Avoiding Colostomy With Conservative Multimodality Management of Distal Rectal Cancer

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While abdominoperineal resection with permanent colostomy has been the surgical benchmark in the treatment of distal rectal carcinoma, different approaches to treatment have been sought for decades to decrease the morbidity and mortality associated with radical surgical procedures for this disease. The advent of alternative methods of sphincter preservation that afford excellent functional results has led to a decline in the incidence of abdominoperineal resection. With appropriate patient selection, accurate preoperative staging data, and the selection of a surgical approach appropriate to the tumor stage, conservative surgical approaches now can be considered in the treatment of cancer at every level of the rectum.

Introduction

When treating a patient with rectal cancer, the surgeon is sometimes faced with difficult treatment decisions. Although many distal rectal cancers are best treated by abdominoperineal resection - a radical procedure that requires permanent colostomy - contemporary management strategies provide several viable sphincter-saving alternatives. The location, histology, and stage of the tumor, as well as the general medical condition of the patient, are factors to consider when contemplating the possibility of sphincter preservation.

Management of T0-T2 Rectal Cancers

The concept of local excision of low rectal cancer (less than 8.0 cm from the anal verge) dates back at least two centuries. Historically, perineal approaches frequently left the patient incontinent, and recurrence rates were high.[1] Complications were common, including sepsis and perineal fistula formation. In 1908, E. W. Miles emphasized excision of the "pelvic mesocolon" and wide perineal dissection in combination with the formation of a permanent colostomy.[2] As experience with this radical procedure grew and mortality decreased, the Miles abdominoperineal resection became the standard treatment of mid and low cancers of the rectum for many years. Further refinements in surgical techniques and particularly in sphincter-saving procedures (eg, low anterior resection, coloanal anastomosis) were developed; thus, permanent colostomy was avoided for many patients.

Today, abdominoperineal resection is the operation most commonly performed for cancers involving the lower third of the rectum. Despite improvements in operative and perioperative care, surgical removal of the rectum for cancer is associated with significant morbidity. Various series report mortality rates of 2% to 6%,[3,4] complication rates of over 50%,[5] and local recurrence rates of 20% to 30%.[3-7] In an effort to decrease the morbidity and mortality of radical surgical procedures for rectal cancer, less aggressive approaches to treatment, particularly of early tumors, have been sought for several decades. For select cancers of the lower rectum, conservative surgery is now more widely accepted.

The objectives of local treatment of rectal cancer are local control of the disease, a low risk of complications, and avoidance of a colostomy. Earlier methods of conservative treatment included transperineal excision,[8] fulguration by electrocoagulation,[9] and endocavitary radiation.[10] These early methods demonstrated that cancers of the rectum can be treated conservatively with local control rates similar to radical surgery.

Prospective trials comparing local excision vs abdominoperineal resection have not been performed. Grigg et al[11] retrospectively studied 1338 patients treated for rectal cancer between 1950 and 1980, 16 of whom underwent local excision. For Dukes’ A lesions, the five-year cancer-specific survival was 100% for the local excision group vs 88% for those treated with radical surgery. The operative mortality for the entire group treated with radical surgery was higher than the incidence of lymph node metastases in the Dukes’ A lesions (7.1% vs 6.5%). There were no deaths in the local excision group.

In a review of 16 series in which a total of 404 patients with invasive carcinoma within 6 cm of the anal verge were treated with local excision, Graham et al[12] found 94% of tumors were T1 or T2 with no identified regional metastases. (See Table 1 for staging of rectal cancer.) Five-year cancer-specific survival was 99%. The local recurrence rate was 19%, and of these, half were cured with additional radical surgery. These results were comparable with those for historical controls treated with abdominoperineal resection, but more importantly, patients avoided a permanent colostomy, and the operative mortality (less than 1%) and morbidity were significantly lowered.

Patient Selection

The ability to prospectively determine which tumors are most suitable for conservative therapy is the dominant factor in selection of patients for local therapy. Local resection can be considered if the rectal tumor is in the lower half of the anus, ie, less than 8 cm from the anal verge. Appropriate candidates should be at minimal risk for local or regional spread of cancer. Local therapy also may be considered for patients with documented distant metastases in whom a radical surgical procedure would be unlikely to alter the clinical outcome of their disease, for medically debilitated patients, and for patients who refuse conventional treatment.

