Surgery for Locally Advanced T4 Rectal Cancer: Strategies and Techniques

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Abstract

Keywords

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Locally advanced T4 rectal cancer represents a complex clinical condition that requires a well thought-out treatment plan and expertise from multiple specialists. Paramount in the management of patients with locally advanced rectal cancer are accurate preoperative staging, appropriate application of neoadjuvant and adjuvant treatments, and, above all, the provision of high-quality, complete surgical resection in potentially curable cases. Despite the advanced nature of this disease, extended and multivisceral resections with clear margins have been shown to result in good oncological outcomes and offer patients a real chance of cure. In this article, we describe the assessment, classification, and multimodality treatment of primary locally advanced T4 rectal cancer, with a focus on surgical planning, approaches, and outcomes.

Of the 39,500 patients who are expected to be diagnosed with rectal cancer in the United States in 2015,¹ approximately 10% will present with locally advanced T4 disease.² Locally advanced rectal cancer presents an exceedingly difficult clinical condition, which is associated with high treatment failure rates and significant mortality. Despite this, well-planned and high-quality treatments can result in durable oncologic outcomes and even cure for many patients. Modern and high-quality treatment requires input from numerous medical professionals working in a collaborative, coordinated, and timely fashion to deliver multimodality therapy, which includes surgery, radiation, and chemotherapy. The goal of surgery in these cases is complete resection of the tumor and rectum en bloc with any involved organs or structures. This article reviews strategies and techniques for locally advanced T4 rectal cancers focusing on preoperative assessment, up-to-date neoadjuvant treatments, and approaches to surgical resection.

Definition of Locally Advanced Rectal Cancer

Although there is much written on locally advanced rectal cancer, its actual definition can be quite variable. Some authors in the past have broadly defined locally advanced rectal

cancers as T3–T4 or node-positive lesions based on the American Joint Committee on Cancer Staging Classification system.^{3,4} Still others limit the locally advanced term to only T4 rectal cancers, whether nodes are involved or not.² T4 rectal cancers can be subdivided into T4a or T4b disease. T4a cancers include those that penetrate only the surface of the visceral peritoneum (which can only apply to the more anterior aspects of upper rectal cancers), whereas T4b cancers include those that directly invade other structures or organs.⁵ This differentiation is important as the surgical treatments and outcomes of T4a and T4b rectal cancers can be quite different.

For the purposes of this article, locally advanced disease will refer to primary adenocarcinomas of the rectum that involve other structures or organs (T4b disease). This definition is more in line with the definition proposed by the Beyond Total Mesorectal Excision (TME) Collaborative, which uses the “primary rectal cancer beyond TME planes” (PRC-bTME) term when discussing cancers for which extended resections beyond the TME plane are needed to attain R0 (microscopically negative) resection margins.⁶ Commonly involved structures or organs can include the genitourinary organs, pelvic sidewall or sacrum, pelvic floor or anal musculature, and small bowel. Multiple organs are involved in approximately 25% of the cases.^{7,8}

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Authors often discuss primary locally advanced rectal cancers together with locally recurrent rectal cancers, which also often involve other organs or structures.⁹ It is, however, worthwhile to discuss them separately as there are some important distinctions. The treatment approaches, recurrence patterns, and long-term survival outcomes can differ between these two conditions.^{8,9}

Initial Evaluation

The initial evaluation of rectal cancer patients begins with a history and physical examination. Pain, obstipation, vaginal bleeding, or urinary symptoms such as pneumaturia may suggest locally advanced disease. Often, however, there is no specific symptomatology to distinguish it from less locally advanced disease.^{9,10}

