Anastomosis to the Rectum

Operative Experience

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Steinhagen RM, Weakley FL. Anastomosis to the rectum: operative experience. Dis Colon Rectum 1985;28:105-109.

Four hundred sixty-six consecutive procedures involving anastomosis to the rectum were performed between March 1969 and December 1982. Three hundred ninety-six (85 percent) were stapled anastomoses and 70 (15 percent) were hand-sutured anastomoses. The stapled anastomoses were constructed using the GIA® or EEA® instrument, some of the latter utilizing a pull-through technique. The hand-sutured anastomoses were constructed in the pelvic space, or externally as a staged pull-through procedure. A diverting stoma was constructed in all 14 staged pull-through procedures, in 47 of 56 (84 percent) conventional hand-sutured anastomoses, and in 38 of 396 (10 percent) stapled anastomoses. While the majority of very low anastomoses (0 to 5 cm from the dentate line) were stapled, 13 conventional hand-sutured anastomoses and all 14 of the staged pull-through procedures were constructed at this level. One patient (0.2 percent) died as the result of an anastomotic complication. Twelve patients (2.5 percent) had anastomotic complications requiring reoperation. The reoperation rate for stapled anastomoses was six of 396 (1.5 percent). For hand-sutured anastomoses, the reoperation rate was six of 70 (8.6 percent). The results show that, for anastomosis to the rectum, stapling instruments are at least as good as hand-suturing. Both stapling techniques and hand-suturing techniques provide the surgeon the capacity to construct safely very low anastomoses. A temporary, diverting stoma is required much less frequently with stapled than with hand-sutured anastomoses. The need for a permanent colostomy should be determined by the stage and level of disease, the systemic health of the patient, and the patient's anatomy, rather than by the selection of anastomotic technique. [Key words: Colon; Rectum; Bowel; Anastomosis; Stapler; Colostomy]

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CURRENTLY USED LINEAR STAPLING INSTRUMENTS were introduced in the United States in the late 1960's,[1,3] and a circular, or tubular stapler was introduced in the 1970's.[4-5] Since then, stapling instruments have gained wide-spread acceptance and popularity for their time-saving benefits and for the technical excellence of their performance.[6-10] Staplers provide the greatest advantage over hand-suturing in locations accessible only with difficulty and associated with high rates of anastomotic disruption: specifically, the esophagus and extraperitoneal rectum.[5] While special, sphincter-saving techniques, such as the Turnbull-Cutait pull-through procedure,[11,12] enable the surgeon to perform a colorectal anastomosis as low as the level of the dentate line, these are usually two-or three-stage procedures that commonly utilize temporary diversion by an intestinal stoma. Previous reports of relatively high complication and anastomotic leak rates for low anterior resection,[13,14] abdomino-sacral resection,[15] and pull-through procedures,[16] all utilizing hand-sutured anastomoses, are well known. Current stapling techniques allow equally low anastomoses to be performed safely, usually without a diverting stoma.[17] In order to evaluate the impact of these stapling techniques on anastomosis to the rectum, we have reviewed the experience of the senior author with procedures involving rectal anastomosis, beginning with his first use of the GIA® (Gastrointestinal Anastomosis, United States Surgical Corporation, Norwalk, CT) stapler in March 1969.

Materials and Methods

Operative records of a single surgeon were reviewed to identify all patients who underwent procedures involving anastomosis to the rectum, beginning with his first rectal anastomosis utilizing the GIA stapler in March 1969. The EEA® (End-to-End Anastomosis, U.S.S.C.) stapler was first used for rectal anastomosis in September 1977. All patients who underwent an operative procedure involving rectal anastomosis between March 1969 and December 1982 were included in this review.

As used in this review, "rectum" is defined as that portion of the large intestine beginning at the coalescence of the tinea coli, and ending at the dentate line. The

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Received for publication August 6, 1984.

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proximal extent corresponds to approximately 15 cm from the dentate line, and is approximately at the level of the sacral promontory. We have classified an anastomosis as being in the upper, middle, or lower third of the rectum, based on a distance of 10 to 15 cm, 5 to 10 cm, and 0 to 5 cm from the dentate line, respectively. This determination was initially an intraoperative one based on known anatomic landmarks, such as the anterior peritoneal reflection, but was confirmed subsequently by postoperative proctosigmoidoscopy.

