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Laparoscopically assisted transsacral resection of rectal cancer with primary anastomosis

A preliminary review

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Abstract
Background: The management of rectal cancer has been changing to include more sphincter-sparing procedures. We report our initial experience with a new technique incorporating laparoscopy and a transsacral approach for low or midlevel rectal cancer. Here, we tried to determine whether this sphincter-sparing method could produce acceptable morbidity and recurrence rates.
Methods: Patients with rectal cancer 4 to 8 cm from the dentate line underwent laparoscopically-assisted transsacral resection (LTR) with primary anastomosis. With this technique, the rectosigmoid is mobilized via laparoscopy while the patient is in the supine position. Next, the patient is placed in the prone jackknife position, and a segment of rectum is resected by a transsacral approach. Age, estimated blood loss, length of time in the operating room, length of stay, and postoperative complications were noted. Aspects of the tumor pathology regarding stage, lymph nodes, tumor size, and presence of tumor at resection margins also were recorded.
Results: A total of 13 patients, ages 26 to 70 years (mean, 52.5 years), underwent the procedure. No perioperative deaths occurred. The mean hospital stay was 9.6 days. The average size of the rectal lesion was 4.3 cm in the largest dimension. The average specimen contained 11.5 total, and 2.0 metastatic lymph nodes. Postoperative complications included two anastomotic breakdowns and two other wound complications. Late follow-up evaluation ranged from 10 to 30 months, with 11 of 13 patients alive (85% survival). Two local recurrences and three distant recurrences were noted at long-term follow-up assessment.
Conclusions: In selected patients with low or midlevel rectal cancer, LTR may be a viable option. Further experience is necessary to define its oncologic efficacy and whether routine temporary diverting colostomy is indicated.

Key words: Cancer — Colorectal — Kraske — Laparoscopic — Neoplasm — Rectal — Resection — Sphincter-sparing — Transsacral

The management of rectal cancer has been changing since Miles [16] introduced his experience with the abdominoperineal resection (APR) in 1908. Largely because of advances in stapling devices, sphincter-sparing operations have become more widely performed in rectal lesions located 8 to 15 cm from the anal verge [19, 25]. We combined abdominal laparoscopic and open transsacral approaches to resect and anastomose primary rectal cancers located 4 to 8 cm from the anal verge. This report reviews our initial experience with this laparoscopic/transsacral resection (LTR). In our analysis of this experience, we sought to answer two crucial questions about the LTR: (a) whether the procedure is safe and can be performed with an acceptable morbidity, and (b) whether the LTR is a sound oncologic procedure with acceptable recurrence and cure rates for rectal cancer.

Methods

Patients with diagnoses of adenocarcinoma by colonoscopic biopsy of rectal lesions located 4 to 8 cm from the anal verge were treated with LTR. All patients first underwent exclusion of synchronous colonic disease by colonoscopy or barium enema and received a preoperative transrectal ul-

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trasound to exclude a significant transmural component to their rectal tumors.

Perioperatively, patients received mechanical bowel preparation before operation as well as broad-spectrum antibiotics. General anesthesia was used in all operations. Patients were counseled on the risks of postoperative local recurrence and frequently recommended to undergo postoperative local radiation. After hospital discharge, patients were seen once a month for 3 months, then every 3 to 6 months. Patients were interviewed by telephone to determine their status on late follow-up evaluation regarding survival, recurrence, and lifestyle.

Operative technique

The patient is situated initially in the supine position, with the operating surgeon standing on the right side of the table and the first assistant to the patient's left. After induction of anesthesia, the laparoscopic ports are placed. Pneumoperitoneum is created from an infraumbilical approach, and a 10-mm port is placed in the left midclavicular line just above the level of the umbilicus. The camera is placed in the infraumbilical port. Another 10-mm port is placed in the right midclavicular line just below the costal margin. Finally, a 10–12-mm port is placed in the right anterior axillary line at the level of the umbilicus.