A digital rectal examination (DRE) and sigmoidoscopy are important components of the physical examination. DRE allows for clinical assessment of tumor size and location, fixation to local tissues, and relationship to the anorectal musculature.¹¹ Tumor fixation to the underlying tissues may suggest locally advanced disease. For female patients with anterior tumors, vaginal exam in conjunction with DRE can assess gynecological organ involvement. Sigmoidoscopy allows the surgeon to see the tumor and more accurately assess its location (e.g., anterior, posterior, lateral, or circumferential). It also allows for the assessment of tumor distance from the anal verge.^{11,12} While rigid and flexible scopes can be used for this purpose, rigid proctoscopy is likely to provide more reliable measurements. If possible, a full colonoscopy should always be performed to rule out synchronous tumors.^{11,12}

The next step in the evaluation is to obtain imaging studies to assess for distant metastatic disease and locoregionally stage the primary tumor. We obtain computed tomography (CT) scans of the chest, abdomen, and pelvis to assess for distant metastatic disease.¹² The presence and burden of any distant disease can influence the preferred sequence of multimodal treatments and, in some cases, preclude patients from being offered surgical resection of their primary disease.

Although either pelvic MRI or endorectal ultrasound (EUS) can be used for locoregional staging, we strongly prefer MRI for most rectal cancer patients. MRI offers several benefits in locoregionally advanced disease. First, MRI has a high pooled sensitivity, specificity, and accuracy for predicting wall penetration of 86, 77, and 82%, respectively.¹³ Furthermore, MRI is more accurate than EUS at diagnosing deeper (T3/T4) tumors.¹¹ When assessing T4 disease, MRI has a sensitivity of 94 to 100%, specificity of 95 to 98%, and accuracy of 95%.¹⁴ From an operative planning perspective, we also find that MRI is more useful at characterizing the total extent of invasion in T4 disease and showing the tumor in relation to all surrounding structures in three dimensions. Finally, we find MRI to be more reliable and easier to interpret when restaging and assessing tumor response after neoadjuvant treatments. Given these reasons, if it is not already ordered as part of routine rectal cancer staging, we strongly believe that a pelvic MRI should be standard in all patients suspected of having T4

disease on CT or EUS. EUS may be considered an adjunct; however, it should not be in lieu of MRI in this context. Our modality of choice is pelvic MRI using phased array surface coils.

We do not routinely order positron emission tomography scans for patients with primary rectal cancers. However, we do find it useful to evaluate and characterize equivocal findings detected on CT scans as well as in the context of recurrent disease.¹²

Treatment of Locally Advanced Rectal Cancer

Although surgical resection is considered definitive treatment, the modern management of locally advanced rectal cancers entails combined modality treatment. Patients with locally advanced rectal cancers should be reviewed at multidisciplinary tumor boards (MDTBs) to review imaging and discuss the appropriateness and sequence of surgery with neoadjuvant or adjuvant therapies. The availability of surgical and medical resources of the treating hospital needs to be considered as well. Surgery for locally advanced rectal cancers can be challenging and frequently require the involvement of multiple specialists as well as specialized medical care and support. It is, therefore, important to strongly consider the extent of resection in the context of the experience of the surgeons and institution with these complex cases, especially in light of volume–outcome relationships shown for rectal cancer.^{15,16}

The goal of curative intent surgery is complete resection of the tumor and rectum en bloc with any involved organs or structures, with preservation of at least reasonable function and quality of life. The most significant predictive factors associated with improved survival in these patients are the absence of distant metastatic disease and the ability to achieve an R0 resection margin.¹⁷ However, attaining an R0 resection can be extremely challenging due to the narrow confines of the pelvis and close relationship of the rectum with the surrounding organs and pelvic sidewall. Extended or multivisceral surgical resections are, therefore, required to attain an R0 resection for locally advanced disease.

