

# Simplified Anterior Resection: Use of the TA Stapler\*

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ANTERIOR RESECTION for carcinomas involving the middle upper rectum, the rectosigmoid and the sigmoid is the operation of choice when compared with abdominoperineal resection.<sup>3</sup> The sphincter-saving anterior resection, generally, has less morbidity, less mortality, and a better survival rate than the Miles operation. Difficult anastomoses deep in the pelvis, associated leaks, and infection have been the major problems when using conventional techniques. Infection is the major factor in morbidity.

Automatic anastomosing stapling devices simplify the operation, lessen leakage and take less time than the conventional suture technique.<sup>5, 6, 11</sup> The TA stapling device (Fig. 1) permits a physiologic end-to-end anastomosis. The purpose of this paper is to present a private series of 40 consecutive cases of anterior resection, high and low, performed during the past two and a half years in two private hospitals in Jacksonville, Florida. No *clinical* leak, no infection, and no death were encountered.

## Technique

Immediately prior to surgery, the bowel was irrigated while the patient was on the operating table, as suggested by Turnbull

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FIG. 1. The TA instrument, used for linear suture closures after the bowel has been triangulated and grasped with Allis forceps. This is the TA 55 (the TA 30 is smaller).

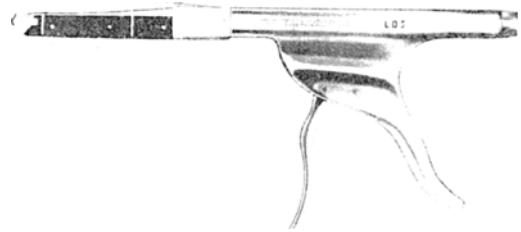


FIG. 2. LDS stapler with cartridge. With one operation the instrument ligates proximally, and distally and divides. Tissue is placed in the hook. It can be operated 15 times with one cartridge and can be reloaded. L - ligate, D = divide, S = staple.

*et al.*<sup>12</sup> Through a midline incision, a thorough exploration is done to establish the stage of the tumor, care being taken to evaluate the liver. Right and left sigmoid peritoneal incisions are made, dissecting at least 4 cm below the tumor and usually below the promontory of the sacrum. Tapes are applied 10 to 20 cm above the lesion, employing "no-touch" technique; the inferior mesenteric lymphovascular