With the patient in the Trendelenberg position, the small bowel is swept superiorly. Next, the assistant holds the sigmoid colon laterally with tension sufficient for the surgeon to incise the medial peritoneum overlying the sigmoid mesentery. This peritoneum is opened inferiorly up to the peritoneal reflection of the rectum. Next, the assistant retracts the sigmoid medially while the surgeon opens the lateral peritoneal attachments of the left colon along the white line of Toldt. The proximal mobilization on the left side extends almost to the splenic flexure and distally to the peritoneal reflection of the rectum. The ureter is visualized on the lateral side of the mesentery crossing posteriorly to the mesentery to be resected. Next, the surgeon completes the rectal mobilization by opening the peritoneal reflection over the anterior aspect of the rectum while the assistant is maintaining countertraction on the rectosigmoid.

At this point the surgeon decides the proximal extent of the rectosigmoid resection, keeping in mind the exact level of the lesion from the colonoscopic examination. If the level of the tumor is dubious, an on-table sigmoidoscopic evaluation can be performed. At the site of the proximal resection, a mesenteric window is created by blunt dissection. Subsequently, the vascular pedicle containing the sigmoid or superior hemorrhoidal vessels is isolated. These vessels are divided using an endovascular stapler (Autosuture Multifier EndoGIA 30-2.5, #030811; U.S. Surgical, Norwalk, CT, USA) through the 10–12 port. Generally, one or two groups of vessels must be divided to facilitate the necessary mobilization. This maneuver should allow the rectosigmoid to be fully mobile. After a careful inspection of the abdomen for bleeding, the ports are withdrawn and the sites closed.

The patient is then placed in the prone jackknife position with the buttocks taped laterally. After reprepping and draping of the patient, a vertical incision is made over the coccyx and angulated superiorly toward the top of the gluteal crease. Using electrocautery, the surgeon continues the dissection through soft tissue to the coccyx, which is then amputated with bone cutters. A small segment of the sacrum, generally 2 by 3 cm then is excised with a mallet and osteotome. After blunt dissection in the retrorectal and perirectal spaces, the middle hemorroidal vessels are visualized in the lateral portion of the wound. With the ligation of these vessels, the rectum usually mobilized out of the wound.

Once the rectum is fully mobile, the extent of the segmental resection can be determined. The lesion then is palpated, and after a careful assessment of its proximal and distal extent, the rectum is resected with sequential applications of an automatic purse-string suture device (Autosuture Pursestring 65, #020242 or Autosuture Roticulator 55-4.8, #017614; U.S. Surgical). The specimen then is grossly examined for negative margins and sent to pathology.

Bowel continuity is reestablished under direct visualization using a 31-mm EEA stapler (Autosuture Premium Plus; U.S. Surgical) placed through the rectum. Rigid proctoscopy then is performed to confirm an intact anastomosis. In addition, the donuts of tissue engaged by the stapling device are inspected to ensure circular continuity of the resected specimens.

If the anastomosis is deemed satisfactory, the wound may be closed. After irrigation of the wound, fibrin glue is instilled into the wound to assist in the closure of the dead space. Interrupted O-vicryl sutures are used to close the retrorectal fascia, which is approximated to the periosteum of the sacrum. Over the fascial layer, 3-O vicryl is used to close the soft tissue. Finally, interrupted 4-O nylon sutures are used to close the skin. No drains are used.

Table 1. Demographic data for patients who underwent laparoscopically assisted resection of rectal cancer

Patient	Gender	Age (years)	EBL (ml)	OT (min)	LOS (days)
1	F	42	125	255	6
2	M	40	200	250	7
3	M	60	400	300	7
4	M	38	350	255	5
5	M	26	350	200	4
6	M	64	300	265	26
7	F	61	420	350	7
8	F	70	200	240	5
9	M	27	200	240	6
10	M	60	300	235	6
11	M	57	250	250	7
12	M	70	250	235	31
13	F	68	200	225	8

EBL, estimated blood loss; OT, operative time; LOS, length of stay in hospital

Results

In this study, 13 patients (9 men and 4 women), ages 26 to 70 years (mean, 52.5 years) underwent LTR between November 1995 and April 1997 (Table 1). All lesions were located within 4 to 8 cm of the anal verge. Each operation proceeded in the aforementioned manner, with minor exceptions. One patient also required the laparoscopic removal of a suspicious ovarian mass, which proved to be benign. Several patients received laparoscopic examination of their livers with an ultrasound probe.

