Local Excision for Early Rectal Cancer—A Compromise Therapy?

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Local excision for early rectal cancer has significant appeal because of its low morbidity, technical ease, superior functional results, and avoidance of a permanent stoma. However, there are many concerns regarding the uncertainty of the long-term oncologic outcome. Factors underlying these concerns include the limited ability to assess regional lymph node status, the inadequacy of full pathologic staging, and recent reports of excessive local failure rates and inferior outcomes, as compared with radical surgery. In addition, surgical salvage following local failure is not universally successful and often requires very extensive radical resection.

Limitations with regard to preoperative staging is one of the major concerns in patient selection for local excision. Endorectal ultrasound is the preferred modality for defining early rectal cancers because of its ability to assess depth of wall invasion. A major concern is that all current staging modalities, including ultrasound, magnetic resonance imaging, and computed tomography, fall short in their ability to accurately assess lymph node status. As reported in the literature, regional lymph node metastasis rates are from 15% to 25% for T1 tumors. 

In this setting, if thoracotomy is possible, preoperative placement of a double-lumen endotracheal tube should be considered. The abdominal portion of the thoracoabdominal incision should be performed first to allow assessment of resectability.

The omentum is separated from the colon with an electrocautery or scissors through the relatively avascular plane. Gentle upward traction is placed on the omentum to facilitate entry into the correct surgical plane. If the procedure involves a formal D2 lymph node dissection, this is also a convenient time to enter the anterior leaf of the transverse mesocolon, which is resected with the anterior covering of the pancreas.

D1 versus D2 Lymphadenectomy: Issues and Evidence

The particular

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rectal cancers and 20% to 35% for T2 cancers. A recent unpublished study from Memorial Sloan-Kettering Cancer Center revealed a 29% incidence of lymph node metastasis in T1 rectal cancers in patients who underwent radical resection; 30% of these were micrometastases (< 1 mm in size). These data substantiate the concern that regional lymph node status cannot be accurately assessed by current preoperative staging modalities.

The studies in the literature are primarily retrospective and involve relatively small numbers of patients with variable follow-up. In recent studies with minimums of 50 cases, the outcome data of most concern relate to the high local failure rate following local excision alone (T1 local failure rate, 4% to 18%; T2 local failure rate, 27% to 67%). In these studies, the pattern of failure is a cause of concern; the preponderance of local failure compared with distant failure suggests that the extent of local resection is inadequate. Although tumor biology undoubtedly is a significant factor, high local failure rates have been reported even in T1 cancers with favorable histology. As mentioned above, the inability to accurately assess regional lymph node status remains a major concern and is likely a major factor in the high local failure rate following these limited excisions.

Despite the high local recurrence rates, in most studies, the 5-year survival rates appear favorable for both T1 and T2 rectal cancers treated by local excision. However, these data may be deceiving, because many studies have inadequate long-term follow-up, and it has been documented that cancer-related deaths after local excision can occur as long as 10 years or longer after treatment. A report from Memorial Sloan-Kettering—the largest study with the longest follow-up in the literature—revealed that 28% of cancer deaths occurred longer than 5 years after local excision. The survival rate for T1 locally excised lesions was 92% at 5 years, but the survival rate decreased to 74% at 10 years. These data suggest that 5-year survival assessment may not be an adequate determination of long-term cure.

Although there are no randomized, controlled trials comparing local excision with radical surgery for the treatment of early rectal cancer, three recent retrospective studies indicate superior results following radical resection, as compared with local excision. In a study from the University of Minnesota involving patients with stage I rectal cancer (uT1N0 or uT2N0), 108 patients underwent local excision, and 153 patients underwent radical resection. It should be noted that the true lymph node status was not assessable in the locally treated group, and that only the node-negative patients were included in the group undergoing radical resection. Hence, the two treatment groups were not equivalent. The 5-year local recurrence rate was higher in the local excision group, as compared with the radical resection group (28% versus 4%, P < 0.001). The difference in 5-year overall survival did not reach statistical significance (82% for radical resection versus 69% for local excision, P = 0.06). However, in a subset analysis, although there was no difference in 5-year survival for patients with T1 cancers, there was a statistically significant difference in 5-year survival for patients with T2 cancers that favored radical resection (81% versus 65%, P = 0.03).