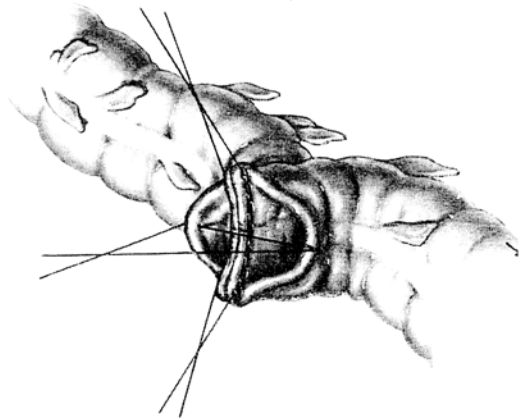
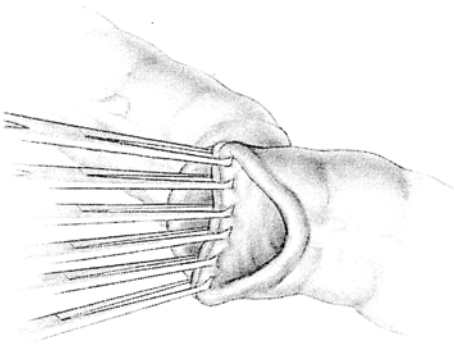
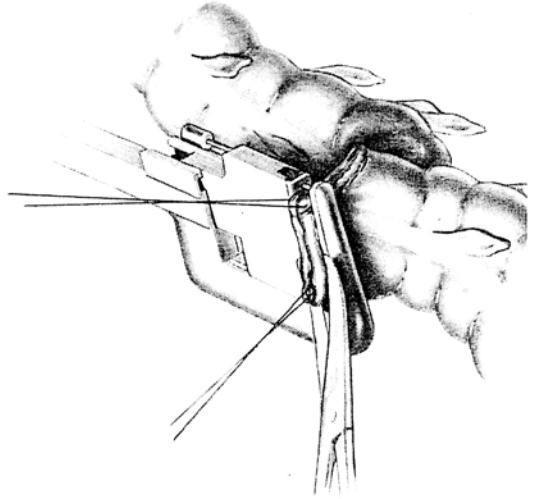
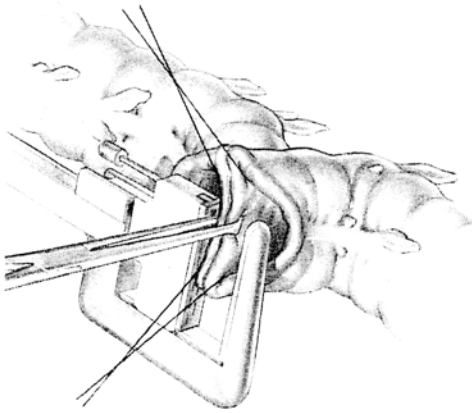
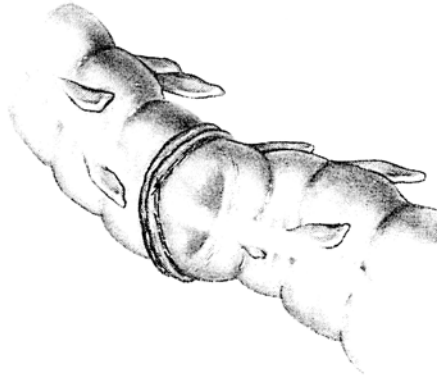
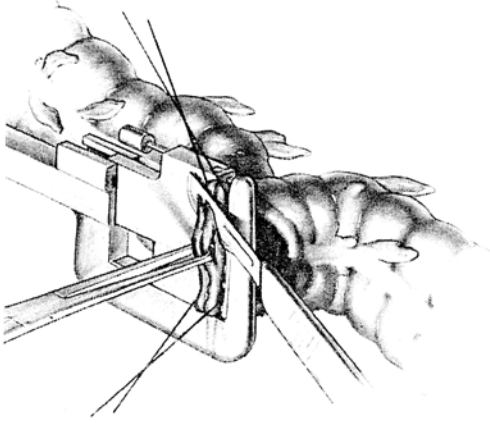


FIG. 3 (*upper left*). Long Allis clamps approximate the bowel prior to application of the TA 55.

FIG. 4 (*upper middle*). TA 55 clamp is placed behind the Allis clamp. Only one is shown in the figure but all six are left in place until the instrument is fired.

FIG. 5 (*upper right*). The redundant tissue is removed after the stapler has been "fired." Care is taken not to cut the triangulating chromic catgut stay sutures.

FIG. 6 (*lower left*). The posterior layer is inverted into the lumen. The stapler has been removed. The triangulating stay sutures are shown.

FIG. 7 (*lower middle*). The TA 30 stapler is used to close the two remaining triangulated segments. This is an everting suture line.

FIG. 8 (*lower right*). The completed anastomosis. This is tested for leakage. Sometimes there is bleeding from the edges and a running suture with 00 chromic catgut may be advisable.

pedicle is ligated using the LDS stapling device (Fig. 2). Four centimeters below the lesion, with the tape tied, the bowel is cut, leaving 4 to 8 cm of distal rectum (depending on the level of the lesion). A triangulating approximation with 00 chromic catgut "stay sutures" pulls the bowel together. The edges of the proximal and distal colon are approximated with long Allis clamps (Fig. 3). The posterior anastomotic line is inverted; the TA 55 stapling device is placed behind the Allis clamps and "fired" (Figs. 4 and 5). The stapler everts the suture line in the other two triangulated segments (Figs. 6 and 7). Tapes are removed; the suture line is tested for leaks, and a running 00 chromic catgut suture is carried around the anastomosis, reinforcing the closure and preventing bleeding (Fig. 8). Water is used to wash the abdomen, lysing tumor cells and removing bacteria. An Abramson<sup>8</sup> (sump) drain, placed low in the pelvis through the lower end of the incision, with suction applied, is removed the next day. Routine tube cecostomy (No. 30 Foley or mushroom catheter) is used, suturing the cecum to the parietal peritoneum.

