

Colorectal Cancer – A surgical approach

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SUMMARY

In the United States alone, it is estimated that there will be over 138,000 new cases of colorectal cancer diagnosed and over 50,000 deaths in 2001. This represents the fourth most common malignancy and the second leading cause of cancer death. Surgery remains the mainstay of treatment for this disease. However, it is limited by tumour stage, location and biological behavior. Although curable in its early stages, the ultimate overall survival is no better than 50%. These numbers have remained relatively constant despite screening and attempts at earlier diagnosis. Newer advances in surgical therapy have centered on the management of rectal carcinoma. Laparoscopic surgical techniques have been adapted to surgical resection of the colon, however for malignant processes it still remains investigational.

PREOPERATIVE PREPARATION

Once the diagnosis of colorectal carcinoma has been established, the subsequent preoperative evaluation should focus on assessing the extent and presence of local, regional, and metastatic disease, and stratifying and minimizing the operative risk. Total colonic evaluation either with colonoscopy or barium enema combined with sigmoidoscopy is essential to rule out synchronous tumours. Rectal carcinomas must be evaluated by rigid sigmoidoscopy to assess the location and extent of the tumour.

The use of CT scan in the pre-operative evaluation of colon cancers is somewhat controversial. The primary

role of CT scan is to evaluate the liver for metastatic disease. The performance of intra-operative inspection and palpation yields a sensitivity similar to if not better than that of CT scan. The addition of intra-operative liver ultrasound increases the sensitivity to over 90%. With regard to rectal carcinoma, CT scan should be considered a routine part of the pre-operative evaluation. It is useful in evaluating the extent of loco-regional disease, adjacent organ involvement, and lymphadenopathy. Endorectal ultrasound has emerged as the most accurate means of staging rectal cancers. This test can assess both extent of tumour infiltration and nodal involvement, with a known accuracy approaching 95% and 85% respectively. Although not infallible, it should be considered part of the standard evaluation of rectal carcinomas.

Laboratory parameters should include a complete blood count and a basic chemistry panel, as well as liver chemistries and a baseline CEA level. The CEA level is used primarily for postoperative follow up. A patient undergoing a curative resection, with an elevated CEA level pre-operatively should be expected to have a normal level post-operatively. A persisted elevation should make one suspicious for persistent disease. A new elevation may indicate recurrence.

In addition to tumour specific evaluation, investigation of co-morbidities is essential. Specific conditions, such as severe cardiopulmonary disease, renal insufficiency, Diabetes Mellitus, poorly controlled hypertension, severe malnutrition, emergency surgery in the elderly, and an overall poor general medical condition, have been shown to lead to an increased risk of post-operative complications. Optimization of these conditions will potentially improve patient outcome.

Pre-operative cleansing of the bowel is essential in colonic surgery. Although controversy exists over the exact method of preparation, it is generally felt that a mechanical preparation combined with antibiotics mini-

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mizes the risk of wound related complications. Mechanical preparation is usually accomplished via an oral lavage solution. Most frequently, non-absorbable oral antibiotics are given at intervals over the 24 hours prior to surgery. Intravenous antibiotics given just prior to beginning the surgical procedure may accompany this. The chosen antibiotics should cover the gram negative and anaerobic enteric organisms.

SURGICAL THERAPY FOR COLON CARCINOMA

The goals of surgical intervention include thorough abdominal exploration, removal of the primary tumour with adequate margins, complete regional lymphadenectomy, and creation of a safe anastomosis. Successful complication free surgery requires reliance on the following principles: adequate blood supply to the non-resected colon, a tension-free anastomosis, and absence of inflammation and infection. The extent of resection is determined not only by the location of the tumour, but also by the blood supply and lymphatic drainage of the tumour bearing area, the blood supply of the remaining colon, and the presence of adjacent organ involvement. The goal is to perform an en bloc resection of all involved structures along with the regional lymphatics. Therefore, a thorough understanding of the lymphatic and vascular anatomy is essential in planning the surgical strategy.

