Rectal Conditions: Rectal Cancer—Proctectomy

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Refer to Algorithm in Fig. 38.1

A. In the current climate of evolving oncologic therapies, increasing evidence has shown that a multidisciplinary approach, with surgical resection at the forefront of curative treatment, improves oncologic, clinical decision-making, and functional outcomes for patients with rectal cancer. For this chapter, we will be focusing on the surgical therapy for resectable rectal cancer and reserve discussion of treatment for unresectable disease and disease amenable to local therapies for elsewhere in this text. Quality oncologic resection requires experience and a deep understanding of the pelvic anatomy in order to yield the best probability of good oncologic and functional outcomes.

B. In order to determine the most appropriate treatment options for the patient, a preoperative evaluation must include not only staging of the cancer according to the TNM classification, but also evaluation of the location of the tumor relative to the sphincter complex, involvement of any adjacent structures, and proximity or involvement of the circumferential resection margin (CRM).

- Thorough physical examination including detailed digital rectal examination can help determine location of the tumor and proximity to anal sphincters, firmness, ulceration, and fixation.
- Carcinoembryonic Antigen (CEA).
- Colonoscopy, if not already performed, to exclude proximal synchronous tumor(s), to obtain histology, and location of tumor including distance from anal verge or dentate line, as well as circumferential location as it relates to surrounding structures. A rigid proctoscope is often preferred in this setting to more accurately assess tumor distance from the verge and distinguish among upper, mid, and lower rectal locations.
- Endorectal Ultrasound (ERUS) or Magnetic Resonance Imaging (MRI) for local-regional staging. ERUS may have advantage in evaluating depth of involvement for early stage tumors, whereas MRI is the only modality that can assess circumferential margin and is the most commonly used method presently. MRI is the accepted standard by the Commission on Cancer (CoC). National Accreditation Program for Rectal Cancer (NAPRC).
- Computed Tomography (CT) of the chest, abdomen, and pelvis to evaluate for distant metastasis.

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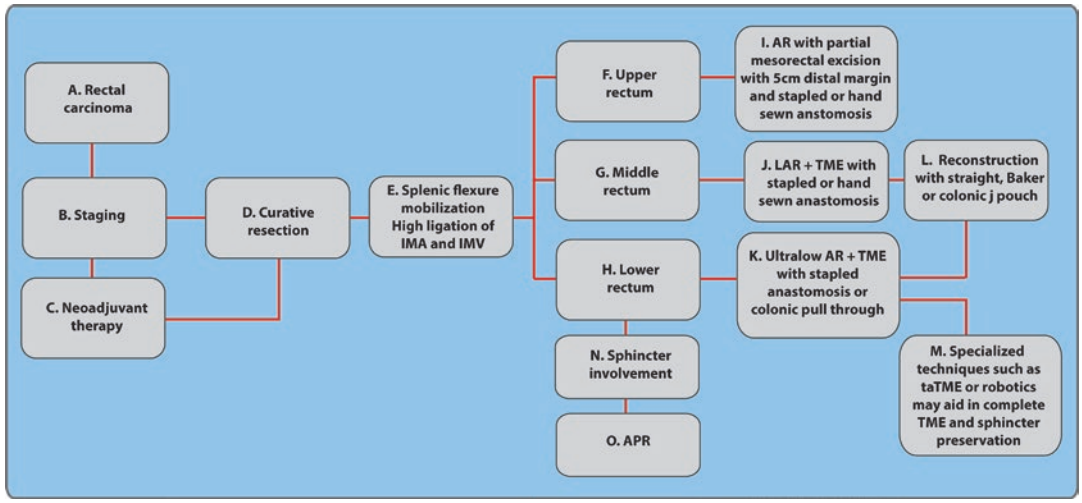

Fig. 38.1 Algorithm for treatment of rectal cancer–proctectomy. *IMA* inferior mesenteric artery, *IMV* inferior mesenteric vein, *APR* abdominal perineal resection, *AR* anterior resection, *LAR* low anterior resection, *TME* total mesorectal excision, *taTME* transanal total mesorectal excision