In a study from the Mayo Clinic, 70 patients with T1 rectal cancer were treated with local excision, and 74 similar patients were treated with radical resection. There was not a statistically significant difference in local failure between the two groups (6.6% after local excision versus 2.8% after radical resection); however, the study did demonstrate an improved overall survival for patients undergoing radical resection (90.4% versus 72.4%). A study from Memorial Sloan-Kettering analyzed the outcomes of 319 consecutive patients with T1 rectal cancer, 151 of whom underwent local excision and 168 of whom underwent radical resection. For the patients undergoing radical surgery,
the tumors were of higher location and were slightly larger than those of patients undergoing local excision; the adverse histologic characteristics were similar for the two groups. For the patients undergoing radical resection, the rate of lymph node metastasis was 18%. Despite these features, the actuarial local recurrence rate following local excision was 15%, compared with 3% following radical resection \( (P = 0.0001) \). Although there was no difference in cancer-specific survival between the two groups, several of the patients who underwent local excision were alive at the conclusion of the follow-up period but had developed unresectable disease, suggesting that longer follow-up may result in a survival difference. On the basis of these three studies, it can be concluded that the data favor radical resection over local excision for good-risk patients with early-stage rectal cancer.

Although several nonrandomized, uncontrolled studies suggest that local excision with postoperative adjuvant radiation or chemoradiation may result in more favorable rates of local control and survival, it is clear that local failure, even with the addition of adjuvant therapy, remains significantly higher compared with radical resection. The Memorial Sloan-Kettering study reported a 22% local failure rate at both 5 and 10 years for 31 patients (7 patients with T1 disease, 24 patients with T2 disease) following local excision and adjuvant therapy.\(^2\) This local failure rate was not significantly different from that seen with local excision alone. However, it should be noted that the cancers of the patients who underwent adjuvant therapy had more adverse features. There are a few small, published series suggesting that preoperative chemoradiation followed by local excision may have potential advantages, but the data are limited. A current investigation by the American College of Surgeons Oncology Group is prospectively studying the outcome of uT2N0 rectal cancers treated with preoperative chemoradiation followed by local excision.

Surgical salvage for local failure following local excision of early rectal cancer has been reported in several small studies. In seven studies involving a total of 104 patients who underwent surgical salvage, only 57 patients (55%) were free of disease at the conclusion of the follow-up period. In a retrospective review at Memorial Sloan-Kettering of 49 patients who underwent surgical salvage, 27 (55%) required extended radical resection with en bloc resection of one or more adjacent structures.\(^6\) Although an R0 resection was accomplished in 47 of the 49 patients, the overall disease-specific survival was only 53%. This study and other smaller reports in the literature indicate that surgical salvage for local failure following local excision is low. This is particularly concerning, since an initial primary early rectal cancer should be easily resectable with good long-term outcome by standard radical resection.

In summary, the long-term risk of recurrence after local excision of early rectal cancer is substantial. Two-thirds of patients with recurrence have local failure, implicating inadequate resection in treatment failure. Neither adjuvant therapy nor surgical salvage is reliable in preventing or controlling local recurrence. The postoperative interval to cancer death is as long as 10 years, raising concern that cancer mortality may be higher than is generally appreciated. Additional treatment strategies are needed to improve the outcome of local excision. Current data indicate that local excision is a compromise therapy for good-risk patients with early rectal cancer. However, local excision remains a reasonable option for elderly and high-risk patients with significant comorbidities. Radical resection remains the gold standard for the good-risk patient with early rectal cancer.

