

Results of the Double Stapling Procedure in Colorectal Surgery

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Abstract: In this report we review our results with the double stapling technique (DST) in 162 patients with colorectal diseases in an attempt to identify some of the potential pitfalls of this new technique. Among these 162 patients, there were 125 patients with colorectal cancer, 25 with chronic ulcerative colitis (UC), 9 with familial adenomatous polyposis (FAP), 2 with adult Hirschsprung's disease, and 1 with sigmoid colon fistula. A total of 46 anastomoses (28 for rectal cancer, 13 for UC, 3 for FAP, and 2 for adult Hirschsprung's disease) were performed at or near the dentate line. Of these, 10 had protective diverting colostomy or ileostomy. The results showed that 6 patients with rectal cancer had anastomotic leakage (3.7%); however, 4 of the 6 patients had also received preoperative irradiation. All the leaks healed after the patients had undergone diverting colostomy, but 7 patients with rectal cancer suffered from neurogenic bladder postoperatively (4.3%). Wound infection occurred in 4 patients (2.5%), anastomotic bleeding in 3 (1.9%), and anal pain in 1 (0.6%), respectively. One patient with rectal cancer and multiple liver metastases died of disseminated intravascular coagulation (DIC). These results thus suggest that the double stapling technique provides a safe anastomosis at or near the dentate line not only for rectal cancer but also for UC, FAP, and adult Hirschsprung's disease.

Key Words: colorectal surgery, double stapling, rectal reconstruction

Introduction

The double stapling technique (DST) for rectal reconstruction after colorectal resection, which involves closure of the lower rectal segment with a linear stapler and performance of anastomosis using a circular stapler across the linear staple row, was first described in 1980

by Knight and Griffen.¹ Since then, even though many surgeons have adopted this procedure in pelvic surgery for colorectal cancer as well as recently for chronic ulcerative colitis (UC) with ileal pouch anal anastomosis (IPAA), and thus confirmed the advantages of this new method,²⁻⁷ there are still some concerns about the safety of DST.^{8,9} Since February 1988, we have used this method on 162 patients with colorectal diseases and have found it to be useful not only for rectal cancer, chronic ulcerative colitis, and familial adenomatous polyposis (FAP) cases, but also for adult patients with Hirschsprung's disease. The purpose of this article is thus to review our experiences and discuss the results and pitfalls of the double stapling technique.

Patients and Methods

From February 1988 to October 1995, 162 patients were operated on using DST either by or under the supervision of one surgeon (T.M). The patients consisted of 103 men and 59 women, and ranged in age from 11 to 90 years (mean 53.7). Of these, 125 patients had carcinoma of the colorectum (Table 1). The distance between the lower margin of the tumor or the anastomosis after resection and the anal verge in patients with rectal cancer is shown in Table 2. Protective transverse colostomy was performed in 4 patients with preoperative irradiation and severe presacral fibrosis. Of the 25 patients with chronic UC, 2 had colon cancer. Familial adenomatous polyposis was diagnosed in 9, out of which 6 had colectomy and ileorectal anastomosis (IRA), and 3 had one-stage proctocolectomy and J-type-IPAA. We also used this method on 2 patients with adult Hirschsprung's disease, both of whom underwent low anterior resection of the aganglionic colorectum, and the anastomoses were performed near the dentate line. Another patient treated with this method had a sigmoid fistula caused by prior operative complications.

Table 1. Patients treated with the double stapling technique and postoperative complications

Diagnosis	No.	Age range	Mean age	Leaks		N. Bladder		W. Inf		A. Bleed		Anal pain	
				n	%	n	%	n	%	n	%	n	%
Colorectal cancer	125	25-90	59.7	6	4.9	7	5.7	3	2.5	3	2.5	1	0.9
Ulcerative colitis	25	11-66	30.6	0	0	0	0	1	4.0	0	0	0	0
FAP	9	21-59	39.9	0	0	0	0	0	0	0	0	0	0
AHD	2	52-54	53	0	0	0	0	0	0	0	0	0	0
S colon fistula	1	59		0	0	0	0	0	0	0	0	0	0
Total	162	11-90	53.7	6	3.7	7	4.3	4	2.5	3	1.9	1	0.6