For lesions confined to the right colon and hepatic flexure, a standard right hemicolectomy should be performed. This involves sacrifice of the ileocolic, right colic and right branch of the middle colic arteries. For transverse colon lesions, a transverse colectomy may be adequate. However, secondary to concerns regarding tenuous blood supply to the region of the flexures, an extended right hemicolectomy may be a better option. This involves resection of the colon from terminal ileum to descending colon. The ileocolic, right colic, middle colic arteries are sacrificed in this resection. Generally a small intestine to colonic anastomosis is considered safer due to the better vascular arcade of the terminal ileum. Lesions of the left colon are treated by left colectomy, and those of the sigmoid are treated by sigmoid colectomy with a colorectal anastomosis.

Margins of five centimeters are considered acceptable. For most colonic lesions, attaining this margin is not problematic, since resection involves sacrifice of a substantial portion of bowel. High ligation of the vascular pedicles at their origin is generally not considered essential. Involvement of the most proximal of lymph

nodes is considered to represent systemic disease and no survival benefit has been demonstrated.

The tumour or tumour containing bowel is sometimes found to be adherent to adjacent structures. Many times it is impossible to distinguish between malignant involvement and inflammatory adhesions. Although historically only 60% of such adhesions are found to be malignant, separation of the involved structures has led to a decreased survival and increased local recurrence rate. Therefore, therapy should involve en bloc resection of all involved structures whenever feasible, to ensure negative margins. An exception to this is if any such radical surgery would involve morbidity that would exceed any possible benefit achieved from a radical surgical procedure.

Obstructing colonic malignancies require special attention. Those on the right side of the colon can, in most instances, be safely resected with a primary ileocolic anastomosis. This includes transverse colonic neoplasms, which can be managed with an extended colectomy. Management of lesions of the left colon is somewhat more controversial, and several treatment alternatives are available. Primary resection with immediate anastomosis of the unprepared colon, although practiced in some centers, is to be discouraged secondary to excessively high rates of anastomotic leakage. Traditionally, the so-called three-stage approach was practiced. This involved proximal diversion as an initial step, followed by subsequent resection and anastomosis. Colostomy reversal was then performed as a third procedure. The major disadvantages of this technique include leaving the diseased segment behind, the need for multiple surgical procedures, a high mortality rate, and a prolonged hospital stay.

More recently the three-stage approach has been abandoned in favour of the two stage procedures. Immediate resection is combined with a colostomy and mucous fistula or Hartmann's closure of the rectal stump. Another alternative is to perform primary anastomosis with proximal fecal diversion. With these approaches, hospital stay and morbidity are decreased. However, up to 40% of patients never have their colostomies reversed.

An attractive alternative for selected patients may be immediate subtotal or total abdominal colectomy with ileorectal anastomosis. The advantages of this technique include a one stage procedure, a single shorter hospital stay, no need for a stoma, and reduction of the risk of synchronous or metachronous lesion. Disadvantages include the potential for long-term diarrhea and increased morbidity.

A less commonly used alternative is on-table colonic lavage. The technique consists of resecting the involved segment of colon, followed by high volume lavage of the remaining colon with a standard saline solution. Although this technique may add up to an hour of operative time, and involves mobilization of both flexures, it can be performed safely with no increase in morbidity. Other rarely utilized alternatives include Intraluminal bypass, or laser recanalization of the lumen or endoluminal stent placement followed by elective resection.

Perforated colonic malignancies are associated with a poor prognosis and a high rate of local recurrence. The perforated bowel segment should be resected at the initial surgical procedure to remove a potential source of ongoing sepsis. Most commonly a primary stoma is performed. However, in selected instances a primary anastomosis may be considered and combined with proximal fecal diversion.

Although we most commonly embark on surgery with intent for cure, there are instances when surgery is performed in a palliative fashion. In fact, in patients with limited metastatic hepatic or pulmonary disease curative surgery for both the primary malignancy and the metastatic deposits may be performed. In the face of more widespread metastatic disease, resection directed towards elimination of symptoms of the primary process should be advocated. This approach will avoid the complications of bleeding, obstruction and perforation. In addition, these resections may in fact prolong patient survival.

