

Laparoscopic Surgery for Colorectal Cancers: Current Status

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ABSTRACT

Background: Minimal access surgery short-term benefits of laparoscopy for colorectal cancer, such as faster bowel function recovery, less postoperative pain and shorter hospitalization based on data organized according to levels of evidence.

Purpose: To understand the long-term benefits of laparoscopy for colon cancer with regard to recurrence and survival based on data organized according to levels of evidence. To review the literature of laparoscopic surgery for colorectal cancers and its current status in purely laparoscopic, laparoscopic assisted, hand-assisted laparoscopic surgery (HALS).

Materials and methods: A literature search was performed using search engine Google, HighWire Press and Online Springer Library facility available at World Laparoscopy Hospital. The following search terms were used: Laparoscopic surgery for colorectal cancer current status. Selected papers were screened for further references, operative procedure were selected, only if they are universally accepted procedures, and the institution where the study was done is specialized institution for laparoscopic surgery.

Conclusions: In selected patients, a laparoscopic resection for colorectal cancer produces acceptable intermediate to long-term oncologic outcomes and a low long-term complication rate.

Keywords: Laparoscopy, Colorectal, Colon, Cancer, Survival, Outcomes, Audit.

INTRODUCTION

Since Jacob's first laparoscopic colectomy in 1991, there are various reports in literature suggesting that minimal access surgery is probably the way forward in colorectal surgery.

We must discuss colonic and rectal cancers as two separate diseases though a lot of concerns are going to be common. Laparoscopy as a tool can be used in two ways:

- Thorough abdominal cavity exploration with simultaneous staging of disease with the help of intraoperative ultrasound
- Intraoperative ultrasound can diagnose liver metastasis which may have been missed by routine preoperative imaging techniques. This may not alter the plan of resection of primary disease but intent of resection may change.

Laparoscopic colorectal surgery can be done in three ways:

- Purely laparoscopic
- Laparoscopic assisted
- Hand-assisted laparoscopic surgery (HALS).

SURGICAL PROCEDURE

An empty digestive tract facilitates the layering of intestinal loops. It is achieved by a strict, fiber-free diet 8 days prior to surgery. Polyethylene glycol is prescribed 2 days before surgery to complete the intestinal preparation.

The patients were placed in a modified lithotomy position, and a pneumoperitoneum was established with a Veress needle, maintaining intra-abdominal pressure at 12 to 15 mm Hg. Four or five trocars were placed (Fig. 1). The descent of the splenic

flexure was first carried out after placing the patient in the antitrendelenburg position with inclination to the right. After the patient was placed in the trendelenburg position, dissection was performed with ligation of the inferior mesenteric vessels at the site of origin, respecting the left colic vein, whenever possible (Fig. 2). Dissection was then made by the avascular plane, performing rectosigmoid dissection with total mesorectal excision (TME) in tumors of the middle and lower thirds (LAR) and mesorectal excision up to 5 cm below the lesion in tumors of the upper third (AR). After completion of the pelvic dissection, the distal end was sectioned using an EndoGIA-type mechanical suturing device. The assistance incision was made at the suprapubic level (Pfannenstiel incision) with a length of 5 to 7 cm, according to the size of the tumor. Intracorporeal