Several characteristics of the primary tumors are associated with a low risk of lymph node metastases or local recurrence. These include well- or moderately well-differentiated histology, size not exceeding 3 cm in diameter, and tumor neither ulcerated nor fixed to the rectal wall.[11-13] Factors associated with increased local recurrence and decreased survival include positive surgical margins, poorly differentiated histology, and increasing depth of bowel wall penetration.[14]

The risk of lymph node metastasis is related to the depth of invasion of the tumor (Table 2). Morson[15] reported a 10% risk of lymph node metastasis when the cancer had not spread beyond the muscularis propria, and in most of these cases, the cancer was poorly differentiated. Cohen et al[16] found the risk of lymph node metastases to be 10% for T1 lesions, 20% for T2 lesions and 40% to 60% for T3 lesions. As tumors become less differentiated, the risk of lymph node metastasis increases (25% in well-differentiated tumors, 33% in moderately differentiated tumors, and 77% in poorly differentiated tumors).

Accurate staging of colorectal cancer has become increasingly important in ascertaining the appropriate options and defining the extent of surgery. Accurate preoperative staging can be challenging. The selection of patients for local excision is based on cumulative data from careful digital rectal examination, endoscopy, biopsy, endorectal ultrasound, and computed tomography (CT). While endorectal ultrasound is currently the most sensitive method to define bowel wall invasion with an accuracy of 90%,[17] the...
sensitivity of all diagnostic methods to determine lymph node metastases is low. Since lymphatic metastases occur in a predictable pattern[18] (ie, those nodes adjacent to the tumor or immediately cephalad are likely to receive metastases first), one possible method to detect lymph node metastases is to sample the perirectal nodes at the time of local excision.[14]

Patients with carcinoma in situ are ideally suited to local excision as there is no risk for metastasis. Patients with well-differentiated lesions with T1 invasion have a low risk of nodal spread and therefore may be adequately treated with local excision alone. Patients with T2 lesions have a 10% to 30% chance of perirectal nodal spread and hence may benefit from the addition of adjuvant chemoradiation. Currently, most single-institution trials and national protocols recommend chemoradiation after local excision for T2 lesions.[19] For T3 lesions, the risk of lymph node metastasis and local recurrence is too high to recommend local therapy.

Presurgical Assessment

Prior to surgical intervention, patients undergo staging procedures to determine the extent and exact location of their primary disease and to detect the presence of distant metastatic spread. Digital rectal examination is performed to determine the precise location of the tumor (Figs 1 and 2) in relationship to the palpable anorectal ring (superior edge of the sphincter complex). The function of the sphincters (resting tone and ability to contract) is assessed, as well as the presence of sphincter invasion, which is an absolute contraindication for sphincter preservation. The characteristics of the tumor (ulceration, fixation, size, circumferential involvement, and obstruction potential) are noted, and complete colonoscopy is performed. A pelvic examination in women allows assessment of involvement of the vagina and/or uterus. The possibility of bladder invasion also will lead to cystoscopy. If the primary rectal tumor is small and a possible candidate for local excision, endorectal ultrasound is performed to determine an accurate T stage and to assess the presence of localized lymphadenopathy. Blood studies including a chemical profile and carcinoembryonic antigen are obtained. CT scans of the abdomen and pelvis together with oral, intravenous, and rectal contrast also are obtained to evaluate the local and distant spread of disease and are complemented by either a CT or chest roentgenogram to search for lung metastasis. If sacral bone involvement is possible, magnetic resonance imaging of the sacrum can define the extent of disease in relationship to the sacral nerve roots.

Technique for Local Excision

Local excision provides a total tumor sample for pathologic review and thus is the preferred method of local therapy. A major disadvantage of fulguration, radiation, and other local therapy techniques that destroy tissue is that the extent of penetration of tumor into the bowel wall cannot be assessed histopathologically. This lack of prognostic information from analysis of bowel wall invasion prevents comparison of the various local treatment modalities and compromises the decision for adjuvant treatment. With increasing use of endorectal ultrasound, this prognostic information may become available to allow more meaningful comparisons among the various techniques.