**REFERENCES**

benefit or simply improves surgical staging. To date, four randomized, controlled trials have failed to show any significant benefit from extended lymph node dissection. In the largest such study, performed by the Dutch Gastric Cancer Group, more than 700 patients were randomly assigned to undergo either D1 or D2 lymphadenectomy. The 5-year survival rates were essentially the same in the two groups; perioperative morbidity and mortality were significantly higher after D2 lymphadenectomy.

A subsequent study from the same group found that at 10 years after operation, D2 lymphadenectomy provided a benefit (in terms of lower local recurrence) only in the subgroup with positive second-order nodes; however, these patients could not be identified preoperatively. For the cohort as a whole, extended lymph node dissection generated no long-term survival benefit. Therefore, although some surgeons extend the lymphadenectomy to include lymph nodes along the left gastric, celiac, and common hepatic arteries (a so-called D1+ dissection), the standard of care for surgeons in the United States continues to be a D1 lymphadenectomy that includes all perigastric lymph nodes and the greater omentum.


Antrectomy in Gastric Resection for Peptic Ulcer Disease

The primary indication for gastric resection in the setting of peptic ulcer disease is chronic obstruction caused by scarring, typically from a pyloric channel ulcer. Antrectomy removes the gastrin-secreting portion of the stomach. In addition, antrectomy may be required for recurrent bleeding after an adequate vagotomy and pyloroplasty for a bleeding duodenal ulcer. Alternatively, antrectomy may be the elective operation of choice for intractable type I, II, and III gastric ulcers, as well as a primary emergency surgical option for perforated or bleeding gastric ulcers. Antrectomy is typically combined with truncal vagotomy.

If a primary gastroduodenostomy is not possible, a Billroth II reconstruction (gastrojejunostomy) is indicated. This procedure involves a number of technical considerations: management of the duodenal stump, the length of and placement of the afferent limb, and the placement and method of the anastomosis. If the duodenum is not scarred or inflamed, simple staple closure will suffice; if closure proves difficult, a lateral duodenostomy tube may help decompress the stump. The duodenal stump should be covered with an omental patch.

The segment used for the anastomosis should be as short as possible while still being able to reach the stomach without tension; approximately 20 cm of proximal jejunum should suffice to serve as the afferent limb. Passing the jejunum through a retrocolic window places less tension on the mesentery than an antecolic approach does, though gastric emptying will occur with either method. If a retrocolic approach is used, a window is created for the jejunum; this must be closed and fixed to the small bowel.

The gastrojejunosotomy may be constructed either to the posterior wall of the stomach or to the inferior portion of the excised staple line. If the anastomosis is placed at the gastric staple line, the inferior portion of the staple line is excised, often together with a wedge of stomach behind the staple line. A two-layer anastomosis is created with an outer layer of Lambert sutures and an inner layer of absorbable full-thickness sutures; the gastric staple line may be oversewn [see Figure, page 8, top]. Alternatively, the gastrojejunosotomy may be created by means of stapling.

Perforated Peptic Ulcer: Laparoscopy Safe and Effective

A meta-analysis of 13 studies involving 658 patients compared laparoscopic and open approaches to perforated peptic ulcers; the study found that laparoscopic repair yielded...
1 BASIC SURGICAL AND PERIOPERATIVE CONSIDERATIONS

Deciding on Extent of Resection in Esophagectomy

It is generally agreed that total esophagectomy is required for type I esophagogastric junction tumors. The necessary extent of resection for type II and III esophagogastric junction tumors has been more controversial. A microscopically negative (R0) surgical margin is closely associated with survival after resection of esophagogastric junction adenocarcinomas, though R0 resection can be quite difficult to achieve, given the propensity of these tumors for intramural spreading. In our experience, positive margins have not been found in patients with T1 or T2 tumors, even when the margins are smaller than 4 cm. In patients with T3 or T4 tumors, however, proximal margins of at least 6 cm have proved necessary. For T1 and T2 tumors, total gastrectomy without thoracotomy may yield adequate margins. For T3 and T4 tumors, however, extended gastrectomy with thoracotomy or esophagectomy may be required. It is well documented that the margin lengths measured on prefixed esophageal specimens are only about 50% of the corresponding lengths measured in situ before completion of resection. Accordingly, intraoperative decisions about the extent of resection should be based on margin length requirements that may be considerably greater than those derived from resection specimens.1