Locally advanced cancers can be divided into three groups based on management approaches and outcomes: (1) isolated, resectable pelvic disease, (2) isolated, unresectable pelvic disease, and (3) locally advanced disease with metastases.¹⁰ A treatment algorithm for isolated, resectable and unresectable, nonmetastatic disease is shown in ►Fig. 1. Isolated, resectable disease includes tumors that are highly likely to be resectable with negative macroscopic and microscopic margins. Unresectable disease refers to tumors for which the likelihood of resection with negative margin is extremely low or zero, without incurring unacceptable patient risk or morbidity. Criteria for tumor resectability have been published for locally recurrent rectal cancer,^{6,18,19} and these can be applied to primary T4b rectal cancers as well (►Table 1). Unresectable tumors include those with proximal bony sacral (S1 or higher) or circumferential pelvic sidewall involvement or those extending through the sciatic foramen because of the low likelihood of achieving an R0 resection and the high

Fig. 1 Algorithm for management of clinical T4bN0-2 rectal cancers with no evidence of distant metastatic disease.

associated morbidity. Bilateral hydronephrosis or external iliac vessel involvement represents at least relative contraindications to resection.

Locally advanced rectal cancer with synchronous metastatic disease presents a challenging situation. This group of patients can have quite heterogeneous disease, so it is impossible to define an all-encompassing strategy. The extent of metastatic disease burden, the extent and resectability of the primary cancer, and the patient's age and health status all need to be taken into consideration to develop an appropriate treatment plan. In patients with limited metastatic disease, a treatment plan aimed at cure can be adopted, if both the metastatic and primary cancers look resectable. Treatment usually starts with systemic chemotherapy, followed by radiation to the pelvis, especially if further downstaging of

the primary disease is needed. The keys in these cases are restaging after chemotherapy or radiation treatments, and thorough and repeated discussion at MDTB as indicated. Resection of the primary and metastatic disease can be considered in highly selected patients, again taking into consideration all of the factors listed above.

Role of Preoperative Treatment

There is strong level I evidence showing that preoperative radiation decreases the risk of local recurrence in patients with rectal cancer.^{4,20} For locally advanced rectal cancers involving other structures, our practice is to use long-course radiotherapy (50.4 Gy in 28 fractions) with concomitant radiosensitizing chemotherapy. Long-course radiation

Table 1 Criteria to define surgically unresectable locally advanced rectal cancer^{6,18,19}

Unresectable metastatic disease	
Absolute contraindications	Relative contraindications
Circumferential pelvic brim involvement	Bilateral ureteral obstruction (hydronephrosis)
Bony pelvic sidewall involvement	Common or external iliac vasculature encasement
Tumor extension through sciatic foramen or sciatic nerve involvement	
Tumor extension into proximal sacrum (S1 or S2)	

therapy may downsize or downstage cancers and, in cases of borderline resectability, increase the likelihood of achieving an R0 resection. Studies suggest that long-course radiation is associated with at least a partial response in approximately half of the cases and a complete clinical response rate in up to 28% of the cases.^{21,22} We do not typically use short-course radiation (25 Gy in five fractions) for patients with clinical T4b disease because we find that it is less effective than long-course radiation at downsizing and downstaging tumors.²³

Some centers have reported using neoadjuvant chemotherapy (FOLFOX—5-fluorouracil, leucovorin, and oxaliplatin) as the first treatment for high-risk rectal cancer patients followed by chemoradiation and then surgery.^{24,25} A study from Memorial Sloan-Kettering Cancer Center (MSKCC) showed that FOLFOX with subsequent chemoradiation before surgery resulted in a tumor response rate of greater than 90%.²⁴ Thus, preoperative chemotherapy may have the potential to further contribute to tumor downstaging prior to surgery, but more studies are required to better define its specific role.²⁵