Transanal excision of the tumor is preferred over transperineal or transacral resection because a painful incision and the potential for fistula formation are avoided. Modern operating proctoscopes and anal retractors have facilitated transanal procedures. Complication rates are low, and complications that do occur are usually minor.[14,20,21] Commonly reported complications are transient incontinence, flatus, or loose stools (which usually resolve within several months) and postoperative bleeding.

Preparation of a patient for local excision of a rectal tumor is similar to that for radical rectal surgery. A mechanical and antibiotic bowel preparation is given, and a suitable broad-spectrum intravenous antibiotic is administered immediately before surgery. Patient positioning in the operating room is determined by the location of the tumor. Anterior rectal lesions are best approached with the patient in the prone position, while the lithotomy position is preferred for those with posterior rectal tumors. Rigid proctosigmoidoscopy is performed to visualize the tumor, assess the adequacy of the bowel preparation, and irrigate the rectum with povidone-iodine solution. The perineum is scrubbed with antiseptic, and the bladder is catheterized. The rectum is exposed with a self-retaining retractor (Fig 3).

Submucosal excision is performed for benign villous adenomas. The submucosa under the tumor is elevated by infiltration with a dilute 1:300,000 epinephrine solution. A 1-cm margin of normal-appearing mucosa is included in the excision. The specimen is oriented immediately after excision, and the rectal mucosal defect is approximated with absorbable sutures.

Pelvic Recurrence

Pelvic Recurrence occurs in patients with T1 or well-differentiated lesions with T1 invasion who do not receive adjuvant therapy after local excision. This is confirmed in 3 N0 lesions (Table 3).[26] This trial aims to improve the quality of life through less radical surgery without sacrificing local control.

Management of T3-T4 Rectal Cancers

When a rectal cancer invades completely through the rectal wall into the surrounding fat or into an adjacent organ such as the uterus, bladder, or prostate, the lesion is staged as T3 or T4, respectively.[27] These stages predict a poorer prognosis than for lesions confined to the rectal wall principally because of their increased tendency for local recurrence that also may be linked to increased rates of associated pelvic neoplastic lymphadenopathy. An understanding of the causes of pelvic recurrence is critical to devising strategies for its prevention.

Pelvic Recurrence

Local (pelvic) recurrence is a common problem for the patient with rectal cancer. The multifactorial causes of pelvic recurrence relate to both the technical aspects of the operative procedure used and the biology of the primary tumor. Technical factors include the adequacy of distal as well as radial tumor-resection margins. Historically, margins of 5 cm or more were recommended, but prospective trials have demonstrated that distal margins of >1 cm generally are adequate in that recurrence rates do not appear to increase until margins approach <0.8 cm.[28] Other studies[29] have demonstrated increased rates of local recurrence with margins of <2 cm (22%) vs margins of >3 cm (13%) but without concomitant decreases in survival. Recent trials also have demonstrated a link between small radial (lateral) margins (<5 mm) and local recurrence.[30] Small radial margins may signal an inadequate mesorectal resection. Radial margins often are not recorded by the pathologist. In the absence of an adequate mesorectal resection, the risk of pelvic recurrence rises to 30% to 65%.

Studies of prognostic factors have shown that local recurrence risks are influenced by biological factors that include tumor stage, grade, size, depth of invasion, pattern of invasion (pushing vs pothing), and angiolymphatic invasion.[31] Without the addition of adjuvant therapy (eg, radiation or chemoradiotherapy), regional nodal involvement without full-thickness bowel wall involvement (T1-2 N+) produces local recurrence rates of 20% to 40%, while full-thickness bowel wall penetration alone (T3-4, N0) results in recurrence rates of 20% to 35%.[32-37] When the bowel wall is penetrated and the nodes are involved (T3-4, N+), the risk of local recurrence increases to 30% to 65%. >
Lymphatic metastasis is related to tumor thickness in that the risk of lymphatic involvement increases significantly with T stage. Tumor recurrence also is related to the location of the primary in the rectum. The more distal the lesion, the greater the chance for local recurrence. Also, tumor cells exfoliated during surgical resection may lodge or become trapped, thereby providing another source for local recurrence in suture lines or other exposed surfaces. Up to 95% of local recurrences manifest within the first two years following primary surgical intervention.[38]