FAP, familial adenomatous polyposis; AHD, adult Hirschsprung's disease; N. Bladder, neurogenic bladder; W. Inf, wound infection; A. Bleed, anastomotic bleeding; S colon fistula: sigmoid colon fistula

Table 2. Distance of tumor or anastomosis from the anal verge

Distance (cm)	Tumor to AV group		Anastomosis to AV group	
	No. of pts (%)	No. of leaks (%)	No. of pts (%)	No. of leaks (%)
<5	26 (20.8)	4 (14.3)*	43 (34.4)	5 (11.6)*
6-10	48 (38.4)	2 (4.3)	57 (45.6)	1 (1.9)
11-15	24 (19.2)	0 (0)	20 (16.0)	0
>15	27 (21.6)	0 (0)	5 (4.0)	0
Total	125	6 (4.8)	125	6 (4.8)

No., number; pts, patients; AV, anal verge

* $P < 0.05$ compared with those more than 6cm from the anal verge

Statistical Analysis

The data from different groups were compared by means of the chi-squared test.

Results

All donuts except for one were intact. In only one patient did restapling have to be done. Postoperative complications are shown in Table 1. Anastomotic leaks with clinical symptoms occurred in 6 patients (3.7%). All of them occurred in the rectal cancer group. Of the 6 patients, the tumors of 4 who had had preoperative irradiation were all located within 5cm above the anal verge; 2 patients also simultaneously underwent resection of part of the bladder, seminal vesicles, and wedge liver due to local invasion and liver metastasis. One of them had a prophylactic transverse colostomy, but anastomotic leakage still occurred. Tables 2 and 3 show the relationship between leakage and the distance between the tumor or the anastomosis and the anal verge, and patients with or without preoperative irradiation, respectively. The statistical results show that more leaks occurred in tumors or anastomoses located less than 5 cm above the anal verge. No statistical significance was observed between the irradiation and non-irradiation

Table 3. Effect of preoperative irradiation on anastomotic leakage in cancer patients with tumors less than 10cm from the anal verge

	Number of patients	Number of leaks (%)	Distance from tumor to AV (mean)
Irradiation group	29	4* 13.8	7.1 cm
Non-irradiation group	44	2 4.6	12.7 cm

* $P > 0.05$, no statistical significance

groups regarding the leakage rate. All leaks healed with either diverting colostomy or ileostomy. No clinical leakage occurred in the UC patients. Postoperative neurogenic bladder was encountered in 7 patients with rectal cancer (4.3%), but none of the patients in the other groups had this problem. Four patients, 3 in the cancer group and 1 in the UC group, had a wound infection. Anastomotic bleeding was seen in 3 patients with rectal cancer. One of them had common bile duct stenosis with a suspicion of primary malignancy and disordered liver function before surgery. After the operation this patient manifested jaundice and anastomotic bleeding. With percutaneous transhepatic cholangiography (PTCD) and local hemostasis, the bleeding stopped. Another patient with double colorectal cancers and multiple liver metastases presented anastomotic bleeding and pulmonary thrombosis postoperatively and died of disseminated intravascular coagulation (DIC) 16 days after surgery. One patient complained of anal pain during defecation 9 days after surgery due to the stapling nails protruding at the dentate line. After removal of the nails, the pain disappeared. No complications occurred in either the FAP or adult Hirschsprung's disease group, or in the patient with sigmoid colon fistula.

Discussion

Compared with hand sewing and ordinary stapling technique, DST offers many advantages for colorectal anastomosis, especially for super-low anterior resections.

Since it uses a linear stapler to close the lower rectal segment and avoids the frustrating and time-consuming distal purse string suture, very low anastomosis is thus possible with a shorter operation time. Many patients who might previously have been candidates for Miles' operation with permanent colostomy can now undergo sphincter-saving operations. In 20% of our rectal cancer patients, the tumors were located less than 5 cm from the anal verge. The anus of most of these patients might have been sacrificed if conventional techniques had been employed.

