovered from leakage without undergoing additional surgery for intraperitoneal drainage or constructing a diverting stoma.

Table 1
Characteristics of patients.

		LG	NLG	Total	P
Age		59.6 ± 13.2	62.7 ± 11.2		NS (P = 0.5304)
Sex	Male	8 (100.0)	217	225	0.0284
	Female	0 (0.0)	132	132	
BMI		23.9 ± 4.62	22.6 ± 3.43		NS (P = 0.2719)
ASA score	1	2	131	133	NS (P = 0.7738)
	2	6	208	214	
	3	0	10	10	

LG, anastomotic leakage group; NLG, no anastomotic leakage group.
LN, lymph node; LCA, left colic artery.
Values in parentheses are percentages.

There was no statistical difference in the rate of laparoscopic surgery between the two groups. There were no statistical differences in tumor histology, tumor diameter, tumor stage, amount of intraoperative blood loss, or operative time (Tables 2 and 3). All of the cases with anastomotic leakage did not underwent preoperative radiotherapy. The rate of residents as the operator of the surgery in the two groups did not also show statistical difference (Table 3).

4. Discussion

The incidence of AL is reported to be around 10 percent [1,2]. AL is associated with subsequent local recurrence and distant metastasis as well as operative mortality [1,2,11–13]. Therefore, various contrivances are employed to prevent AL at each institution. At our institution, LCA is preserved in all patients except for those who have lymph node (LN) metastasis at the root of IMA. In the present study, no significant association was detected between the rate of AL and the ligation level of IMA. According to the previous study, correlation between the ligation level of IMA and AL is still controversial. Trencheva et al. reported that ligating IMA below LCA significantly decreased the rate of AL using univariate and multivariate analysis ($p = 0.0281$ and 0.0165 respectively) [6]. Komen et al. detected increased blood flow in patients with preserved LCA using laser Doppler flowmetry [14]. Cirocchi et al. conducted meta-analysis including 8666 patients and showed no statistically significant difference in AL rate between the high tie and low tie groups [15].

Regarding the transanal drainage tube, the present study showed no significant difference in AL rate between the patients with and without one. However, Zhao et al. conducted a non-randomized prospective study and showed that AL was less frequent in patients with one (7.8% in the group with one and 2.5% in the other group), though no statistically significant difference was detected ($p = 0.160$) [16]. Nishigori et al. retrospectively reviewed rectal cancer surgery cases and showed a similar result with statistical significance ($p = 0.04$) [17].

A diverting stoma is constructed to protect the distal colorectal anastomosis. In the present study, no significant difference was identified in AL rate between patients who had one constructed and those who had not. However, some studies have shown the effectiveness of stoma in reducing AL. In a retrospective study by Peeters et al., diverting stoma was significantly associated with lower anastomotic failure rate ($p = 0.003$) [7]. Thoker et al. conducted a randomized controlled trial including 78 rectal cancer patients and showed less frequent anastomotic leakage in cases with diverting stoma without statistical significance [18]. Multivariate analysis in a case-control study conducted by Jestin et al. showed that a diverting stoma significantly reduces AL [3].