No perioperative deaths occurred. Average blood loss was 273.7 ml. Mean operative time was 253.8 min, approximately 20 min of which involved turning, repositioning, reprepping, and redraping the patient. The average hospital stay was 9.6 days (range, 4–31 days). All final pathology specimens were adenocarcinoma of the rectum and the average size of the lesions was 4.3 cm (Table 2). The average specimen contained 11.5 lymph nodes, with nodes on the average containing metastatic deposits. The presence of tumor at the proximal, distal, and radial margins also was recorded (Table 3).

Different early and late postoperative complications were noted (Tables 4 and 5). Most notably, two patients experienced anastomotic breakdowns, which necessitated diverting colostomies and wound care. These two patients had hospital stays of 26 and 31 days, respectively, whereas no other patient had a stay longer than 9 days. Three patients, including one woman, had urinary retention perioperatively. One patient had a wound hematoma needing evacuation, and another had a sacral wound dehiscence requiring postoperative dressing changes.

Late follow-up evaluation ranged from 10 to 30 months (mean, 19.6 months) (Table 6). Of the 12 patients offered adjuvant therapy, 10 completed their courses (Table 7). At late follow-up evaluation, 2 of the 13 patients had died. Both of these patients experienced liver metastasis from

Table 2. Tumor pathology

Patient	Total nodes	Metastatic nodes	Size (cm)	T	Stage
1	17	2	4	T3	3
2	9	4	7	T2	3
3	1	0	4.8	T3	2
4	13	0	6	T3	2
5	6	1	3.7	T3	3
6	7	3	3.5	T3	3
7	11	5	7.3	T3	3
8	19	10	4.5	T3	3
9	19	1	2.8	T3	3
10	15	0	3.3	T3	2
11	4	0	2.9	T2	1
12	24	0	2.9	T3	2
13	4	0	3	T3	2

Note: Size is tumor size in largest direction. T and Stage represent tumor characteristics by TNM staging

Table 3. Margins

Radial	Proximal	Distal
–	–	–
–	–	–
+	–	+
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	–
–	–	+
–	–	–
–	–	–

Table 4. Incidence of early postoperative complications

Stool frequency (6/13)
Anastomotic breakdown (2/13)
Urinary retention (3/13)
Wound complications (2/13)

Table 5. Incidence of long-term complications

Erectile dysfunction (3/13)
Constipation (2/13)
Anorectal stricture (1/13)
Detrusor areflexia (1/13)
Incontinence (1/13)
Sacrococcygeal hernia (1/13)
Stool frequency (1/13)

their cancer. One of the two patients who died also suffered a local recurrence. In the other, an anorectal stricture developed, which was suspicious for a recurrence but negative for malignancy on biopsy. This second patient received a palliative colostomy before his death. Another patient experienced both local and distant metastasis within 14 months, but was alive at 30 months follow-up evaluation after receiving salvage chemotherapy. In all, hepatic metastases developed in three patients, and local recurrence in two patients.

Table 6. Long-term follow-up results

Patient	Postop mo	Outcome	Local recurrence	Distant metastasis
1	30	Alive	Yes (14 mo)	Liver mets (13 mo)
2	28	Alive	None	None
3	24	Alive	None	None
4	23	Alive	None	None
5	23	alive	None	None
6	19	Deceased	Yes (6 mo)	Liver mets (4 mo)
7	22	Alive	None	None
8	18	Alive	None	None
9	16	Alive	None	None
10	16	Alive	None	None
11	10	Deceased	None	Liver mets (3 mo)
12	14	Alive	None	None
13	12	Alive	None	None

Post op, postoperative; mo, months; met, metastasis

Table 7. Adjuvant therapy

Patient	Adjuvant chemotherapy	Adjuvant radiation
1	Refused	Refused
2	5-FU, leucovorin, levamisole	5400 cGy
3	5-FU	5400 cGy
4	5-FU	5400 cGy
5	5-FU, leucovorin	5400 cGy
6	5-FU	4500 cGy
7	5-FU	5400 cGy
8	5-FU, leucovorin	5400 cGy
9	5-FU	4500 cGy preop, 4500 cGy postop
10	5-FU	4600 cGy
11	Refused	5040 cGy
12	None	None
13	Refused	1800 cGy (quit early)

preop, preoperative; postopt, postoperative

Although every contacted patient reported satisfaction with his or her operation, several postoperative complaints were noted at long-term follow-up evaluation (Table 4). Three of nine men noted some degree of erectile dysfunction on late follow-up assessment. An aymptomatic sacral hernia developed in one patient. Bladder areflexia developed in another patient, requiring chronic intermittent catheterization. At long-term follow-up evaluation, 1 of the 13 patients regularly complained of more than 4 to 6 bowel movements per day.