### Method

Since May 1971, the United States staplers TA 30 and TA 55 have been used by us for anterior resections done for carcinomas and diverticulitis. From May 1971 to October 1973, 40 cases were collected. Age, sex, race, symptomatology, level of lesion, time of the surgical procedure, stay in the hospital, and complications were studied. All anterior resections were elective, and all patients were treated in a similar manner. Patients were admitted to the hospital two to three days prior to surgery for evaluation. Intravenous pyelograms, chest x-rays, electrolytes, SMA12 chemistries, regular laboratory tests, and urinalyses were done. Barium-enema study was generally done prior to admission. All

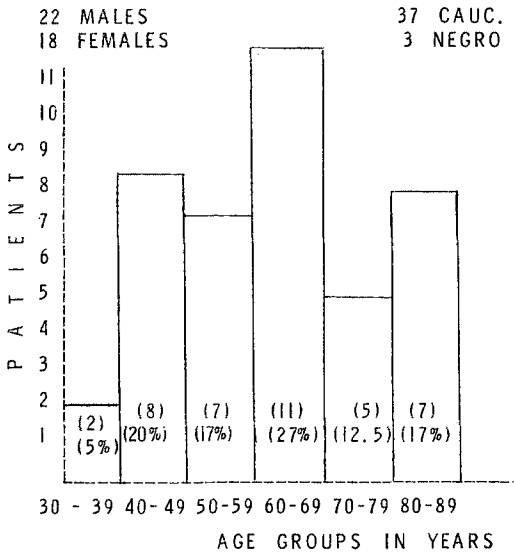


FIG. 9. Distribution by age, sex and race of 40 patients treated by anterior resection.

of these patients except four received complementary cecostomies or diverting colostomies.<sup>10</sup> Thirty-two patients received complementary cecostomies, and four received diverting colostomies. Each patient received phospho-soda as a saline cathartic on the day prior to operation. Kanamycin bowel preparation with a dosage of 1 g every hour for four hours and every four hours thereafter was used. Azulfidine, 2 g, *q.i.d.*, was given for two days prior to surgery. Each patient was given 2 g of cephalothin on the morning of operation and 2 g (intravenously) every eight hours for one day postoperatively.

**Results**

Figure 9 shows distribution of the patients by age, sex, and race. As expected, younger patients had less morbidity. There was no mortality. The youngest patient was 33 and the oldest was 84 years of age. Seventy per cent were less than 70 years old, yet 17 per cent were more than 80 years old. The median age was the seventh decade of life (60-69 years), and accounted for 27 per cent (11 cases) of the total.

**Sex and Race:** There were 22 male and 18 female patients; 37 were Caucasian and three were Negro.

**Symptoms and Diagnoses:** Thirty-three of the resections were done for neoplastic disease, five for diverticulitis, one for procidentia, and one for endometriosis. Rectal bleeding was the main symptom and was present in 27 patients—18 of whom had durations of illness of less than three months and nine, durations of more than three months. Rectal bleeding was the

TABLE 1. Diagnoses

Neoplasia	33*
Diverticulitis	5*
Procidentia	1
Endometriosis	1

\* One patient had carcinoma and diverticulitis.

TABLE 2. Levels of the Lesions

Below 25 cm	31
Between 14-25 cm	17
Below 14 cm	14
Above 25 cm	9*

\* Includes procidentia, 5 diverticulitis, and endometriosis.