Clinical anastomotic leakage is the main concern regarding DST. Dziki et al.⁸ showed experimentally that although anastomosis using such instruments as the stapler was quicker and easier to perform than hand sewing, hand-sewn anastomoses were stronger and had a lower tendency to stricture. Herfarth⁹ reported that in his group of patients the leakage rate using DST was as high as 33%. However, other authors have reported leakage rates of from 3.8% to 8.3% in colorectal anastomosis without diverting colostomy.^{4,6,10-12} We did not routinely make a diverting colostomy in colorectal cancer patients unless the location of the tumor was very low or we were not quite sure of the safety of the anastomosis after making it, particularly in cases with preoperative irradiation. We had 4 patients (2.5%) who had protective colostomy; however, in 1 of them, anastomotic leakage still occurred. From our experience, diverting colostomy did not prevent leakage, but if it occurred, it made management of the leakage easier. To prevent leakage, we thus found it important to deal with the "dog ears" properly, since a blood supply impairment might occur at these two sites. We customarily made additional seromuscular sutures between the proximal colon and both sides of the "dog ears" to cover the anastomosis edge. Furthermore, one of the advantages of stapler anastomosis is thought to be the tight hold of the tissue at the anastomotic site due to the nails. We therefore tried to avoid clearing the proximal colon around the anastomotic site as much as possible, and in some very fatty cases when the fatty tissue was very thick at the site of anastomosis, we tried to clear the fatty tissue when necessary and keep some of it. The preserved fatty tissue near the cut end of the proximal colon which is covered by the serosa of mesocolon and appendices epiploicae may be caught between the instrument and the anvil, and thus the surrounding fatty tissue is squeezed out from the site of anastomosis when the anvil is approximated. The preserved serosa at the anastomotic site also helps the colonic wall to be held tightly by the stapler nails. We thus find this technique to be very important for preventing anastomotic leakage. Since its introduction, we have done 52 anastomoses with this technique, and no unexpected leakage has been observed.

From our results, it has become clear that more leakage occurs in patients with tumors or when the anastomosis is located near the dentate line, such as in cases less than 5 cm from the anal verge. This is considered to be due to impairment of the local blood supply and the technical difficulty in establishing the anastomosis. Although more anastomotic leakage occurred in patients with preoperative irradiation, no statistical significance was observed. Besides, considering that the location of the tumor in patients who did not receive preoperative irradiation was much higher than that in those in who did, the influence of irradiation on anastomosis leakage might thus have been neglected. In all 37 patients with benign colorectal diseases, no clinical leakage was observed. Furthermore, the leakage rate differed in different periods. Of the six leaks, 4 (66.6%) occurred before 1990 and 2 (33.3%) in 1992 and early 1993, respectively. Since then, no leakage occurred. All these results suggest that anastomotic leaks after DST are related to the type of operation, the tumor location and anastomosis site, the surgeon's experience, and preoperative irradiation.

Other complications such as neurogenic bladder and anastomotic bleeding are usually related to operations for advanced-stage cancer patients due to extended resection. No such complication occurred in the groups with benign diseases. Although many authors have reported stenosis after surgery utilizing DST, our experience showed that this problem could be avoided by merely choosing the right size stapler. Recently, DST has also been adopted for both UC and FAP patients. Its advantages over the hand-sewn method, however, remain controversial.^{6,13} Galandiuk et al.¹⁴ and Sugerman and Newsome¹⁵ promoted IPAA with protective ileostomy and reported a leakage rate of 5%. Our results of no leakage after one- or two-staged J-type-IPAA thus suggest that the double stapling IPAA itself can be safely created in one stage.

We first used DST in two adult patients with Hirschsprung's disease to perform low anastomosis after removing the narrow segment. Compared with the traditional Swenson method, this technique is considered to provide a safer and easier solution.

In summary, we used DST on 162 patients with colorectal diseases. Our results confirm the findings of other authors' reports which concluded that DST is a safe method for colorectal anastomosis in low anterior resections, especially for super-low anastomosis, even after patients have undergone preoperative irradiation.

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