Definitive surgery is usually performed approximately 6 to 8 weeks after the completion of neoadjuvant radiation therapy. Some centers have recently suggested that waiting longer than 6 to 8 weeks may be beneficial, particularly for more advanced disease, as tumors may continue to shrink and demonstrate clinical response after this point. Furthermore, longer intervals prior to surgery do not appear to negatively impact surgery-related complications.^{26,27} Thus, for patients with suspected T4b rectal cancers, we prefer to extend the interval prior to surgery to take full advantage of any potential downstaging effects. We usually perform definitive surgery approximately 8 to 10 weeks after the completion of radiation in this group of patients with very locally advanced disease, although some authors suggest the interval can be stretched even longer.²⁶ A retrospective Brazilian study found that the rates of lower post-neoadjuvant stage disease were significantly higher when surgery was delayed more than 12 weeks after the completion of chemoradiation compared with when surgery occurred within 12 weeks. Furthermore, intervals of more than 12 weeks were not associated with any differences in survival outcomes.²⁶ Ultimately, the surgeon needs to balance any benefit gained with additional downstaging against (1) the radiation-related fibrosis that occurs with time and (2) leaving the patient off all treatments for an excessive period while the cancer is still in situ.

Surgical Planning

We restage all patients with locally advanced rectal cancer 6 to 8 weeks after the completion of neoadjuvant therapy and approximately 1 to 2 weeks prior to surgery.⁶ This timing allows the tumor time to demonstrate a response to neoadjuvant therapy. It also provides surgeons with the most up-to-date information on the tumor's relationship to other structures, which helps to plan the operative procedure. Restaging MRI is less accurate after radiation therapy due to fibrosis, inflammation, vascular proliferation, and proctitis. It is, therefore, important that they are reviewed with an

experienced radiologist and interpreted in light of these factors.^{28,29} We also obtain repeat CT scans of the chest, abdomen, and pelvis during this time period to ensure that no metastatic disease has developed in the interim as this could alter treatment plans.

Surgical planning is paramount. Following restaging investigations, cases are presented again at MDTB as needed. If resection of non-gastrointestinal organs is anticipated, the appropriate personnel need to be included early in the planning stages.¹² These may include urologists, gynecologists, and orthopedic or plastic and reconstructive surgeons. If a stoma is anticipated, patients should be seen and preoperatively marked by an enterostomal therapist.³⁰

Extended and complex multivisceral resections are associated with significant morbidity and potential mortality. These operations are associated with long postoperative stays and frequent complications, including anastomotic leaks and pelvic sepsis, wound complications, ileus, and cardiac, pulmonary, and urological complications.^{6,31} In one series of multivisceral resections for locally advanced rectal cancer ($n = 30$), authors reported in-hospital complications rates to be more than 75% and hospital mortality of 10%.³² Given these risks, an assessment of the patients' overall health and physiological status must be undertaken to determine the fitness for surgery as patients with significant medical comorbidities may not be appropriate candidates for resection.^{11,33} Surgeons must counsel patients on quality-of-life issues that ensue after major surgical resections. Quality of life after major extended resections is understudied but the impact on patients can be profound. Impairments of sexual, urinary, bowel and overall function must be considered during the surgical decision-making process.⁶

Classification of Locally Advanced Rectal Cancer

Classification systems may help standardize treatment approaches and plan procedures, compare outcomes, and better stratify prognosis. Several classification schemes have been developed for advanced rectal cancers, mostly in the context of recurrent disease. These systems classify recurrences based on their anatomic location (MSKCC),¹⁸ sites of fixation (Mayo Clinic),³⁴ or MRI extent of tumor invasion (Royal Marsden Hospital).³⁵ These classification systems are outlined in ►Table 2.

There is no standard classification scheme for locally advanced T4b disease, although the Royal Marsden Classification includes it in their locally advanced disease classification along with recurrent disease. Below we describe surgical approaches to T4b rectal cancers based on region of invasion, which more closely follows the Royal Marsden group's approach. There is considerable overlap between the approach proposed by the Royal Marsden group and the MSKCC approach.