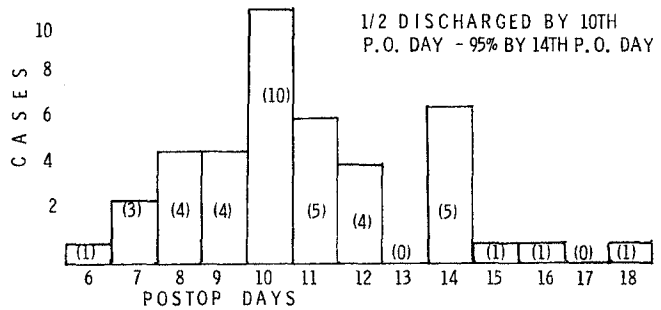
TABLE 3. Factors Affecting Level of Resection

Better	Worse
Female	Male
Elderly	Young
Thin	Obese

TABLE 4. Operative Time

70 per cent less than two hours
Shortest 45 minutes (2)
Longest three hours, 40 minutes (1).
Stapler saves 30 minutes-1 hour

FIG. 10. Postoperative stays in the hospital, 40 patients treated by anterior resection.



chief complaint of all the patients who had neoplasms except two, and these were seen because of abdominal pain. Other symptoms were constipation, pain, diarrhea, and obstruction, and these were found largely in the diverticulitis group. (Two patients had admission hemoglobin values below 11 g/100 ml.) The diagnoses were confirmed by proctoscopy and barium-enema study. One patient had both diverticulitis and carcinoma (Table 1).

**Level of the Lesion:** Thirty-one of the lesions were below 25 cm and within the range of the proctoscope. Seventeen were between 14 and 25 cm, 14 below 14 cm. Nine were above 25 cm—these including the five patients who had diverticulitis, one who had endometriosis, and one who had proclinentia. All of the anastomoses were either near the peritoneal reflection or below it (Table 2).

**Operative Time:** Seventy per cent of the procedures were performed in less than two hours, the shortest time being 45 minutes (two cases) and the longest, three hours and 40 minutes. The shortest operative times occurred in cases of thin, elderly women, and the longest times in cases of obese, not too elderly men (Tables 3 and 4).

**Stay in the Hospital:** Practically all patients were admitted on an elective basis two days prior to operation. More than half (22) were discharged by the tenth postoperative day; three fourths (30) by the twelfth postoperative day; 90 per cent by

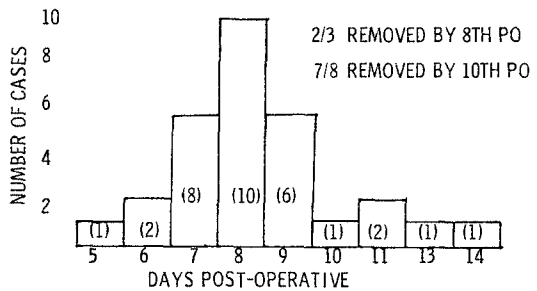


FIG. 11. Tube removal, 32 complementary cecostomies.

the fourteenth postoperative day. The earliest discharge was on the sixth postoperative day and the latest on the eighteenth day (Fig. 10).

**Complementary Cecostomies:** Thirty-two complementary cecostomies and four diverting colostomies were done.<sup>10</sup> Four patients received no cecostomy or colostomy. The cecostomy tubes were removed from the fifth day to the fourteenth day. The majority were removed on the seventh (9), eighth (10) and ninth (6) postoperative days (Fig. 11).