3 Perioperative Considerations for Anesthesia

RESUSCITATION STANDARDS: LATEST RECOMMENDATIONS

In 2005, current scientific developments in the acute treatment of cerebrovascular, cardiac, and pulmonary disease were merged with the evolving discipline of evidence-based medicine to produce the most comprehensive set of resuscitation standards ever created: a 14-part document from the American Heart Association entitled “2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care.” This document addresses a wide array of key issues in both in-hospital and out-of-hospital resuscitation, including a recommendation for confirmation of tube position after endotracheal intubation and a warning about the danger associated with unintentional massive auto-positive end-expiratory pressure (auto-PEEP).

As regards the impact the new guidelines have on management of cardio pulmonary resuscitation, an increase in compression:ventilation ratios (30:2) and an emphasis on effective chest compressions (push hard, push fast) are suggested. In addition, early chest compressions before defibrillation, 1-shock versus 3-shock sequence for defibrillation, and avoidance of prolonged interruption of chest compressions are recommended.

For wide QRS dysrhythmias, amiodarone continues to be the drug of choice. It may also be administered for ventricular fibrillation or pulseless ventricular tachycardia unresponsive to CPR, shock, and a vasopressor. Amiodarone is a complex, powerful, broad-spectrum agent that inhibits almost all of the drug receptors and ion channels conceivably responsible for the initiation and propagation of cardiac ectopy, irrespective of underlying ejection fraction, accessory pathway conduction, or anatomic substrate. It does, however, have potential drawbacks, such as its relatively long half-life, its toxicity to multiple organs, and its complicated administration scheme. Furthermore, amiodarone is a potent noncompetitive alpha and beta blocker, which has important implications for anesthetized, mechanically ventilated patients who may be debilitated and experiencing volume depletion, abnormal vasodilation, myocardial depression, and fluid, electrolyte, and acid-base abnormalities. That said, no other drug in its class has ever demonstrated a significant benefit in randomized trials addressing cardiac arrest in humans.1

1. American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 112 (24 suppl IV-1, 2005 [http://circ.ahajournals.org/content/vol112/24_suppl

WHEN GENERAL ANESTHESIA IS MANDATED

Anesthesia may be classified into three broad categories: (1) general anesthesia, (2) regional anesthesia, and (3) monitored anesthesia care. General anesthesia can be defined as a state of insensitivity characterized by loss of consciousness, amnesia, analgesia, and muscle relaxation. This state may be achieved either with a single anesthetic or, in a more balanced fashion, with a combination of several drugs that specifically induce hypnotism, analgesia, amnesia, and paralysis.

There is, at present, no consensus as
to which general anesthetic regimen best preserves organ function. General anesthesia is employed when contraindications to regional anesthesia are present or when regional anesthesia or monitored anesthesia care fails to provide adequate intraoperative analgesia. In addition, there are a few situations that specifically mandate general anesthesia and controlled ventilation: the need for abdominal muscle paralysis, lung isolation, and hyperventilation; the presence of serious cardiorespiratory instability; and the lack of sufficient time to perform regional anesthesia. Alternatives to general anesthesia should be considered for patients who are susceptible to malignant hyperthermia, for those in whom intubation is likely to prove difficult or the risk of aspiration is high, and for those with pulmonary compromise that may worsen after intubation and positive pressure ventilation.

Advantages of Neuraxial Blockade

Neuraxial blockade has several advantages over general anesthesia, including better dynamic pain control, shorter duration of paralytic ileus, reduced risk of pulmonary complications, and decreased transfusion requirements; it is also associated with a decreased incidence of renal failure and myocardial infarction. Contrary to conventional thinking, however, the type of anesthesia used (general or neuraxial) is not an independent risk factor for long-term cognitive dysfunction.1 Neuraxial blockade is an essential component of multimodal rehabilitation programs aimed at optimization of perioperative care and acceleration of recovery.