The decision to construct a diverting stoma (or to preserve one previously constructed) was made intraoperatively at the time of anastomosis. Multiple factors, such as the presence of preexisting pelvic sepsis, thickening and edema of the bowel walls, and technical adequacy of the anastomosis, were considered. The level at which the anastomosis was constructed was not, *per se*, a factor. Bowel that was judged to be too thick (*i.e.*, more than twice normal) to be safely stapled, was anastomosed using hand-suturing techniques, and the highest proportion of diverting stomas were constructed in this group.

Hospital and outpatient charts were reviewed to evaluate the postoperative course, with emphasis on anastomotic complications. Specifically, the need for reoperation as the result of pelvic sepsis or anastomotic dehiscence was recorded. Postoperative contrast studies to evaluate anastomotic integrity were not done routinely. Patients were seen in the outpatient clinic within four to six weeks after discharge from the hospital, their convalescence was evaluated, and the anastomotic level was confirmed by proctosigmoidoscopy.

Complications unrelated to the anastomosis are not reported. The techniques for performing these rectal anastomoses have been described previously.[11,17]

Results

Between March 1969 and December 1982, 466 procedures involving rectal anastomosis were performed on 465 patients. A single patient underwent a second procedure because of stricture of a hand-sutured anastomosis. Of the total, 279 (60 percent) were done with the GIA stapler and 117 (25 percent) were done using the EEA stapler, a total of 396 (85 percent) stapled anastomoses. Fifty-six (12 percent) were primary hand-sutured anastomoses and 14 (3 percent) were staged pull-through procedures[11,12] (Table 1). The diagnosis for which these procedures were done was cancer in 297 (65 percent), diverticular disease in 125 (27 percent), inflammatory bowel disease in 22 (5 percent), benign polyps (including multiple polyps and familial polyposis) in 12 (3 percent) and a miscellaneous group of nine patients (2 percent) who were referred from other institutions and in whom the original diagnosis was unclear (Table 2).

Two hundred sixty-four of the GIA anastomoses were performed prior to introduction of the EEA stapler in September 1977 (82 percent of the rectal anastomoses done between March 1969 and September 1977), whereas only 15 have been GIA stapled since September 1977 (10 percent of the rectal anastomoses done between September 1977 and December 1982; Table 3).

Of the 466 procedures, 99 (21 percent) involved a diverting stoma created either at the time of making the anastomosis or present from an earlier procedure and left intact. Of the 56 hand-sutured anastomoses, 47 (84 percent) had diverting stomas constructed while only 30 of the 279 (11 percent) GIA anastomoses and seven of the 100 (7 percent) EEA anastomoses had stomas constructed. Of the 17 pull-through EEA anastomoses, only one (6 percent) had a diverting stoma constructed as part of the primary procedure. All of the staged pull-through procedures had diverting tomas constructed (Table 4). In general, hand-sutured anastomosis was performed when the bowel wall was judged to be too thick for the safe use of stapling instruments.

The level of anastomosis by each technique is described in Table 5. As stated above, the staged pull-through technique (Turnbull-Cutait)[11,12] allows very low colorectal anastomosis to be performed without stapling instruments. It is apparent from the data, however, that the majority of the lowest anastomoses have been performed with stapling instruments, especially the EEA.

Since the introduction of the EEA stapler in September 1977, 144 anastomoses to the rectum were performed. Of these, 117 (81 percent) involved the use of the EEA stapler. This is the same percentage of rectal anastomoses that were performed using the GIA stapler in the pre-EEA era. Of the 117 anastomoses, 58 were done through a transabdominal colotomy or ileotomy, 42 were done transanally,

TABLE 1. *Method of Anastomoses to the Rectum*

	Number	Percent
GIA®	279	60
EEA®	100	21
EEA® pull-through	17	4
Total stapled	396	85
Primary hand-sutured	56	12
Staged pull-through	14	3
Total sutured	70	15
Total anastomoses	466	100

TABLE 2. *Diagnosis in 465 Patients Having Anastomosis to the Rectum*

	Number	Percent
Cancer	297	64
Diverticular disease	125	27
Inflammatory bowel disease	22	5
Benign polyps	12	3
Miscellaneous	9	2
TOTAL	465	

TABLE 3. *Method of Anastomosis Before and After Availability of EEA® Stapler*

	Before (1969-1977)		After (1977-1982)	
	Number	Percent	Number	Percent
GIA®	264	82	15	10
EEA®	—	—	100	69
Pull-through EEA®	—	—	17	12
Total stapled	264	82	132	92
Hand-sutured	45	14	11	8
Staged pull-through	13	4	1	1
Total sutured	58	18	12	8
TOTAL	322	69	144	31

and 17 were done from the external perineal field as a pull-through procedure. Ninety-four were done for cancer and 21 for diverticular disease. One each was done for ulcerative colitis and for colonic ischemia. Only eight of the 117 (7 percent) had stomas constructed or left at the time of the primary procedure, and none in the last 56.