Operative Procedure

Patients should be cross-matched for blood as needed, especially if a high volume of blood loss is expected, as with

Table 2 Selected classification schemes of locally advanced and recurrent rectal cancer based on site of site of fixation, anatomical location of tumor, and MRI extent of tumor invasion⁶

Classification Scheme	Variables	Description
Site of fixation (F) and symptoms (S) ³⁴	F0	No site of fixation
	F1 ^a	1 site of fixation
	F2	2 sites of fixation
	F3	3 or more sites of fixation
	S0	No symptoms
	S1	Symptoms but no pain
	S2	Symptoms with pain
Anatomical pattern of involvement ¹⁸	Anterior	Involves prostate, seminal vesicles, uterus, vagina, bladder
	Posterior	Involves sacrum/coccyx
	Lateral	Involves bony or sidewall muscles of pelvis, iliac vessels, ureters, pelvic nerves
	Axial	Anastomotic recurrence, local recurrence, perineal recurrence but not including anterior, posterior, or lateral sidewalls
MRI extent of tumor invasion ³⁵	Anterior above PR	Involves iliac vessels and ureters above peritoneal reflection; sigmoid colon, small bowel, or lateral side wall involvement
	Anterior below PR	Involves urethra, bladder, vagina, uterus, seminal vesicles, prostate, and pubic symphysis
	Peritoneal reflection	Involves the recto-uterine or recto-vesical pouch
	Posterior	Involves sacrum, presacral fascia, or coccyx
	Central	Recurrences involving the rectum either intraluminal or extraluminal or perirectal fat
	Lateral	Involves iliac vessels, lateral pelvic lymph nodes, sciatic nerve or notch, S1/S2 nerve roots, obturator internus or piriformis muscle, ureters
	Inferior	Involves perineum, levator ani, external sphincter complex, or ischioanal fossa

Abbreviation: PR, peritoneal reflection.

^aCan be further organized based on anterior (A), sacral (S), right (R), and left (L) sites of adhesion or invasion.

sacrectomies. We are liberal in our placement of ureteral catheters to aid in their identification as normal anatomy can be difficult to elucidate in these cases. Depending on the extent and duration of surgery, it may be also helpful to have another experienced colorectal or surgical oncologist colleague available to offer assistance or a break during part of the procedure or, in some cases, to simultaneously conduct the perineal dissection.

The operative procedure for locally advanced disease consists of three phases: (1) exploration and assessment of resectability, (2) en bloc resection of the tumor and involved structures, and (3) reconstruction of the gastrointestinal, genitourinary tracts, and perineum as indicated. Although laparoscopic multivisceral resections for rectal cancer have been reported,³⁶ we favor an open approach in vast majority of cases. Laparoscopic resection should be considered in only highly selected cases.

Laparotomy begins with a search for previously undetected metastatic disease. We then focus on the pelvis and assess for any obvious contraindication to resection. In the absence of these findings, we proceed with our resection. The dissection usually begins with a standard TME technique.³⁷ Depending on the pattern of organ involvement, surgery may

extend beyond normal anatomical planes or require a multi-visceral resection.^{11,38} Tumors may be adherent to other organs or structures due to direct invasion or inflammatory adhesions. Adherent organs or tissues must be completely resected in an en bloc fashion because distinguishing inflammatory adhesions from malignant invasion intraoperatively is unreliable. Reviews of resected surgical specimens suggest that 40 to 84% of tumor-associated adhesions are actually malignant.^{11,38} Transecting a tumor at a point of local adherence compromises the resection and is associated with high rates of treatment failure. A good dissection strategy is to start in uninvolved areas first and then approach the tumor from different sides or angles. This approach allows for improved mobility and visualization around the tumor and involved organs. At this point, the surgeon then dissects beyond traditional planes or resects involved organs en bloc with adequate margins. We aim for gross margins of at least 1 to 2 cm, but this may not always be possible depending on the involved structures and the proximity of any critical structures. If needed, intraoperative frozen section biopsies can be used to assess questionable margins. Following a complete resection, attention is then turned to hemostasis and reconstruction, which is discussed below.