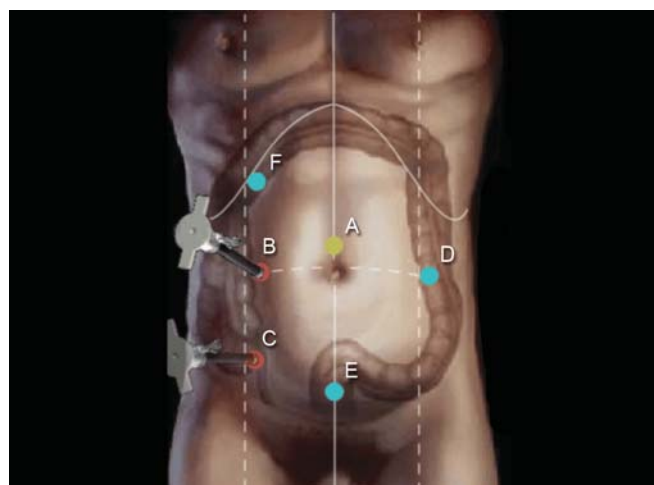


Fig:1: Working port

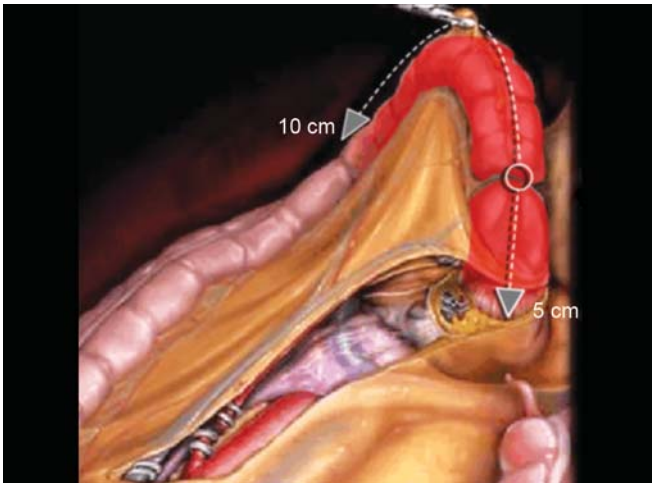


Fig. 2: Dissection, opening of peritoneum, initial vascular approach, mobilization of sigmoid colon



Fig. 3: Extra-abdominal preparation for proximal segment EndoGIA-type mechanical suturing device

anastomosis was made in all cases under laparoscopic control, and a low-pressure aspirative drain was placed next to the anastomosis. Protective ileostomy was performed in cases with very low anastomoses and in patients who had undergone previous neoadjuvant treatment, although this was always done at the discretion of the surgeon. Conversion was defined as the need to carry out an unplanned incision or an incision of greater than normal size to complete the dissection and/or section of the distal end of the rectum. A Pfannenstiel incision or infraumbilical middle laparotomy was performed at the discretion of the surgeon (Fig. 3).

A successful TME starts with the proper ligation of the SHA or IMA. As one dissects down toward the sacral promontory, the sympathetic nerve trunks are identified. The dissection plane is just anterior or medial to these nerves. Using the cautery or scissors, the nerves are reflected toward the pelvic sidewall while the mesorectal fascia surrounding the mesorectal fat is kept as an intact unit. The dissection starts posteriorly and then at each level proceeds laterally and then anteriorly (Fig. 4). In the midrectal area along the lateral sidewalls, one can sometimes see the parasympathetic nerves tracing anteriorly toward the hypogastric plexus. The plexus is usually on the anterolateral sidewall of the pelvis, just lateral to the seminal vesicles in the man and the cardinal ligaments in the woman. There is often a tough ligament that traverses the mesorectum at this point. It theoretically contains the middle rectal artery. However, in a study by Jones et al this artery is only present to any significance about 20% of the time. The anterior dissection is perhaps the most difficult. In men, one should try to include the two layers of Denonvillier's fascia. This fascia is composed of peritoneum that has been entrapped among the seminal vesicles, prostate anterior and the rectum posterior. In woman, the peritoneum at the base of the pouch of Douglas is incised and the rectovaginal septum is then separated.

Colorectal surgeries are nicely performed through hand-assisted technique (Fig. 5). In hand-assisted surgery, the

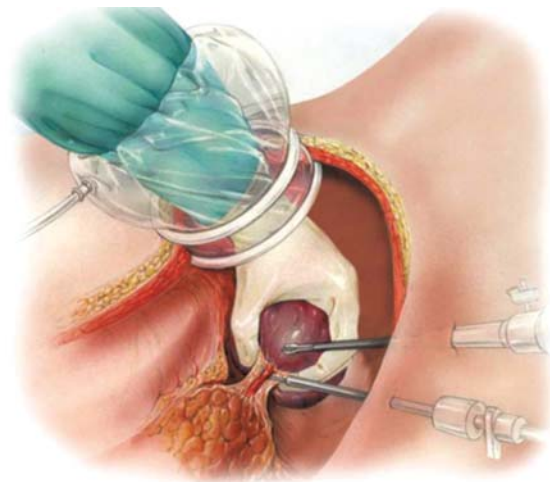


Fig. 4: Hand-assisted surgery



Fig. 5: HALS and colorectal surgery

surgeon can insert a hand through the small incision via a special pressurized sleeve. In this procedure, the surgeon makes a small incision in the abdomen and inserts his hand into the patient's

body, using it for sensory perception and to guide the surgical instruments. He manipulates with his other hand while observing the entire procedure on a TV screen overhead. With both hand and laparoscopic instruments doing the work, the surgeon has more control over the operation and sense of depth and sensation of touch that cannot be gained through the lens of a camera.

POSTOPERATIVE PAIN

Numerous randomized controlled trials have demonstrated a significant reduction in pain or analgesic requirements in the immediate postoperative period. In a meta-analysis, Abraham et al found significant advantages for the laparoscopic colectomy group in pain levels at rest and during coughing.