Of the 17 procedures done with the EEA pull-through technique, 13 were in men and four in women. All were done for carcinoma of the midrectum (5 to 10 cm from the anal verge). The anastomosis was constructed on, or within, 2 cm of the dentate line. Ten of these 17 (59 percent) anastomoses were reinforced with sutures placed from the external perineal field. Only one had a diverting stoma constructed at the time of the primary procedure.

Complications

For the entire series of 466 operations, there was one postoperative death attributable to an anastomotic complication (0.2 percent) and there were 12 (2.5 percent) complications requiring reoperation. Of these, six (1.5 percent) were in stapled anastomoses and six (8.6 percent) were in hand-sutured anastomoses (Table 6).

The patient who died had undergone an abdominal colectomy and GIA ileorectal anastomosis for an obstructing left colon carcinoma. The anastomosis leaked, peritonitis developed, and the patient evenually died from sepsis, despite reoperation involving drainage and construction of a diverting stoma. Since the introduction of the EEA in September 1977, there have been no perioperative mortalities.

TABLE 5. *Level of 466 Rectal Anastomoses*

	Distance from Dentate Line		
	Lower (0-5 cm)	Middle (5-10 cm)	Upper (10-15 cm)
Stapled			
GIA®	8	60	211
EEA®	28	30	42
Pull-through EEA®	17	0	0
	53	90	253
Sutured			
Hand-sutured	13	24	19
Staged pull-through	14	0	0
	27	24	19
TOTALS	80	114	272

TABLE 4. *Diverting Stomas in 466 Anastomoses*

		Diverting Stomas	
	Number	Number	Percent
GIA®	279	30	11
EEA®	100	7	7
Pull-through EEA®	17	1	6
Total stapled	396	38	9.6
Hand-sutured	56	47	84
Staged pull-through	14	14	100
Total sutured	70	61	87
TOTAL	466	99	21

In the 100 EEA anastomoses, there were two (2 percent) anastomotic complications requiring reoperation. One was an anastomotic leak treated by drainage and a loop transverse colostomy. The other was peritonitis that developed three months after proctosigmoidectomy and colorectal anastomosis. A leak developed from the colotomy site used for introduction of the stapler. This was treated by suture closure, drainage, and loop transverse colostomy.

In the group of 17 pull-through EEA anastomoses, the only complication was a rectovaginal fistula that developed at home three weeks postoperatively. It was treated by loop ileostomy, subsequent repair and, later yet, ileostomy closure.

In the GIA group, other than the previously mentioned death, there were two anastomotic leaks requiring reoperation for a total of three complications in 279 procedures (1.1 percent). All of these occurred prior to introduction of the EEA stapler in September 1977.

In the 56 conventional hand-sutured anastomoses, there was one anastomotic leak, one anastomotic stricture, and one rectovaginal fistula (5.3 percent). In the 14 staged pull-through procedures, there was one presacral abscess that was drained at the time of staged amputation of the colonic stump, and there were two anastomotic strictures that required repeated dilatation or division (21 percent). There were no deaths in any of these patients, and all had good functional results.

TABLE 6. *Complications Requiring Reoperation*

	Complications per Category Total	Percent
GIA®	3*/279	1.1
EEA®	2/100	2.0
Pull-through EEA®	1/17	5.9
Total stapled	6/396	1.5
Hand sutured	3/56	5.3
Staged pull-through	3/14	21.0
Total sutured	6/70	8.6
TOTAL	12*/466	2.5

*One postoperative death (0.2 percent).

There were no documented instances of anastomotic dehiscence that were treated without reoperation. No patient had to be reoperated just to drain a pelvic abscess and there were no cases of documented pelvic sepsis in situations other than those in which there was clinically evident anastomotic breakdown.

Discussion

A number of reports[7-10,18-20] have praised the circular stapling device for use in rectal anastomosis on the grounds that, when compared with hand-sutured anastomosis, it is quicker, more secure, and allows for the construction of a lower anastomosis, thus preserving rectums that would otherwise need to be resected. We challenge this point of view, since it is the patient and the disease, not the technique, that should determine whether a rectal remnant can be retained. Use of the staged pull-through procedure has permitted colorectal anastomosis as low as the level of the dentate line, long before the availability of the EEA.

The majority of these 466 consecutive operations involving anastomosis to the rectum were performed using one of the available stapling instruments. Prior to September 1977, the GIA stapler was used in 82 percent of cases and, since then, 81 percent have been constructed using the EEA stapler. Hand-sutured anastomoses were constructed in those few instances in which the bowel wall was judged to be too thick to use stapling instruments safely.