LAPAROSCOPIC COLORECTAL RESECTION

Laparoscopic colon resection has become an accepted approach for a variety of benign colorectal conditions. Advantages include faster recovery, shorter hospital stays, fewer complications, less post-operative pain and disability, and better cosmesis. However, concerns regarding the oncological results have limited the acceptance of this technique. Many studies have looked at the extent of resection, resection margins, and lymph node harvest. These have all shown comparable results to open surgery. However, reports of port site and extraction site recurrence have generated considerable concern. Therefore, although short-term results are comparable to open surgery, results from long-term trials will determine the applicability of this approach.

SURGICAL MANAGEMENT OF RECTAL CANCER

The mainstay of therapy for rectal adenocarcinoma is surgical resection. This may be accomplished via several different techniques depending on the size, stage, and histologic characteristics of the tumour. Neoadjuvant therapy may also be considered for patients with more advanced lesions in an attempt to downstage these lesions and thereby allow an adequate resection margin, reducing local recurrence, and possibly salvaging the sphincter muscles.

The goals of treatment for patients with rectal cancer include surgical cure with long-term survival, without local recurrence of tumour, and with sphincter salvage. Attaining these goals depends on several factors including characteristics of the tumour itself, patient related issues, and the experience and expertise of the surgeon. Tumour characteristics that are important to consider include tumour stage, degree of differentiation, and lymphatic, vascular or perineural invasion. Patient factors that may alter the type of procedure that may be done include the age of the patient, the overall health and co-morbid conditions, and sphincter competency. The expertise and case volume of the surgeon, including a thorough understanding of deep pelvic anatomy, will also contribute to the type of procedure to be performed.

The surgical options available for patients with rectal cancer can be divided into two main types of procedures. These include local or trans-perineal procedures and abdominal procedures. Trans-perineal procedures are best considered in patients whose tumours are well differentiated, 3 centimeters or less in size, stage T1 by endorectal ultrasound, without evidence of lymphovascular or perineural invasion. These tumours should ideally be palpable by digital rectal examination.

The most common perineal procedure performed to treat rectal cancer is a full thickness trans-anal resection. This procedure is typically done under regional or general anesthesia in either the prone jack-knife or lithotomy position depending on the location of the tumour. A full thickness disc excision of the bowel wall is performed, optimally with a 2-centimeter margin circumferentially around the tumour. The bowel wall is then closed in a transverse manner with interrupted absorbable sutures in order not to compromise the luminal diameter of the bowel.

Another less commonly used perineal procedure is a trans-sphincteric excision. This procedure is most suitable for lesions located 8-12 centimeters from the anal

verge on the anterior wall of the rectum. It is performed with the patient in the prone jack-knife position. The entire posterior wall of the anorectum is divided longitudinally marking the muscles with stay sutures for proper identification. The tumour is resected with a clear margin while the anterior wall of the rectum is closed. The posterior layers are then properly re-approximated.

Trans-anal endoscopic microsurgery is a newer more complex technique that can remove lesions of the upper rectum. It requires specialized and expensive equipment and proper training. The equipment essentially uses a large bore operating proctoscope and a binocular optical system with magnification. Rectal distension with carbon dioxide permits dissection of the tumour with the use of laparoscopic-type instruments through working channels of the sigmoidoscope.

Other trans-anal techniques include the use of electrocautery, cryotherapy, laser and photodynamic therapy, and endocavitary radiation. These techniques are beneficial for palliation, allowing for control of bleeding and prevention of colonic obstruction. Photodynamic therapy may be used to treat small rectal lesions. In this therapy, a photosensitizing agent that is preferentially taken up by neoplastic tissue is given to the patient. A red light from a laser is then applied to the lesion. This causes the release of singlet oxygen from the drug, which is cytotoxic and kills the tumour cells.