QUALITY OF LIFE

Quality of life (QOL) has primarily focused on postoperative pain and intravenous analgesic requirements. While it may be expected that laparoscopy results in decreased pain and consequently less intravenous analgesic use, this assessment may be subject to bias in nonrandomized trials since patients undergoing laparoscopy tend to start oral feeding/analgesics earlier. The few case control and cohort studies that addressed postoperative pain have reported inconsistent results possibly due to the small number of patients in these studies. In contrast, randomized trials have shown laparoscopy to be associated with less pain at some point in the postoperative recovery period, pain with coughing and fatigue were significant less in the laparoscopy group up to postoperative days. Exact QOL between two groups is difficult to measure because of lack of more sensitive and appropriate instruments.

RECOVERY OF BOWEL FUNCTION

Faster recovery of bowel function is another significant advantage seen in the laparoscopic group. Schwenk et al found that first passage of flatus was 1 day earlier in the laparoscopic colectomy group ($p < 0.0001$) and the first bowel movement was 0.9 days earlier ($p < 0.0001$). Lacy et al demonstrated faster initiation of peristalsis and oral intake in laparoscopic group.

LENGTH OF HOSPITAL STAY

Length of hospital stay is a common variable assessed in most laparoscopic studies. It reflects the rapidity of physiologic recovery and has economic implications with regard to operative and hospital costs.

Results from numerous retrospective and prospective series demonstrate a mean duration of hospitalization of 10.5 days, with one series reporting a mean as high as 16.6 days. However, it is difficult to make sense of this data as the length of hospitalization is significantly influenced by the health care system in which the patient is treated as by the condition of the patient himself.

It is often dependent upon bowel function recovery and severity of postoperative pain. There is high level of evidence suggesting laparoscopic group has shorter stay compared with laparotomy group.

COST

Experience with laparoscopy for the treatment of benign disease has suggested that the short-term benefits gained with the laparoscopic approach may compensate for the higher costs related to a laparoscopic procedure. Although laparoscopy was associated with increased operating times and increased costs associated with disposable equipment, the total overall cost was less than for the open group. The most convincing evidence comes from a recent prospective, randomized study, in which cost analysis was performed on a subset of patients (98 laparoscopic, 111 open) participating in the Swedish colon cancer laparoscopic or open resection. The study period included 12 weeks after surgery and the analysis examined direct medical costs (hospital costs and cost of outpatient care) and indirect costs, such as loss of productivity, because of time absent from work. The authors found that the total cost to society was similar for laparoscopic and open procedures but the total cost to the health care system was significantly higher for the laparoscopic group. The main contributors of this higher cost included higher operating room costs, costs resulting from complications and reoperations which occurred more frequently in the laparoscopic group. However, it is critical to note that in this study there was no difference in hospital length of stay to offset the higher costs of short-term care. However, early recovery resulted in less loss of productivity such that the two approaches did not differ in economic impact.

LONG-TERM OUTCOMES

Long-term outcomes among the various studies may be impaired due to the lack of homogeneity in patient selection, radiation therapy, site and stage of the tumor, time of follow-up and violation of the "intent-to-treat principle" in some trials, which can impact recurrence and reported survival rates. Additionally, most of these studies are non-controlled, non-randomized trials with a short-term follow-up and/or a small number of patients.

DISEASE-FREE SURVIVAL AND OVERALL SURVIVAL

Different studies have reported 3 to 5 years survival (Kaplan-Meier curve) data. Retrospective and prospective reviews have demonstrated a 5-year survival rate ranging from 72 to 80.9%, after curative resection with better outcomes associated with early stage carcinomas.

Comparative case control and cohort studies have not demonstrated any differences in 5-year survival between patients who underwent laparoscopy and those individuals who had laparotomy with rates ranging from 64 to 93% in both

groups published one of the largest nonrandomized studies. Data from 102 consecutive patients who underwent laparoscopic colorectal resection were reviewed and compared to 641 patients who had an open procedure at the same institution and with the National Cancer Data Base (NCDB), including 36,947 patients during a similar time period; complete 5-year survival data were attained for 93% of the laparoscopically treated patients. Overall, the mean follow-up time was 64.4 months; patients who died were excluded. The 5-year relative survival rates in the laparoscopic group were 73% for stage I, 61% for stage II, 55% for stage III and 0% for stage IV disease. These results were comparable to the open group and the NCDB data which showed a survival rate of 75% and 70% for stage I, 65% and 60% for stage II, 46% and 44% for stage III, and 11% and 7% for stage IV disease respectively. Finally, the overall Kaplan-Meier 5-year survival curve for patients treated by laparoscopy was 54%, including all stages of disease, and 64% for stage I to III diseases.