Local recurrence is difficult to manage and is often associated with poor end results. Pelvic recurrences frequently lead to intractable physical disabilities that include pelvic pain, tenesmus, and fecal soiling.[39] These recurrences are only rarely amenable to curative resection that often involves multimodality therapy (radical exenterative surgery that may include sacrectomy, chemotherapy, and radiotherapy), as well as plastic surgical procedures (rotational and or free myocutaneous flaps) for wound coverage. Because pelvic recurrences are associated with the development of distant metastatic disease, five-year survival rates following these recurrences are as low as 5%.[40]

The primary goals in managing the patient with T3 and T4 stage rectal cancer are the prevention of local recurrence and the preservation of continence of bowel and bladder. While not all patients are eligible for sphincter-preserving procedures when distal rectal cancers are advanced at presentation, a number of patients can be adequately treated using a multimodality approach and sphincter-preserving procedures. With current neoadjuvant treatments and conservative surgical procedures, many patients with large tumors beneath the peritoneal reflection may be candidates for procedures other than an abdominoperineal resection or pelvic exenteration. At the same time, it must be remembered that the best chance for cure is at the time of the first surgical procedure.

Neoadjuvant Therapy

There are several theoretical advantages to preoperative over postoperative radiotherapy. When radiotherapy is delivered before surgery, the therapist can focus on the tumor rather than the entire wound in the treatment plan and therefore can give smaller radiation volumes and dosages. In addition, radiation is less likely to affect the small bowel, which is likely to move freely within the abdomen and pelvis in a patient who has not undergone an operation. The small bowel often is fixed in the pelvis postoperatively and is more likely to sustain radiation damage. Also, radiation delivered in the preoperative setting is more likely to be effective because the target tissues are better oxygenated.

Trials are underway to address whether certain patients with rectal cancer benefit more from preoperative therapy than from postoperative treatment. However, studies have been published that support the use of radiotherapy[41] and/or chemotherapy[42] to reduce the size of tumors and to render them more amenable to conservative approaches. For example, Minsky et al.[43] reported that all 86 patients with rectal cancers less than 6 cm from the anal verge were successfully treated with sphincter preservation following preoperative high-dose radiotherapy (45 to 55 GY). A local recurrence rate of 16% and a five-year survival of 79% were recorded. The rationale for chemotherapy and radiotherapy together stems from data collected by the Gastrointestinal Tumor Study Group[7] that show longer survival when the two modalities are used together. Recent trials[44,45] suggest that more patients will be eligible for sphincter preservation with a combination of preoperative 5-fluorouracil (usually delivered by continuous infusion in a radiosensitizing dose) and radiotherapy.

Preservation of the Sphincters

The introduction of the low anterior anastomosis by Dixon[46] in 1948 has led to a significant trend towards sphincter preservation. Multiple studies[29,47] have demonstrated that abdominoperineal resection provides no survival advantage as long as a sphincter-saving procedure can be performed with a clear surgical margin. From 1972 to 1986, the rate of abdominoperineal resections for distal rectal cancers in Great Britain decreased from 59% to 30% without apparent negative effects on survival or local recurrence.

The decision to attempt sphincter preservation in the patient with locally advanced disease is contingent on the precise location of the tumor from the anal sphincter complex, its mobility, its response to neoadjuvant treatment, sphincter tone and compliance, and patient motivation. If the lesion can be surgically excised with negative margins (1 cm minimal from the sphincter complex), we will attempt sphincter preservation in patients willing to endure up to a six-month period of adaptation during which bowel function is expected to improve from possible incontinence with frequent bowel movements to full continence with few (one to five) daily bowel movements. The location of the distal tumor margin in relation to the dentate line is secondary to its relation to the sphincter ring, which must not be resected when striving for sphincter preservation. Muscular margins can always be stripped to the dentate line, but underlying sphincter musculature must be preserved. When the decision has been made to attempt to preserve the sphincter complex but local excision procedures have been rejected, two surgical procedures are commonly used: anterior resection and coloanal anastomosis.