**Complications:** Nine patients had complications. Six patients had atelectasis, four had ileus, three had urinary-tract infections and urinary dysfunction, one had diarrhea. Three patients had more than two complications. Two had subclinical leaks that were discovered later on proctoscopy. (Two patients developed recurrences; one of these (Dukes' C) was apparently due to "seeding" at the time of operation; in the

TABLE 5. *Complications*

Atelectasis	6	No dehiscence
Ileus	4	No infection (wicks)
Urinary-tract infection	3	No mortality
Diarrhea	1	No defecation disturbance
Subclinical leaks	2	No sex disturbance
Total 9 patients, three with two or more complications.		

other case (Dukes' C) it was felt that a pararectal node had eroded through the suture line.) There was no operative death. No patient had any interference with defecation postoperatively and, based on brief interviews in the office, there was no change in sexual function (Table 5).

**Leakage:** In two patients proctoscopic examination disclosed small leaks, but neither of these was of clinical significance.<sup>2, 4, 7</sup> The staples came out into the lumen over a 12-month period. All were proctoscoped in the follow-up periods (Tables 6 and 7).

**Stage:** Thirty-three patients had neoplasia; of these, eight had Dukes' A lesions; ten, Dukes' B; eleven, Dukes' C; three, Dukes' D. One patient had a large villous tumor. The size of the lesion seemed to have no effect on the stage. Every lesion had a 4 cm margin or better below it (Table 8).

### Discussion

"Anterior resection" is a term that is loosely used, and normally indicates operations done for lesions of the rectosigmoid and upper rectum. It should be distinguished from an abdominoperineal resection and the pull-through operation.<sup>3, 9</sup> Lesions resected in this study were mid rectal or higher. The anastomosis made by the stapling device were either near or below the peritoneal reflection. The lowest lesion had a rectal cuff of at least 4 to 5 cm from the anal verge.

Rectal bleeding was the chief symptom, and most of the lesions were found early, accounting for the high incidences of Dukes' A and B lesions. No attempt was made to study survival rates, as the primary purpose of this paper is to present the use of the TA 30 and TA 55 stapling device after resecting lesions of the lower left colon. The study is recent and does not permit calculation of survival rate. The incidence of leakage was lower in the series than is generally reported. The high

TABLE 6. *Leakage after Anterior Resection (Dehiscence of Suture Line)*

Goligher <i>et al.</i> <sup>2</sup> (overall)	51 per cent
Subclinical—high	40 per cent
Clinical high	9 per cent
Subclinical—low	69 per cent
Clinical low	27 per cent
This study (overall)	5 per cent
Subclinical—low	2.5 per cent
Clinical low	0
Subclinical—high	2.5 per cent
Clinical high	0
Morgenstern <sup>4</sup> (overall)	23 per cent
Beahrs <sup>4</sup>	8 per cent
Zollinger <sup>13</sup>	23 per cent
Zollinger <sup>13</sup> (end-to-side)	3 per cent
Schrock <i>et al.</i> <sup>7</sup> clinical (overall)	4.5 per cent

TABLE 7. *Recurrence at Suture Line*

Average	10 per cent
This study	5 per cent

TABLE 8. *Stage of 33 Adenocarcinomas, Left Colon\**

1 stage 0 (villous)
8 stage A
10 stage B
11 stage C
3 stage D

\* All had 4 cm margin or more.

incidences in some reports, such as Goligher's<sup>2, 4, 7</sup> 51 per cent, are manifestations of diligent searches for leakage. Average reported incidences are 5 per cent to 10 per cent. Twenty-three per cent was reported recently by Morgenstern *et al.*<sup>4</sup> The crux of the matter concerning leakage is: "Is the leakage of clinical significance?" Two of these patients had small leaks demonstrated on proctoscopic examination, but neither had any clinical difficulty. The use of the complementary cecostomy as a decompressive, ostomy vent, may have accounted for the low incidence in leakage in this series. The use of four defunctioning colostomies points out the necessity for a defunctioning procedure (Table 9) when one is not entirely satisfied with the security of the suture line, whether the suture line is stapled or sutured. The Abramson drain, which was left in the pelvis for 24 hours, removed serum and accumulative material, which prevented infection and breakage into the suture line postoperatively.<sup>8</sup> Antibiotics, with adequate preoperative bowel cleansing, probably prevented infection. The generally accepted 3 to 5 per cent mortality points to the continued decline of the 10 per cent mortality

TABLE 9. *Colostomy vs. Cecostomy*

Low resection Insecure anastomosis Fecal loading
32 cecostomies 4 colostomies 4 no cecostomies

rate of the 1930's. The mortality for abdominoperineal resection remains high—10 per cent.

