Colorectal Cancer: Surgical Intervention

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Introduction

Surgery is the main treatment for colorectal cancer.

Among all available treatment modalities, surgical intervention provides the most rapid relief of symptoms associated with colorectal cancer, including symptoms arising due to bleeding, obstruction, perforation and fistulation into surrounding organs.

About 80% of colorectal cancers are technically amenable to resection. For localized cancer, the primary goal of surgical resection is total cure. This is called a curative resection. A cure can be achieved by surgical resection alone (for early stage disease) or by combination with adjuvant therapy (including chemotherapy and radiotherapy).

For disseminated malignancy where cure is not possible, surgical treatment may be useful to provide palliation of local symptoms; such as those symptoms associated with recurrent bleeding, unrelied obstruction and bowel perforation.

Principles of Oncological Surgery

Radical surgical resection for colorectal cancer follows the following three principles:

1. En-bloc resection of the tumour with adequate margins - the part of the large bowel bearing the tumour should be resected with clear proximal, distal and radial resection margins. In locally advanced cancers that are adherent to other organs (such as small bowel in colon cancer; bladder and uterus in rectal cancer), en-bloc resection is advantageous. This entails removal of the tumour-bearing large bowel with the adjacent adherent organ in a single piece. Otherwise, separation of adherent tumour from adjacent organs results in a high local recurrence rate.

2. Resection of drainage lymph nodes for staging - lymph node involvement and the number of involved nodes are the strongest predictors of prognosis and frequently dictate adjuvant treatment. A standard lymph node dissection involves resection of lymphatic channels running along the named artery of the segment of large bowel in which the tumour arises.

3. Intraoperative assessment of the liver and peritoneal cavity for staging - intraoperative examination for the evidence of metastatic disease is important, especially for colon cancer.
**Preoperative Evaluation**

Every patient with a non-obstructive colorectal cancer should have a complete colonoscopy preoperatively to rule out synchronous cancer (which occurs in 3-6% of patients) and to clear the colon of co-existing adenomatous polyps by polypectomy.

For colon cancer, extensive preoperative staging is usually not required. It is because complete tumour staging is best accomplished during surgery. Besides, even in the presence of unresectable metastatic disease, the primary lesion should best be removed for symptomatic control.

For rectal cancer, the situation is different. The most important factors determining the choice of therapy for rectal cancer are the level of the tumour from the anal verge and the preoperative tumour stage. Therefore, accurate preoperative staging is critical for rectal cancer. Local tumour staging can be performed using endorectal ultrasound or CT/MRI scan of the pelvis. For metastatic work-up, either one of the following combinations are useful: (1) chest X-ray and ultrasound of liver; (2) CT scan of thorax and abdomen; (3) PET-CT scan.

**Preoperative Therapy: Neoadjuvant Therapy for Rectal Cancer**

For locally advanced rectal cancer, particularly those adherent to or invading surrounding organs (T4 tumour), there is an increasing trend to treat these patients first with chemoradiation therapy for a number of weeks before surgical resection. The aims of such “neoadjuvant” chemoradiation are to shrink down the tumour and to sterilize the operative site so as to maximize the chance of subsequent radical resection with clear resection margins. Compared with upfront surgery, neoadjuvant chemoradiation can significantly reduce the local recurrence rate and may even improve the overall survival of patients with locally advanced rectal cancers.

**Preoperative Preparation**

**Bowel Preparation**

For elective operation of patients with non-obstructing cancer, bowel preparation aiming at clearing the large bowel of faecal matter prior to surgery is often performed. Bowel preparation consists of two parts:

1. **Dietary restriction** - the patient is advised to reduce fibre intake for 2-3 days prior to the surgical procedure. Only fluid will be allowed on the day before surgery.

2. **Mechanical bowel preparation** - the patient will be given oral lavage fluid for mechanical cleansing of the large bowel on the evening before the surgical procedure.
Removal of faecal matter facilitates mobilization of the large bowel and allows a
safe anastomosis to be performed after bowel resection. In selected patients with bowel
obstruction precluding preoperative bowel preparation, intraoperative colonic lavage can
be performed to allow primary bowel anastomosis.