Discussion

Historically, the management of rectal cancer has been changing. Before Miles's [16] classic paper in 1908, low rectal cancers were treated with a local procedure, which resulted in a sacral anus [26]. Miles [16] described the lymphatic pathways to the pelvis nodes, championing an *en bloc* resection and abdominal anus. Goligher et al. [7] later observed in 1951 that lateral and inferior dissemination were uncommon in the higher rectal cancers. In the ensuing decades, this latter observation spurred the resurgence of sphincter-sparing surgery for higher lesions and smaller lesions not directly involving the anal sphincter [19].

To preserve the anal sphincter in the middle and low

rectal lesions, different techniques have been used. Mason [15] used the transsphincteric approach by itself or with a combined abdominal approach for sleeve and local resections of rectal lesions. Pull-through techniques have enjoyed worldwide use for benign diseases, but certain surgeons such as Parks and Percy [21] have demonstrated the efficacy of a coloanal anastomosis in malignant diseases as well.

The transsacral approach was first described by Kraske [12] in 1885, but this technique was not widely used in the early 20th century. With a combined simultaneous APR, Localio and Stahl [14] rejuvenated consideration of the posterior approach. Subsequently, Adloff et al. [1] used a purely posterior approach for the excision of benign lesions. Significantly, Adloff et al. [1] also described the use of a circular stapler inserted through the rectum for a primary bowel anastomosis.

Recently, multiple institutions have supported the use of sphincter-sparing surgery in rectal carcinoma. Steele et al. [23] prospectively studied 26 select patients with low rectal cancer who underwent sphincter-preserving surgery, noting no recurrences at a median of 21 months. Notably, in this study, 16 patients had lesions larger than 5 cm. In a large retrospective study from the Cleveland Clinic, Lavery et al. [13] showed that local recurrence and distant metastasis rates were similar for sphincter-sparing procedures and APRs used to manage tumors located 5 to 7 cm from the anal verge. Huguier et al. [8] also concluded that after retrospectively controlling for relative risks based on tumor characteristics, APR and sphincter-sparing resections had similar survival and recurrence rates in midlevel rectal cancer.

The fundamental basis for LTR uses the principles of sphincter-sparing surgery for rectal cancer established by these earlier authors. Patients who appear to be candidates for the procedure include those with lesions located at 4 to 8 cm from the anal verge without a significant transmural component studied by ultrasound [22]. The perirectal fat is included with the specimen to minimize the chances of a positive lateral margin. Although a larger tumor may appear to minimize the chance of a curative resection, the five patients with tumors larger than 4.5 cm were disease free at 23 months mean follow-up evaluation.

Adjuvant therapy may decrease the chances of a recurrence in selected patients with rectal cancer [20]. Preoperative radiation also has been well described in rectal cancer and may play a role in downstaging [17]. Postoperative radiation may be especially beneficial in decreasing local recurrence in patients with Dukes C cancer [3]. The addition of 5-FU in certain subgroups also may decrease the local failure rate for these patients [10]. Our series was too small to determine whether the adjuvant chemotherapy given to our patients had an impact on survival.

Given that limitations exist in our review and relatively short follow-up period, only preliminary conclusions can be made about LTR. In our experience with this operation, the rates of patient survival, local recurrence, and distant metastasis were certainly comparable with those established by the larger series of patients with rectal cancer [5]. In our series, the survival rate at the mean follow-up period of 19.6 months was 85% (11 of 13 patients survived), and both patients who died had demonstrated liver metastases within 4 months. Therefore, these patients may not necessarily have shown a better outcome with an APR.

Our local recurrence rate was 15% (2/13), and the distant metastatic rate was 23% (3/13). Both patients who experienced local recurrence had negative resection and donut margins for tumor at final pathology, so their recurrences could not have been predicted. Interestingly, the two patients who did have positive margins of resection at operation remained free of local recurrence at follow-up assessment.