Recurrences at the suture line a few years ago were reported to have an incidence of 10 per cent, and this rate continues to decline.<sup>2, 4, 7</sup> Two cases in this series comprise a 5 per cent incidence. This is explained in part by seeding in one case; although the anastomosis was well (5 cm) below the main lesion, the submicroscopic seeding played a large part in the recurrence. In the other case, a Dukes' C lesion, a rather low one, probably had pararectal nodal involvement, which may have been the causative factor in the recurrence. The specimen showed a free 5-cm cuff. Preoperative cleansing enemas, saline cathartics, and pre- and postoperative "short-term antibiotics" lessened morbidity and

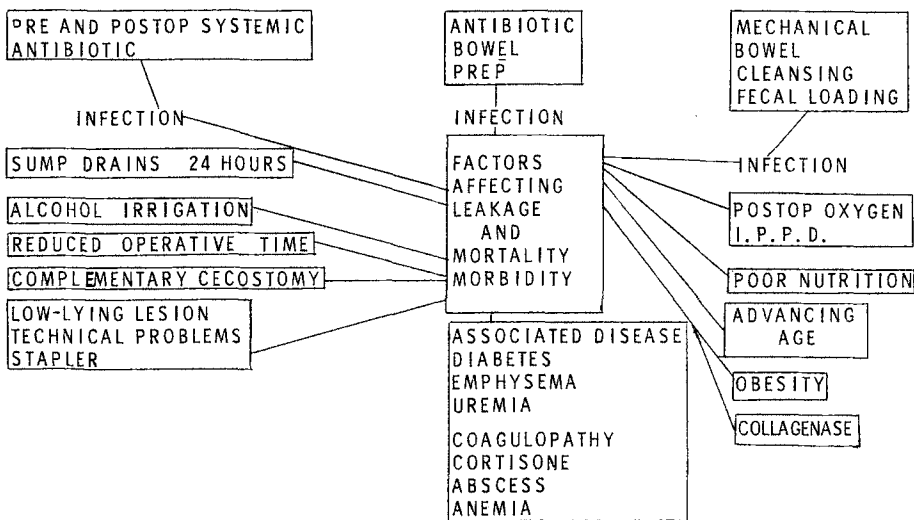


FIG. 12. Some factors affecting leakage, mortality, and morbidity.

eliminated mortality. Atelectasis, the most frequent and troublesome complication,<sup>7</sup> occurred despite postoperative use of intermittent positive-pressure breathing (Fig. 12). More frequent use of endotracheal suction and postoperative oxygen administration should help in preventing atelectasis. No dehiscence occurred. No infection occurred. Both of these complications may have been held to a minimum by "wicking" the wound down to the fascia.

Most surgeons enjoy suturing, and the stapler presents a psychological barrier. Nevertheless, the stapling device makes the operation easier and saves an average of about 30 to 60 minutes of operative time. The stapler clips are more expensive than sutures, but when credit is given for the sutures not used, in addition to credit for lessened operative time, an overall saving results, as well as the other advantages of lower morbidity and lower mortality. Body habitus, sex, and age are important factors relative to the mechanics of anastomoses, whether one uses the stapling device or ordinary suture technique. One should receive instruction in the use of these stapling devices before using them. A respect for tissue thickness and the limitations of the device as correlated with the tissues should be appreciated.<sup>2, 5, 11</sup>

### Summary and Conclusions

Forty consecutive anterior resections using TA stapler were studied. No mortality, no clinical leak, and no infection were

encountered in this group. The stapler is recommended as an aid in simplifying the operation and lessening the operative time.

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