Prophylactic Antibiotics

Intravenous antibiotics against bowel organisms are usually given upon induction of
anaesthesia and prior to wound incision. Studies have shown that prophylactic antibiotics
can significantly reduce the chance of surgical wound infection associated with large bowel
resection.

Options of Surgical Procedure

Endoscopic Polypectomy

If cancer is limited to a polyp (mushroom-shaped growth), it can be removed by
endoscopic polypectomy without a formal surgical resection.

Transanal Excision

For very early rectal cancer (T1, with invasion of the mucosa and submucosa only)
located near the anus (usually within 5-6 cm), transanal full-thickness local excision can be
an alternative to more radical resection. However, local excision is only suitable for a
minority of patients: <5% of rectal cancer patients are candidates for local therapy.

Bowel Resection

If cancer invades deeper into the bowel wall, bowel resection is required.

1. Technical Approach - Laparoscopic vs. Conventional

In addition to the conventional approach of resection by laparotomy, technological
advances has made laparoscopic resection possible in the past decade. Laparoscopic
resection is suitable for limited local invasion by the cancer (with or without distant
spread). Compared with the conventional approach, laparoscopic resection has the
advantages of less blood loss, less wound infection, less wound pain, faster
postoperative recovery and better-looking wound.

Recent studies have shown that, if performed properly by experienced surgeons, the
oncological outcome (in terms of recurrence and survival rates) of laparoscopic
resection for colon cancer is comparable to that of conventional resection.
2. Colonic Resection

A colectomy involves removing part of the colon that contains the cancer, along with a margin of normal tissue on either side of the cancer to ensure that no cancer is left behind. Nearby lymph nodes are also removed at the same time to determine if the cancer has spread to them. After the tumour is removed, the two ends of the remaining colon are reconnected, allowing normal bowel function. In some situations, especially bowel perforation or obstruction, it may not be possible to reconnect the colon; therefore, a colostomy is needed.

Depending on the exact location of the cancer, a number of names are given to these colectomy:

a. Right hemicolecetomy - for tumours at the caecum, ascending colon, hepatic flexure and transverse colon;
b. Left hemicolecetomy - for tumours at the splenic flexure and descending colon;
c. Sigmoid colectomy (or sigmoidectomy) - for tumours at the sigmoid colon

3. Rectal Resection

Sphincter-Ablative Surgery

In the olden days, the standard treatment of any rectal cancer is removal of the whole rectum and anus resulting in a permanent colostomy; a procedure called abdominoperineal resection. With increasing knowledge and technological advances, nowadays, abdominoperineal resection is only used for low-lying cancers (usually involving or very close to the sphincters) in which a sphincter-preserving operation is not possible technically or not advisable oncologically.

Sphincter-Preserving Surgery

The introduction of mechanical stapling devices has been one of the most important reasons for the increase in sphincter-preserving resection in rectal cancer. The use of preoperative chemoradiation therapy in selected cases has also increased the sphincter preservation rate.

Anterior resection and low anterior resection are names used for rectal resection with anastomosis. In low anterior resection, when the anastomotic site is very close to the anus (usually <5 cm), the surgeon may elect to perform a temporary stoma (defunctioning stoma) to divert the faecal stream from the anastomosis in the immediate postoperative period. The stoma will usually be closed 8-12 weeks later after contrast or endoscopic study demonstrating anastomotic integrity.

A defunctioning stoma may also be performed for higher anastomosis if adverse factors are present interfering with normal healing; this includes preoperative radiation, steroid therapy, chronic renal or liver impairment and technical difficulty.
**Hartman’s Procedure**

This procedure is most commonly performed in the treatment of advanced, obstructed or perforated rectal cancer which would have much increased risk of anastomotic leakage. The rectal cancer is resected with the formation of a colostomy; the remaining rectum and anus are left behind. If the procedure is performed for obstruction or perforation, there is a potential for delayed anastomosis a few months later when the patient fully recovers.