Anterior Invasion

Limited involvement of structures such as small bowel, bladder dome, posterior vagina, or seminal vesicles can be treated with a partial resection of these structures en bloc with the rectum. For partial cystectomies, the bladder may be closed primarily if there is adequate reservoir capacity. If not, augmentation with bowel such as with an enterocystoplasty can be considered.³⁹ For small vaginal defects, the vagina may be closed primarily or left partially open with a Penrose drain to heal by secondary intention. For larger defects, vaginal reconstruction can be accomplished using vertical rectus abdominis muscle or biosynthetic meshes.

Invasion of the bladder trigone usually requires an exenterative procedure. Total pelvic exenteration entails en bloc resection of the rectum, internal genitalia, and bladder. If a total cystectomy is required, noncontinent or continent urinary diversions may be constructed. We most frequently use a noncontinent ileal conduit. Early complications with ileal conduits may occur including leakage of the ureteroileal anastomosis (7%), paralytic ileus (22%), and anastomotic bowel leak. Late complications include benign ureteroenteric anastomotic strictures (7–14%), hydronephrosis, renal failure, and abdominal wall related complications (15–65%).⁴⁰ Continent diversions with an intestinal neobladder have been reported,³⁹ but these for the most part have been limited to highly selected cases in specialized centers.

For rectal cancers in men with limited prostate involvement, a bladder-preserving prostatectomy with an urethrovesical anastomosis can be associated with negative surgical margins in selected cases.^{39,41} If this is not possible, a total pelvic exenteration may be required. In women, tumors involving the cervix usually necessitate a posterior pelvic exenteration (rectum, uterus, and partial vaginectomy).

Lateral Pelvic Sidewall Invasion

Tumors with threatened lateral margins may require dissection into retroperitoneal planes deep to standard TME planes. Invasion deeper into the pelvic sidewall usually presents an extremely difficult situation. In selected patients, partial ureteric resection can be considered. Some authors have described partial iliac vessel resections, but these are potentially highly morbid procedures and evidence supporting the long-term benefits of such procedures is lacking.⁶

Posterior Invasion

In cases of posterior invasion with limited sacral fascial involvement, en bloc resection of the rectum with periosteal elevation can achieve negative margins. However, this technique can be associated with significant hemorrhage.¹⁰ Posterior involvement with bony sacral invasion necessitates an abdominosacral resection to achieve an R0 resection. S2/3 is usually considered the highest level of sacrectomy, as bilateral S2 preservation is required for, at best, satisfactory bladder and sexual function.^{42,43} Higher sacrectomies through S1/2 or L5/S1 levels have been described, but these

can result in significant functional impairment. Bilateral S1 nerve root resection results in complete bladder denervation, and higher resections can result in significant lower extremity weakness. Furthermore, later development of metastatic disease in patients undergoing higher level sacrectomies is common.⁴⁴ Technical aspects to assist resection include ligation of internal iliac vessels to limit bleeding and prone positioning.^{42,45,46}

Inferior Invasion

Locally advanced tumors may extend inferiorly to the levator muscles, external sphincter complex, or ischioanal fossa. In these cases, wide resection to include the ischioanal fossa or the levator ani muscles at their bony insertion may be necessary to achieve an R0 resection. An abdominoperineal resection (APR) that includes the levator muscles at their bony insertion is referred to an extralevator APR. These result in more cylindrical-shaped APR specimens, which are associated with lower positive circumferential margin rates compared with conventional APR specimens.⁴⁷ A prone position for the perineal resection portion of the procedure can improve vision and exposure and facilitate wide levator resection.