Beart and Kelly[20] reported a prospective trial comparing hand-sutured with stapled anastomoses. They estimated that use of the EEA stapler allowed preservation of 12 percent of rectums that would have to have been sacrificed had only hand sutures been available. However, they gave no consideration to the use of single-layer anastomoses or to any of the other sphincter-saving procedures (*e.g.*, Turnbull-Cutait staged pull-through or abdominosacral resection and anastomosis) available as alternatives to conventional, anterior resection with two-layer anastomoses.

Others who have used hand-sutured, sphincter-saving procedures have reported relatively high complication and anastomic leak rates[15,16] and our results in a small number of patients are comparable. We favor the pull-through technique, using the EEA stapler,[17] because it can be performed safely as a one-stage procedure without a colostomy and because the complications are fewer.

Each of our reported techniques for rectal anastomosis utilizing stapling instruments has an important place in the armamentarium of the colorectal surgeon and should be used in the appropriate circumstances.[17]

Transanal introduction of the EEA stapler for creating a colorectal or ileorectal anastomosis was felt to be hazardous because of the possibility of introducing deep pelvic soilage from the perineal field. Rectal lavage, antiseptic perineal preparation, and sterile draping were used in our patients, and pelvic soilage was not encountered. At the present time, transanal introduction of the EEA stapler is preferred. Whether introduced transanally or via a proximal colotomy, The EEA anastomosis requires impeccable cleanliness of the bowel lumen. Placement and tying of the very low rectal purse-string suture may be difficult, but is certainly easier than the placement of conventional sutures at the same level.

The pull-through EEA technique permits construction of a very low colorectal anastomosis at, or just above, the dentate line. The anastomosis is constructed from the perineal field and the technique may be utilized despite imperfect lumen cleansing. It should be noted, however, that there is frequently a posterior tear or rent that occurs at the instant of tumor pull-through, and 59 percent of our anastomoses required suture reinforcement. This is easily accomplished from the perineal field prior to allowing the anastomosis to return to the supra-anal level.

The GIA colorectal anastomosis reduces the amount of time during which the bowel lumen is exposed and reduces the chance of expressing luminal contents into the operative field. It eliminates diameter disproportion problems and affords "shielding" of the anastomosis by anterior and posterior bowel. It does, however, require at least 5 cm of rectal remnant and thus is of limited utility for very low anastomoses, especially in the android pelvis.

All stapled anastomoses are limited by the design characteristics of the instruments, which safely accept only normal or nearly normal bowel-wall thickness. When the walls are very thick (more than twice normal), staples are likely to cut through the tissue crushed by the stapling instrument. This is most often the case in situations where hypertrophy or inflammation is present. These anastomoses will be likely to leak and we suggest the use of hand-sutured anastomoses and a diverting stoma in these situations. This philosophy is evident in our series in which 84 percent of all patients with hand-sutured anastomoses had colostomies constructed or left if already present, as compared with 21 percent for the entire 9.6 percent for the stapled anastomoses.

Conclusions

This is a retrospective review of the experience of a single surgeon spanning 14 years. The low morbidity and mortality statistics in this series support our contention that when constructed appropriately, stapled anastomoses are of high integrity and seldom need exclusion by a diverting stoma. Use of the operations represented by these results, whether by staples or conventional sutures, supports our further contention that, if any rectal remnant remains after adequate resection, intestinal conti-

nuity can usually be re-established. The need for a permanent colostomy should thus be determined by the stage and level of disease, the state of general systemic health of the patient, and the patient's anatomy, rather than by the selection of anastomotic technique.

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Announcement

85TH ANNUAL CONVENTION OF THE AMERICAN SOCIETY OF COLON AND RECTAL SURGEONS

The American Society of Colon and Rectal Surgeons will sponsor its 85th Annual Convention to be held May 11-16, 1986, in Houston, Texas. The program is designed to provide in-depth and up-to-date knowledge in treatment of diseases affecting the colon and rectum. It is directed primarily toward colon and rectal surgeons, general surgeons, and others interested in treatment of diseases related to the specialty. The scientific program includes plenary sessions, as well as a series of smaller Electives. There will be both podium and poster presentations, plus a wide variety of Scientific and technical exhibits. Abstracts of presentations on relevant topics are invited and must be submitted by October 1, 1985. For more information, write: American Society of Colon and Rectal Surgeons, 615 Griswold #1717, Detroit, Michigan 48226.