Anterior Resection With Coloanal Reconstruction

Anterior resection provides the benefits of surgical extirpation of the primary tumor along with lymphatic staging via removal of the associated mesorectum, a region prone to lymphatic metastasis and a site frequently involved in local recurrence. Tumors can be excised with hypogastric nerve preservation to prevent impotence if tumors are centrally confined. Surgical procedures resecting distal rectal tumors often require extensive anterior dissection to levels several centimeters below the coccyx as well as transection of the distal margin. We prefer mucosal dissection from the dentate line to the level of the superior margin of the anorectal ring where the bowel is then transected, often with bimanual guidance from an operator's hand placed in the deep posterior pelvic dissection plane.

Following complete removal of the lesion, all margins (distal, radial, and proximal) are inked appropriately and checked by frozen or permanent section for adequacy. If positive radial margins are anticipated as part of a palliative procedure, intraoperative radiotherapy may be delivered to the pelvis at risk.[48] Surgical clips placed along surgical planes and margins of resection often are beneficial in directing the radiotherapist when postoperative radiation is necessary. The proximal descending colon is prepared for anastomosis by mobilizing the splenic flexure and transecting the inferior mesenteric vein and mesentery to the level of the middle colic vessels. A surgically constructed J pouch is optional but may benefit the patient by reducing the frequency of daily bowel movements. A hand-sewn anastomosis is frequently required, although a stapled coloanal anastomosis may be sufficient, depending on the level of the distal tumor margin. A temporary diverting loop ileostomy is often constructed to protect the anastomosis for four to six weeks.

Conservative Pelvic Exenteration With Coloanal Reconstruction

Invasion of the bladder, vagina, uterus, or other organs by T4 rectal cancer does not automatically necessitate formal pelvic exenteration. If the bladder trigone is not involved, the bladder may be preserved, thereby avoiding ileal conduit diversion. If an ileal conduit is required, a continent form of diversion may be considered as a suitable option. If the vagina is involved, often a posterior wall vaginectomy with or without hysterectomy will permit complete resection of adherent tumors. Also, using similar surgical principles as described for anterior resection, we will attempt to preserve the anal sphincters in patients undergoing conservative exenterations. Coloanal anastomosis in men is often technically easier to perform following resection of the bladder and prostate en bloc with the distal rectum than when done with rectal resection alone. We find this to be a good surgical option in patients whose tumors do not invade the anal sphincters or the prostate gland. While many patients are unhappy about the need for urinary diversion, they are grateful for attempts at sphincter preservation.

When sacral bone involvement is present, tumors often are not amenable to sphincter preservation and may not be amenable to curative resection. Distal sacral segments and the coccyx may be resected with little added morbidity, but these lesions frequently require abdominoperineal resection secondary to levator muscle involvement.

When tumors invade adjacent organs and thus mandate formal pelvic exenteration and permanent colostomy with urinary diversion, it may be appropriate to consider the placement of a rectus flap (composed of muscle alone, or muscle, fat, and de-epithelialized dermis when more bulk is needed) into the deep pelvis to exclude the small bowel. Obliteration of the potential space in the deep pelvis may reduce infection by preventing seromas and will permit the radiotherapist to deliver significantly greater doses of radiation to affected areas without associated small bowel toxicity.

Conclusions

Until recently, abdominoperineal resection was the foremost surgical treatment for rectal cancer. Surgical improvements in the treatment of rectal cancer, particularly in sphincter-preserving procedures and progress in adjuvant and neoadjuvant radiation and chemotherapy, have translated into alternative treatment modalities for the patient with rectal cancer and a reduction in the number of patients requiring a permanent colostomy. While not appropriate for all rectal cancer patients, local excision can be an alternative to more radical procedures. In other patients with rectal cancer, resection with coloanal anastomosis can provide acceptable functional results. Continued advancements in accurate staging, diagnosis, and perioperative care will enhance survival rates and lead to decreased morbidity and mortality from this disease.