The abdominal approaches to rectal cancer are used for lesions that are not amenable to trans-anal resection, higher staged lesions, or lesions that are poorly differentiated. Lesions of the upper rectum are treated in a manner similar to colon cancer and an anastomosis of the bowel is fashioned to the middle or lower rectum after a 5 centimeter margin is obtained on the resected specimen. Lesions of the middle and lower rectum are treated similarly in that a sharp total mesorectal excision (TME) is performed and a colo-anal anastomosis is then fashioned. A minimum 2 centimeter distal margin should ideally be obtained in these cases. However, there is data suggesting that less of a margin may be adequate. Lesions of the distal rectum, invading the anorectal musculature, will require an abdomino-perineal resection and a permanent colostomy.

The concept of total mesorectal excision has been advocated in order to adequately clear all of the lymph bearing tissue as well as the blood supply of the rectum. This procedure has been promoted by many colorectal surgeons and should be done sharply with scissors or electrocautery in order to prevent disturbing the plane en-

veloping the lymphatic-bearing tissue of the mesorectum. Destruction of this plane has been one of the reasons suggested for tumour recurrence. Local recurrence rates as low as 4% have been reported when proper total mesorectal excision is performed.

In addition to TME, lateral spread must also be considered. There does not, however, appear to be any difference in lateral clearance of lymph nodes whether an APR or a sphincter saving procedure is performed. Lateral spread of tumour occurs by both direct extension and by lymphatic routes.

There have been several studies comparing sphincter salvage procedures to abdomino-perineal resection. The majority of studies fail to show any difference in local recurrence rates between the two procedures. However there have been a few studies which do show a significant difference in local recurrence rates between the two procedures with sphincter sparing procedures reporting a higher recurrence rate. These studies, however, generally compare the experiences of many different surgeons at different hospitals, many of whom were not specialty trained in colorectal surgery.

Sphincter salvage surgery does pose the risk of anastomotic leaks, which have a reported occurrence between 3% and 18%. However, this has not affected the overall mortality of this procedure and when sphincter sparing procedures are compared to APR, there has been no significant difference in operative mortality. A temporary diverting stoma should be strongly considered in patients who undergo an anastomosis below the level of 4 centimeters from the dentate line, due to the higher risk of anastomotic leak in these patients. In addition, fecal diversion should also be considered in patients treated with neoadjuvant chemoradiation. The fecal diversion is generally kept in place for 12 weeks, until there has been complete healing of the anastomosis.

Rectal reconstruction may be performed via a straight colo-anal anastomosis or by creating a colonic reservoir for the storage of stool. Patients who undergo a straight anastomosis seem to have more difficulty with urgency, frequency, and occasional tenesmus in the initial post-operative period. This “low anterior syndrome” is thought to be due to a loss of the native rectal reservoir. Therefore, creation of a colonic pouch recreates this reservoir. These patients seem to have a functional advantage for approximately two years until the bowel proximal to the straight anastomosis distends and accommodates stool.

The overall quality of life after sphincter salvage procedures is greater compared to APR. Almost all patients

are continent to solid stool, while some may have difficulties controlling liquid stool and gas. Despite these difficulties, the patients undergoing APR seem to have a much harder time adapting to life with a colostomy. There are significant social and psychological implications associated with a permanent stoma that must be overcome.

Therefore, in conclusion, it seems reasonable to consider all patients for sphincter salvage surgery provided a clear margin can be obtained and the tumour is not fixed in the pelvis or the sphincter muscles. These procedures do not differ in the incidence of local recurrence or the operative mortality. For low-lying lesions that are of a low stage and well differentiated, one should consider trans-anal resection.

CONCLUSION

Surgical therapy for carcinoma of the colon and rectum remains the primary treatment modality. Although the overall cure rate has remained relatively stable, there have been numerous advances in surgical procedures, primarily with regard to therapy for rectal cancer. The long-term outcomes from several prospective randomized trials will determine the applicability of laparoscopic techniques for surgical management of colorectal carci-

nomas. Future advancement will certainly involve further refinements in laparoscopic techniques and definition of the role of sphincter reconstruction in the outcomes for rectal cancer. In the end, we strive to cure the patient of their disease with the minimum of morbidity. We aim to preserve sphincter function and minimize the risk of recurrence, while returning the patient to their initial functional state.

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