Intraoperative Radiation Therapy

Some centers offer intraoperative radiation therapy (IORT) as part of the surgical treatment of locally advanced T4 rectal cancers. IORT offers the ability to directly deliver radiation to areas involved with tumor while limiting exposure to adjacent uninvolved tissue. In this way, it can deliver two to three times the biological equivalent dose over fractionated external beam radiation therapy.^{9,19} This may be considered an additional radiation boost to assist in cases involving close margins.¹² It can be delivered with either external beam applicators or as high-dose-rate (HDR) brachytherapy IORT.¹⁹ A large retrospective series of locally advanced rectal cancer ($n = 409$) demonstrated that in a subgroup of patients with a microscopically involved circumferential radial margin ($n = 48$), IORT was associated with a significant improvement in 5-year local recurrence-free survival compared with patients not receiving IORT (84 vs. 41%).⁴⁸ However, IORT may be associated with increased wound complications (24%), complications of the bladder (20%) and ureters (23%), and peripheral nerve damage (16%).⁴⁹

Perineal Reconstruction following Multivisceral Resection

Small perineal defects may be closed primarily. However, large perineal wounds are common after multivisceral resection, APR, and abdominosacral resections, and may require reconstruction to close defects and limit wound complications. In addition, neoadjuvant radiation has been shown to increase perineal wound complications, and alternatives to primary perineal closure should be considered.⁵⁰ Myocutaneous flaps are commonly used as they utilize nonirradiated,

well-vascularized tissue to provide coverage.⁵¹ The multiple options include vertical rectus abdominis myocutaneous (VRAM), bilateral gluteal, or gracilis flaps. If a VRAM flap is used, preoperative planning of ostomy sites is critical, as is avoidance of injury to the inferior epigastric vessels during laparotomy.⁵¹ These flaps are often preferred as they provide large, viable tissue bulk with minimal donor site morbidity, reliability, and ease of construction.^{52,53} When compared with primary perineal closure after APR, perineal closure with VRAM flaps have been shown to reduce perineal wound complications, such as perineal abscesses and wound dehiscence, without significant increases in the rates of abdominal wall complications.⁵³

Outcomes

In patients with nonmetastatic disease, the most important factor associated with outcome for locally advanced rectal cancer is the ability to achieve an R0 (negative microscopic margins) resection.⁵⁴ En bloc resection with negative margins can result in survival outcomes comparable to patients whose cancers did not invade adjacent organs.^{11,17,55} A systematic review of multivisceral resections reported a 5-year overall survival of 52.8% (95% confidence interval [CI], 52.0–53.8%), which was higher than resections for recurrent rectal cancers at 19.5% (17.8–21.2%).⁵⁴ Factors associated with disease-free survival are younger age (<60 years), lower BMI (<20 kg/m²), negative lymph node status, and inflammatory reaction.⁵⁶ After surgery, patients should be assessed for adjuvant therapy such as postoperative chemotherapy.¹¹

Most outcomes studies on multivisceral resections look primarily at survival and recurrence rates after surgery. There is, unfortunately, a paucity of research looking at quality-of-life outcomes after multivisceral resection for rectal cancer.⁶ There is no doubt that complex multivisceral resections for locally advanced rectal cancer can have a profound impact on multiple aspects of patients' quality of life and function, including stoma/bowel, urinary, and sexual function. Furthermore, there is evidence to suggest deficiencies in our preoperative counseling efforts.^{57,58} It is critical to develop a better understanding of quality of life after extended resections to manage patients' expectations and balance these factors with the likelihood of cure. Measuring quality-of-life and functional outcomes after these resections will be an important area of research for this group of patients going forward.

Summary

Locally advanced T4 rectal cancers are complex and challenging clinical presentations whose treatment involves a multidisciplinary team of specialists working in a coordinated, timely fashion. Accurate preoperative assessment and patient selection is paramount to ensure optimal outcomes in the face of high postoperative morbidity and functional, quality-of-life issues. For selected patients, using multimodality treatment regimens and aggressive surgical management to obtain negative margins can result in durable long-term outcomes. With improvements in diagnostic imaging, newer

locoregional and systemic therapies, and more aggressive surgical techniques, it is expected that more patients with locally advanced rectal cancer will undergo surgery with the aim of cure in the future.

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