C. Neoadjuvant chemoradiotherapy for locally advanced rectal cancer (cT3-4, cN0 or any cT, cN1-2) reduces the risk for local recurrence when compared to surgery alone in several landmark studies. Chemoradiation delivered in the neoadjuvant setting is associated with a lower rate of recurrence and higher treatment completion rates compared to adjuvant chemoradiation. Short-course radiation can also be delivered in neoadjuvant setting and shown to significantly reduce local recurrence. Neoadjuvant chemoradiotherapy may also be considered for those patients with low rectal tumors where sphincter-preserving surgery would not yield adequate results without reduction of the tumor burden. Upper rectal lesions (above the peritoneal reflection) are more controversial, and in many cases do not require neoadjuvant therapy and can be resected primarily.

D. The anatomy of the rectum can be quite variable from patient-to-patient and requires experience and reliance on key anatomical constants when operating in a radiated and occasional difficult anatomical of the pelvis. The location of the rectal tumor is often measured as the distance from the anal verge or the dentate line, and the height of the rectum varies between 12 and 15 cm by rigid proctoscopy, depending on the type of measurement and size of the patient. Some surgeons will use the relationship of the tumor to the rectal valves as a reference point for height of the tumor (low, middle, and upper rectum).

The superior aspect of the rectum is identified as the colon passes over the sacral promontory into the pelvis and the taeniae coalesce to form a complete layer of longitudinal muscle. The anatomy which comprises the mesorectal excision can be separated similarly to how they are encountered surgically, the anterior, posterior, and deep anatomy. From superior to inferior the anterior excision is comprised of:

- The intraperitoneal anterior wall of the rectum.
- The peritoneal reflection.
- Denonvilliers' fascia behind the seminal vesicles and fusing with the fascia on the back of the prostate in males.

Posteriorly the mesorectum is largely comprised of a bilobed lipomatous like structure that lies anterior to the sacrum and enveloped by the investing visceral fascia of the hindgut. Waldeyer's fascia invests

the front of the sacrum and provides some protection from the venous plexus and autonomic nervous plexus of the pelvis. Between the investing fascia of the mesorectum and the investing fascia of the sacrum posteriorly is an avascular plane of dissection that guides the surgeon to a complete mesorectal excision, the so-called "Holy Plane" of dissection. Distally the mesorectum narrows or tapers into a "waist" as the lipomatous lymphatic and vascular supply tapers and the muscular wall of the rectum becomes the internal anal sphincter as it inserts into the pelvic floor.

Essential to functional outcomes following a TME is an understanding and awareness of the sympathetic and parasympathetic fibers that supply the rectum and genitourinary tract. The sympathetic or superior hypogastric plexus arises from T12-L2 and passes anteriorly over the aortic bifurcation and sacral promontory as it divides laterally into the right and left hypogastric nerves. Damage to these nerves can result in urinary incontinence and retrograde ejaculation. As the superior hypogastric plexus travels inferior and lateral in the pelvis, posterior to the mesorectum it joins the pelvic splanchnic nerves, or nervi erigentes, to form the inferior hypogastric plexus. Injury to the parasympathetic nerves when dissecting out the mesorectum can lead to erectile dysfunction and bladder dysfunction.

As the TME dissection commences, the avascular presacral plane will act as a guide for the rest of the abdominal approach to the dissection. The plane can reliably be found by retracting the rectum up and out of the pelvis and scoring the peritoneum over the sacral promontory from the right side of the patient. Care should be taken to avoid the sympathetic trunks at this location. Once entered, this plane can be followed both distally and laterally to completely encompass the visceral fascia of the mesorectum.