The use of laparoscopy in the treatment of rectal cancer is not new. The laparoscopic aspect of our procedure is similar to the laparoscopic mobilization used in intraperitoneal rectosigmoid colectomies [6] for benign polyps, inflammatory bowel disease, and palliation for malignancy [18]. Authorities have argued whether laparoscopic surgery should be used in patients with potentially curative colorectal cancer, noting that inadequate staging or port-site tumor recurrences may arise [24]. This contention has been refuted by at least one group, who claimed that accurate intraabdominal staging can be performed laparoscopically for colorectal cancer, and that even a no-touch technique operation is feasible [9].

The possibility of port-site recurrences is a separate concern [9]. In LTR, the danger of port-site recurrences should be minimal because the tumor is both located and removed extraperitoneally. Here, no intraperitoneal tumor manipulation is performed, and the tumor is not exposed to any gas insufflation, a feature that has been suspected of initiating tumor recurrence. In our abbreviated experience, no port-site recurrences were noted at our long-term follow-up evaluation.

The benefits of LTR as compared with APR are intuitive. Patients are spared the morbidity of both a laparotomy (also used in a coloanal procedure) and a lifelong colostomy. Because a segmental resection is performed, the nodal drainage in the specimen may be more completely represented than in an abdominopelvic resection with mesorectal excision. Although unproven, this procedure may provide a better lateral margin of resection for rectal cancer than a transabdominal procedure with a coloanal anastomosis.

If proven safe, LTR may develop a variety of indications. One potential group might include patients with rectal cancer who refused APR and permanent colostomy, but who would consent to another procedure. Other areas of study in the future for LTR could be its potential use in certain benign diseases such as villous adenomas. Finally, the procedure may become useful as palliation for patients with end-stage rectal cancers.

From the standpoint of pain, LTR and APR appear comparable. Subjectively, in our experience, the patients appear to tolerate the pain of the sacral resection as well as that of a perineal resection, or better. Patients ambulate on the first postoperative day and often are tolerating a regular diet by the third postoperative day. Most of the patients left the hospital within 1 week of their procedure and had their pain well controlled with oral narcotics.

Our complications were varied and in some ways predictable. Two patients experienced the major morbidity of an anastomotic breakdown necessitating colostomy. Notably, both patients with anastomotic breakdown had negative

distal resection margins for tumor. In one patient, the 31 EEA stapler may have been too large, creating ischemia at the anastomosis. This patient may have benefited from a smaller stapling device at his original operation. The overall 15% breakdown rate seen in our study is comparable with the 20% incidence of fecal fistulas noted by Bleday et al. [4] in his series of transcoccygeal and transsphincteric excisions. Further experience may reveal whether routine or selective diversion is indicated as a part of LTR.

Our use of fibrin glue has not been described previously as routine in any gastrointestinal surgery with potential anastomotic complications. The dissection of LTR can create a significant dead space in the retrorectal area. This area could be prone to the development of serous fluid collection, which could further predispose to wound infection or persistent wound drainage. The concept also exists, although unproven, that the fibrin glue may help seal an enteric anastomosis, because fibrin glue has been used in the closure of alimentary tract fistulas [11].

Other complications were much less morbid but still troublesome. The two patients who had frequency of stools reported improvement with stool-bulking agents. The patients with a sacrococcygeal hernia, a complication described earlier by Arnaid et al. [2], may require operative correction in the future if symptoms persist.

Our preliminary review appears to demonstrate that LTR is a potentially beneficial procedure in selected patients with rectal cancer. In our experience, the laparoscopic portion was performed routinely within 60 to 90 min despite being taught concurrently to house staff. Without an intracorporeal anastomosis, the laparoscopic portion can be performed fairly readily by a surgeon with basic laparoscopic skills. Certainly, a much larger patient cohort with different treatment arms would be needed to establish definitively the efficacy of any particular sphincter-sparing procedure over that of APR. Nonetheless, if the long-term results of LTR prove comparable and the short-term complication rates can be minimized, this operation with adjuvant therapy may become an attractive option for many patients with rectal cancer.

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