Preventing Aspiration

Aspiration of gastric contents is an extremely serious complication that is associated with significant morbidity and mortality. Fasting helps reduce the risk of this complication. When the likelihood of aspiration is high, pharmacologic treatment may be helpful (see Table, below). H₂ receptor antagonists (e.g., cimetidine, ranitidine, and famotidine) and proton pump inhibitors (e.g., omeprazole) reduce gastric acid secretion, thereby raising gastric pH without affecting gastric volume or emptying time. Nonparticulate antacids (e.g., sodium citrate) neutralize the acidity of gastric contents. Metoclopramide promotes gastric emptying (by stimulating propulsive GI motility) and decreases reflux (by increasing the tone of the esophagogastroduodenal sphincter); it may also possess antiemetic properties.

In all patients at risk for aspiration who require general anesthesia, a rapid sequence induction is essential. This is achieved through adequate preoxygenation, administration of drugs to produce rapid loss of consciousness and paralysis, and exertion of pressure on the cricoid cartilage (the Sellick maneuver) as loss of consciousness occurs to occlude the esophagus and so limit reflux of gastric contents into the pharynx. An alternative is the so-called modified rapid sequence induction, which permits gentle mask ventilation during the application of cricoid pressure (thereby potentially reducing or abolishing insufflation of gas into the stomach). The advantages of the modified approach are that there is less risk of hypoxia and that there is more time to treat cardiovascular responses to induction agents before intubation. Regardless of which technique is used, consideration should be given to emptying the stomach via an orogastric or nasogastric tube before induction.

5 GASTROINTESTINAL TRACT AND ABDOMEN

31 Appendectomy

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Operative technique for open and laparoscopic appendectomy, special considerations, complications, and outcome evaluation are discussed.

Laparoscopic and Open Appendectomy: A Comparison

To date, 31 reports of randomized, controlled trials comparing laparoscopic appendectomy with open appendectomy have been published as full manuscripts in English. These reports involved a total of 4,352 patients, of whom 2,194 underwent laparoscopic appendectomy and 2,158 underwent open appendectomy. The incidence of histologically normal appendix was similar in the two groups (14.3% with laparoscopic appendectomy versus 14.8% with open appendectomy). The conversion rate from laparoscopic appendectomy to open appendectomy was 10% (range, 0% to 23%). Laparoscopic appendectomy was associated with a

Pharmacologic Prevention of Aspiration

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
<th>Timing of Administration before Operation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂ receptor antagonists</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Cimetidine</td>
<td>300 mg p.o.</td>
<td>1–3 hr</td>
<td>Hypotension, bradycardia, heart block, increased airway resistance, CNS dysfunction, reduced hepatic metabolism of certain drugs</td>
</tr>
<tr>
<td>Ranitidine</td>
<td>50 mg I.V.</td>
<td></td>
<td>Bradycardia</td>
</tr>
<tr>
<td>Famotidine</td>
<td>20 mg I.V.</td>
<td></td>
<td>Rare CNS dysfunction</td>
</tr>
<tr>
<td>Sodium citrate</td>
<td>30 ml p.o.</td>
<td>20–30 min</td>
<td>Increased gastric fluid volume</td>
</tr>
<tr>
<td>Omeprazole</td>
<td>40 mg I.V.</td>
<td>40 min</td>
<td>Possible alteration of GI drug absorption, hepatic metabolism</td>
</tr>
<tr>
<td>Metoclopramide</td>
<td>10 mg I.V.</td>
<td>15–30 min</td>
<td>Extrapyramidal reactions, agitation, restlessness (large doses); to be avoided with MAOIs, pheochromocytoma, bowel obstruction</td>
</tr>
</tbody>
</table>
Although appendectomy has traditionally been done—and largely continues to be done—as an open procedure, there has been increasing interest in laparoscopic appendectomy since the beginning of the 1990s. At present, however, the only patients for whom laparoscopic appendectomy appears to offer significant advantages are women of childbearing age, obese patients, and patients with an unclear diagnosis. Accordingly, the gold standard for surgical treatment of acute appendicitis remains open appendectomy as described by McBurney. The occasional patient with chronic appendicitis should be electively treated with the laparoscopic approach.