E. Consistent with oncologic principles of surgery, the mesentery of the colon and rectum should be taken *en bloc* with the specimen. For rectal cancer, ligation proximal to the superior rectal artery (low tie) has similar survival outcomes to ligation of the IMA proximal to the left colic artery (high tie). However, a high ligation is often necessary in order to provide adequate length for a tension-free anastomosis and should be performed when patients have suspicious lymph node involvement proximal to the superior rectal artery. Additionally, a high ligation of the inferior mesenteric vein is advocated both for lymph node yield and adequate mobilization for tension-free anastomosis. Routine high ligation of the vessels and complete splenic flexure mobilization are can be essential maneuvers to ensuring a tension-free anastomosis. In those patients with a redundant and floppy colon who are undergoing a more proximal anastomosis or an abdominal perineal resection (APR), a splenic flexure mobilization may not be required.

F. The location of rectal tumors is often described in reference to the upper (11–15 cm from anal verge), middle (7–11 cm from anal verge), or lower third (anorectal ring to 7 cm from anal verge) of the rectum. The anatomical association to this reference is that the upper third of the rectum is intraperitoneal and covered by peritoneum anteriorly and laterally. The middle rectum is anteriorly covered by peritoneum while the lower third is devoid of peritoneum and is entirely extraperitoneal.

G. Tumors of the middle and lower third of the rectum should undergo a complete TME including anterior dissection through Denonvilliers' fascia. This will allow for complete excision of lymphatic drainage and minimize risk of local recurrence.

H. Secondary to several anatomic constraints, tumors of the lower rectum often present the greatest challenge to successful outcomes. Proximity to the pelvic floor and sphincter complex may make satisfactory functional

outcomes unobtainable and complete excision of the tumor may require an abdominal-perineal resection (APR) for adequate oncologic and functional outcomes. Additionally, the natural mesorectal plane narrows deep in the pelvis making the circumferential margin at higher risk of being threatened. Extra-organ involvement is also more likely with tumors in this location given the proximity of the seminal vesicles, prostate, and vagina.

I. Much controversy exists over the most appropriate distal margin of resection. Distal lymphatic or intramural spread of the tumor presents the potential for a positive distal margin despite a clear gross margin intraluminally. However, a distal mesorectal margin of 5 cm for an anterior resection has been accepted for rectal cancer of the upper third of the rectum, but should be weighed against other clinical and pathologic features of the tumor. A complete posterior and lateral dissection should be performed during this operation while maintaining the lateral stalks prior to determining where to divide the distal margin.

J. While concern over technical difficulties and risks for morbidity following increased rates of anastomotic leaks and pelvic sepsis are present, middle rectal tumors should undergo a low anterior resection with total mesorectal excision with a stapled or hand-sewn anastomosis.

K. When possible, a sphincter-sparing operation should be the operation of choice for rectal cancer, including low rectal tumors where sphincter preservation and reasonable functional outcomes are possible without increasing the risk of unfavorable oncologic outcomes. Whereas 5 cm of distal margin is ideally accepted for more proximal tumors, various studies have found that margins of 2 cm or less have resulted in similar oncologic outcomes. When compared to the difference in quality of life between an APR and a sphincter-sparing operation, a low colorectal or even coloanal anastomosis is often preferred for patients with good preoperative sphincter function.

Once the oncologic concerns of proper resection margins have been met and anal sphincter function accounted for, the greatest concern in the postoperative period is the risk of anastomotic leak and pelvic sepsis. The risk of anastomotic leak in a low pelvic anastomosis can be up to 3–32% depending on multiple risk factors including tumor height, receipt of neoadjuvant therapy, and comorbid conditions. Technical factors increasing the risk of anastomotic leak include relative ischemia and tension on the anastomosis. Several meta-analyses have been published evaluating the role of diverting ileostomy for low anterior resections (LAR) and confer that a diverting stoma reduces the risk of both anastomotic leak and the need for reoperation by approximately 60–70%. For this reason the authors advocate routine diverting loop ileostomy for low and ultra-low anterior resections in addition to leak testing all colorectal and coloanal anastomoses.