RECURRENCE RATES

Large number of retrospective and prospective series have reported recurrence rates after curative resection. These studies have had a mean/median follow-up time from 16 to 71 months; recurrence rates varied from 7.2 to 16.1%, including local recurrences from 1.5 to 4.1% and distant recurrences from 6.1 to 10.3%. In contrast to earlier reports, port/extraction site recurrence rates do not seem to surpass 1% after curative resection in the majority of recent studies.

Comparative studies have found equivalent recurrence rates between laparoscopy and laparotomy with an overall rate of approximately 4.6 and 20% for both groups. Local recurrences have reached up to 14.8 and 26% and distant recurrences up to 15 and 18.6% in the laparoscopic and open groups respectively.

PORT SITE METASTASIS AND TUMOR DISSEMINATION

In 1993, Alexander et al reported a case of wound recurrence after 3 months following laparoscopic right hemicolectomy for a Dukes C adenocarcinoma. After this, there were flood of reports of increased port site metastasis with laparoscopy for malignancy.

In a critical review of the literature from 2001, Zmora et al analyzed total of 16 series of laparoscopic colorectal resections for carcinoma, published between 1993 and 2000, each comprising of greater than 50 patients and found an incidence of port site metastasis of less than 1% among 1,737 patients. More recently, the data from well-designed randomized controlled trials have provided definitive evidence against a higher incidence of port site metastasis in laparoscopic colon surgery compared with traditional resection. The clinical outcomes of surgical therapy (COST) study reported a wound recurrence rate of 0.5% in laparoscopy group compared with a 0.2% in the open group (n = 872, p = 0.50). Lacy et al found a

single case of port site recurrence in the laparoscopic group (n = 106) as compared to none in the open group (n = 102), after a median follow-up of 43 months. Early high incidence of port metastasis was probably because enthusiastic laparoscopic surgeons ignored oncological principles.

Another concern is regarding the accidental tumor spillage during laparoscopic colorectal resections that is caused by grasping and manipulating the bowel in the narrow pelvis. The prevalence of intraoperative tumor cell dissemination that is caused by iatrogenic tumor perforation or transaction during laparoscopic APR has been reported to be as high as 5%. At the moment, there are few large studies more than 50 patients and 3 years follow-up. In two series, where patients underwent laparoscopic rectal resection for advanced tumor, local pelvic recurrence rates were 19% and 25%, quite similar to recurrence rate in the open group.

In CLASICC trial, 7,242 rectal resections were performed and conversion rate ranges from 34% for rectal cancer as opposed to 25% for colonic cancer. Rate of positive margins were not statistically difficult. This clearly demonstrates that laparoscopic rectal resection even in the hands of experienced surgeons is more technically demanding than laparoscopic colonic surgery. Although large randomized, prospective trials may show that experienced laparoscopic colectomists can achieve good outcomes for patients who have curable intraperitoneal colon adenocarcinoma, these results cannot be extrapolated immediately to patients who have rectal cancer. Thus, it is critical to evaluate immediate pathology and long-term oncological results of laparoscopic proctectomy prospectively, before recommending the technique for mass consumption.

SUMMARY

Laparoscopy for colorectal cancer has shown to be superior to laparotomy in regard to short-term benefits, including pain, length of ileus, length of hospitalization, cosmesis, morbidity and disability. When performed by appropriately skilled surgeons in properly selected patients, these short-term benefits are almost always demonstrated. Since the publication of the COST trial, it appears that laparoscopic colectomy and conventional open colectomy have similar long-term outcomes. Fundamental differences exist between the Lacy trial and the COST trial. The former study included patients all of whom were operated upon by a single highly skilled surgeon with a team devoted to laparoscopic resection. The latter study included a myriad, if surgeons with a wide range of backgrounds entering a variable number of cases per surgeon. The COST trial may therefore better reflect the typical community standard than the Lacy trial. However, the Lacy trial which found superiority relative to recurrence and survival in favor of laparoscopy suggests that, in the hands of skilled laparoscopic surgeons performing a high volume of this technique in the

setting of a dedicated team, laparoscopy may be superior to laparotomy. The fact that this difference was not detected in the COST trial may be more due to study design than to case selection. In addition, other benefits, may be conferred by laparoscopy, including reduced rates of ventral incisional hernia and bowel obstruction. Unfortunately, none of the randomized, controlled trials to date have included these variables for analysis.

CONCLUSION

The COST trial prompted the American Society of Colon and Rectal Surgeons and the Society of American Gastrointestinal Endoscopic Surgeons to jointly endorse an approval statement on laparoscopic colectomy for curable cancer.

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