### Treatment Options for Patients with Suspected Appendicitis

- **Patient has clinically suspected acute appendicitis**
  - Obtain history.
  - Perform physical examination.

  **Typical signs and symptoms are present**
  - Patient is not obese and is not a woman of childbearing age
    - Perform open appendectomy.
  - Patient is obese or is a woman of childbearing age
    - Perform laparoscopic appendectomy.

  **Atypical signs and symptoms are present**
  - Perform additional procedure(s) to confirm diagnosis.
    - Ultrasonography or CT scanning
      - Diagnosis is confirmed
        - Perform appendectomy.
      - Diagnosis is not confirmed
        - Diagnostic laparoscopy
          - Other pathologic condition is identified
            - Treat other pathologic condition(s).
          - Results of imaging study are completely normal
            - Discharge patient.
          - Imaging study identifies other pathologic condition
            - Treat other pathologic condition(s).
    - Results of imaging study are equivocal
      - Perform diagnostic laparoscopy (see above).
lower incidence of postoperative wound infection than open appendectomy was (3.5% versus 6.7%), but it was also associated with a higher incidence of postoperative intra-abdominal abscess (2.5% versus 1.1%). The length of stay was slightly shorter after laparoscopic appendectomy (1 to 4.9 days; average, 2.7 days) than after open appendectomy (1.2 to 5.3 days; average, 3.2 days). Randomized, controlled trials carried out within the past 5 years have not led to any significant changes in the statistical picture.

When the Appendix Does Not Appear Inflamed

Acute appendicitis is the most common cause of an acute surgical abdomen in the United States, and it remains one of the most challenging diagnoses to make in the emergency department. Although the use of advanced diagnostic imaging modalities (e.g., ultrasonography and computed tomography) has led to more accurate diagnosis of acute appendicitis in research settings, it has not been shown to reduce the rate of misdiagnosis of acute appendicitis in the general population.

The incidence of histologically normal appendix in patients with clinical signs and symptoms of acute appendicitis ranges from 8% to 41%. Nonetheless, appendectomy relieves symptoms in the vast majority of these patients. When extensive sectioning is done on histologically normal specimens, it often happens that a focus of inflammation is found in only a few serial sections. This condition is known as focal appendicitis—so called because the polymorphonuclear infiltration is confined to a single focus, while the remaining appendix is devoid of any polymorphonuclear cells. It is not clear that all cases of acute appendicitis arise from this focal inflammation; however, such inflammatory foci may be the earliest recognizable manifestations of appendicitis in some so-called negative appendectomies. Furthermore, a substantial proportion of histologically normal appendices removed from patients with clinical signs and symptoms of acute appendicitis exhibit significantly increased expression of tumor necrosis factor-α and interleukin-2 messenger RNA (a sensitive marker of inflammation in appendicitis) in germinal centers, the submucosa, and the lamina propria. Therefore, appendectomy is recommended in patients with clinically suspected acute appendicitis even when the appendix does not appear inflamed during exploration. Laparoscopic appendectomy has not been shown to reduce the incidence of negative exploration in patients with clinically suspected acute appendicitis.

Factors in Managing the Unexpected Appendiceal Mass

Neoplastic lesions of the appendix are found in as many as 5% of specimens obtained with routine appendectomy for acute appendicitis. Most are benign. Preoperative detection of such conditions is rare, and intraoperative diagnosis is made in fewer than 50% of cases. Appendectomy alone may be curative for appendiceal mucocele, localized pseudomyxoma peritonei, most appendiceal carcinoids, and other benign tumors. Definitive management of an appendiceal mass unexpectedly encountered during exploration for clinically suspected acute appendicitis depends on whether the tumor is carcinoid, its size and location, the presence or absence of metastatic disease, and histologic and immunohistochemical findings.