**Pelvic Exenteration**

For locally advanced rectal cancer with invasion to surrounding organs (bladder in men and uterus in women), en-bloc resection of the rectum with the invaded organ(s) will be performed with or without bowel anastomosis. This procedure is called pelvic exenteration.

**Other Surgical Procedure**

1. **Stoma**

   Stoma is an opening of a loop of bowel onto the abdominal wall to allow faecal material to be excreted and collected by an external appliance. When the opening is on a loop of distal small bowel (the ileum), it is called an ileostomy whereas colostomy is an opening on a loop of colon. A stoma can be permanent or temporary.

   A temporary stoma can be used for the following purposes:

   a. Temporary relief of bowel obstruction before definitive surgery at a later date;
   b. Diverting the faecal stream to protect a distal anastomosis; this is called a defunctioning stoma.

   A permanent stoma can be the result of rectal resection. It can also be a palliative procedure to relieve obstruction of an unresectable tumour.

   Enterostomal therapist, usually nurses specialized in the care of stoma, will be responsible for the planning, initial care, education and supervision of stoma management. Nowadays, there is a whole range of stoma bags that can satisfy individual needs. Odour and gas can effectively be managed with suitable appliances.

2. **Intestinal Bypass**

   This is a palliative procedure for bowel obstruction resulting from an unresectable tumour or a tumour with widespread dissemination. In this procedure, a loop of bowel proximal to the obstructing tumour is anastomosed with a bowel loop distally to relieve bowel obstruction.
**Postoperative Care**

For elective surgical procedure, routine use of nasogastric tube is unnecessary. Drainage tube is used only for selected cases of rectal resection and is not used routinely for colonic resection. Urinary catheter can be removed when the patient is ambulatory to allow self-voiding. In selected cases of rectal resection, however, the surgeon may elect to rest the urinary bladder for 5-7 days postoperatively.

Early postoperative feeding is safe after elective resection. Early feeding does not prolong postoperative bowel recovery and has no higher rate of anastomotic leakage or aspiration pneumonia. Patient’s diet is advanced by stages, usually starting with liquids on the first postoperative day and advancing to a regular diet as tolerated.

Patient may be discharged when able to walk, take solid food and have good pain control on an oral pain-killer. This usually occurs between postoperative days 3 and 7.

**Possible Complications**

1. Anastomotic Complications - Leakage, Stenosis

   Leakage occurs in <5% of anastomosis after elective large bowel resection. The leakage rate, however, is higher in emergency resection with unprepared bowel. The rate is also higher in patients with impaired healing due to poor nutrition, advanced malignancy or immunocompromised medical conditions.

2. Bleeding

   Uncontrolled bleeding can occur during or after the operation. Postoperative bleeding may require reoperation for control.

3. Damage to Surrounding Structures

   For colonic resection, the duodenum or spleen may be injured during colonic mobilization. For rectal resection, the ureters or presacral autonomic nerves may be injured during pelvic dissection. Damage to the autonomic nerves will result in sexual dysfunction in men and voiding dysfunction in both men and women.

4. Infection - Wound or Intra-Abdominal

   The chance of infective complication is higher in emergency operation, especially in the presence of bowel perforation resulting in significant wound and peritoneal contamination.

**Long Term Consequence of Surgical Resection**

1. Change in Bowel Habit
There may be disturbance in bowel function depending on the length and the location of the segment resected. Diarrhoea after colonic resection may be the result of removal of absorptive surfaces, particularly the right colon. Constipation may occur after sigmoid and rectal resection. Majority of the bowel dysfunction can be managed with conservative treatment and will not significantly affect a person’s quality of life.

2. Permanent Stoma

Studies have shown that ostomates can resume normal daily activities and have comparable quality of life as the general population.

**Adjuvant Therapy Suggested**

1. Colon cancer

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2. Rectal cancer

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**Prognosis**

The main prognostic indicator for colorectal cancer is the stage of the disease upon clinical presentation. Lymph node involvement is also another important prognostic indicator. For advanced colorectal cancer, adjuvant therapy can significantly reduce local recurrence and improve survival when compared with surgical resection alone.