L. Reconstructive options following low and ultra-low anterior resection include a straight anastomosis, colonic J-pouch, coloplasty, or a Baker-type side-to-end anastomosis. Several factors should be taken into account when deciding on restorative technique for optimizing function of the postoperative neo-rectum. With the loss of the rectum as a reservoir, and disturbance of the anorectal reflex with low pelvic dissections patients can experience frequency, urgency, soiling, and incomplete evacuation, a constellation of symptoms known as the LAR syndrome. The risk of these symptoms are increased with lower anastomoses and with decreased reservoir compliance. Large systematic reviews have shown that for the first 1–2 postoperative years the functional outcomes for patients are improved following colonic J-pouch reconstruction compared to straight coloanal or colorectal anastomosis. For this reason, when colonic length is adequate, and the pelvic volume can accommodate a larger reconstructed reservoir, the authors prefer where feasible, a colonic J-pouch reconstruction or side-to-end as opposed to a

straight anastomosis for low and ultra-low sphincter-sparing operations. Prior to advancing the circular stapler or performing an anastomosis, rectal washout with a tumoricidal agent may reduce any theoretical risk of exfoliating intraluminal tumor cells, although data has not consistently shown benefit to this maneuver.

M. Minimally invasive techniques in colorectal surgery have repeatedly shown benefits in outcomes of early postoperative recovery; however, studies comparing laparoscopic to open surgery have less consistency and yield conflicting results for short- and long-term oncologic outcomes. In the MRC CLASICC trial, 794 patients in the UK were randomized 2:1 to laparoscopic or open resection for rectal cancer. The laparoscopic group had a higher rate of positive CRM; however this did not translate into long-term differences in outcomes, with the laparoscopic group have equivalent overall survival, disease-free survival, and local recurrence rates. The COLOR II Trial was another randomized controlled trial comparing the oncologic outcomes of 1044 patients who underwent laparoscopic or open resection for rectal cancer. In this large European study, there was no difference in the 3-year locoregional recurrence rate, disease free survival, or overall survival between the laparoscopic and open groups. The ACOSOG Z6051 Trial was a multicenter randomized controlled trial in the U.S. and Canada involving 486 patients with Stage II or III rectal cancer who underwent neoadjuvant therapy. In this study laparoscopic approach was compared to open approach in a non-inferiority analysis for pathologic outcomes clear distal and circumferential margins and well as the completeness of the mesorectal excision. For the authors, the preferred technique remains to be a minimally invasive approach. Challenges still exist for treating low rectal tumors, particularly when operating in a narrow pelvis or on patients with increased visceral adiposity. Newer techniques that have growing popularity are the use of robotic surgery and combined transanal and transabdominal approach. Advocates for robotic surgery suggest that articulating instruments and improved visualization aid in improved dissection in the difficult pelvis and low-lying tumors. Proponents of transanal total mesorectal excision also advocate that this technique adds benefit to improved oncologic specimens primarily for low and ultra-low tumors, possibly increasing the feasibility of sphincter sparing operations for patients with ultra-low cancers, although data on the long-term value of these techniques are still being formulated.

N. Sphincter preservation is not advisable for those patients with poor sphincter control or who have low tumors invading the levators or anal sphincters following neoadjuvant treatment. These patients should undergo *en bloc* resection of the anus, rectum, and sigmoid colon with permanent descending colostomy possibly as an extralevator APR.

O. While APR has long been the gold standard operation for patients with low rectal cancer, recent evidence has shown that the improved oncologic outcomes associated with TME and neoadjuvant chemoradiation have not been routinely replicated in patients undergoing APR. Keeping in mind that these tumors have a higher propensity for local spread and invasion into adjacent tissues given the lack of a mesorectum, studies have shown positive circumferential resection margin (CRM) rates in the 30% range for APR compared to 11% for LAR. Additionally, APR has a higher rate of incomplete dissection and a perforation rate nearly 14% compared to 2.5% for LAR. Some surgeons have advocated for extralevator APR to combat the high risk for positive margins or incomplete resections. In this approach the perineal dissection is started with a wide cylindrical incision and carried through the ischiorectal fat and the levator ani divided at the attachment to the sidewall, therefore eliminating the "waist" associated with the standard APR specimen and decreasing the risk of a positive CRM. The downside to this technique,

however, is the resultant large perineal defect which often requires a flap for closure and has a higher rate of wound complications.

Suggested Reading

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