



# Laparoscopy Surgery for Colon and Rectal Cancer



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## Introduction

Last two decades have seen some revolutionary changes in the field of surgery as a whole, and more so in abdominal surgery. This era has not only seen a quantum leap in instrument development, but also in its applications. Since Eric Mauhe [1] and Philip Mouret [2] did the first laparoscopic cholecystectomy in the late 1980's, Minimal Invasive Surgery has established itself as the preferred mode of treatment for most benign diseases. However, application of Minimal Invasive Surgery to gastrointestinal malignancies including colorectal cancers has been rather snail paced. I would like to discuss the era of laparoscopic surgery for colorectal cancer in three phases. In early 90's it was ridiculed because of high incidence of port site metastasis reported in the literature up to 21% [3]. In the mid 90's its use beyond trials was violently opposed. In the beginning of the new millennium it is said that short term advantages of laparoscopy are self evident as proven by most of the trials. So we have moved from a period where technical feasibility and oncological safety were a big concern, to a period where both these issues have been put to rest. Today the issue is whether laparoscopic colorectal surgery for cancer extends any long term oncological benefits in terms of overall survival or disease-free survival to the patient as compared to conventional surgery for colorectal cancer.

There are certain advantages of laparoscopic colorectal surgery over open surgery that have been proven beyond reasonable doubt in the literature. These are: Shorter hospital stay-The literature is full of studies proving this point. Recently, a group of people applied ERP [4] (Enhance Recovery Programme) to conventional colorectal surgery and demonstrated that hospital stay after conventional surgery can be brought down significantly. Currently LAFA trial [5] (Laparoscopy and/or Fast track multimodal management versus standard care) is underway which was conceived to determine whether for patients having segmental colectomy for malignant disease, laparoscopic surgery, fast track peri-operative care, or a combination of both is preferred over open surgery with standard care. It will not be unfair or illogical to pre-empt that if ERP is applied to laparoscopic group, it should bring down the hospital stay. However, we would have to wait till LAFA trial results are out. There are numerous studies demonstrating short term advantages

of laparoscopic resection which include less post-operative pain, earlier restoration of bowel function, and earlier mobilization [6-8] which lead to shorter hospital stay and reduced direct costs. In addition there is less morbidity from blood loss and transfusion requirements [9], respiratory complications [10], wound infections [11], better cosmesis [12], adhesions and incisional hernias [13]. There are certain technical concerns about laparoscopic colectomy for cancer that too have been addressed adequately in the literature and have shown to be equivalent to open surgery for the same. These are as follows:

## Port site metastasis

Several studies have shown that by using sound laparoscopic surgical technique, the incidence of port site recurrence is the same as wound recurrence after open colorectal cancer surgery. If we protect our wound site with a wound protector, prevent leakage of gas from the trocar site, prevent hypothermia by using preheated gas, and apply usual oncological principles to laparoscopic colorectal cancer surgery, we would see port site metastasis incidence close to 1% as compared to wound metastasis in open surgery [6,7,14].

## Disease free proximal and distal resection margins

In colonic and high rectal cancers there are two ways of marking distal margin one by preoperative colonic tattooing and other by doing per-operative colonoscopy. Pre-op tattooing can be done by Indian ink, should be marked at least three quadrants because sometimes it is difficult to know anti mesenteric border on colonoscopy and if one mark the tumor site on the mesenteric border it will not be visible from out site on laparoscopy. Per-op colonoscopy using air can cause distention of bowel obscuring the space and vision while doing laparoscopy. If we use CO2 while doing colonoscopy we don't face these problems as CO2 is rapidly absorbed [9]. For low rectal cancer digital examination at the table is probably the best method. There are many studies in the literature confirming adequacy of laparoscopy in attaining disease free distal and proximal resection margins [15,16].

## Circumferential margins (CFM)

Circumferential resection margin is an important area of concern especially in low rectal cancers. There are studies

suggestive of CFM being less adequate in laparoscopic surgery than in conventional surgery. But these inadequacies were not statistically significant [17]. However one has to be very careful while doing lap low anterior resections. One must follow the same neoadjuvant protocols as followed for conventional surgical groups. No. of lymph nodes harvested-One of the biggest criticism after port site metastasis incidence which rocked the boat of laparoscopic surgery was adequate number of lymphnodes harvested. After initial studies which raised this concern now we have numerous studies authenticating that laparoscopy can harvest same no. of lymphnodes as by conventional surgery if not more [6,7,18].

### Steep learning curve

Laparoscopic colorectal surgery for malignant disease is no doubt an advanced procedure. We need to get over the learning curve before we can compare our results with time tested conventional technique. People with experience of high volume conventional [19] colorectal work have better results than occasional surgeons. This shows that high volume centers have better results even for the open technique and there is a learning curve to achieve optimum results. The challenge faced by a lot of colorectal and onco surgeons is that they haven't gone through the learning curve of basic general surgical laparoscopy procedures, and therefore find it challenging to train themselves directly for advanced procedures. There is no consensus today on what number is adequate to train for laparoscopic colorectal surgery, and go beyond the learning curve. In the literature, this number varies from 20-50 cases [20]. It may be a good idea to start with right colon resection, then go on to left colon resection, and then to rectal surgery. It may also be helpful to treat benign pathology during the learning curve.

### Lack of tactile sensation

Conventional surgery has an inherent advantage of tactile feel by hand. This not only gives feedback about the tissue but also gives an additional opportunity to do blunt dissection, give traction, counter traction and control bleeding. Sophisticated instrumentation, newer energy sources (like ligasure and harmonic scalpel) and laparoscopic ultrasound have somewhat obviated the need of hands to be inside the abdomen. However with the use of a hand port, one can introduce one hand inside the abdomen. A hand port can also help in bringing down the learning curve [21]. Critics may argue that one will lose the advantage of totally minimal invasive technique by making a small incision at the beginning of procedure. However, there are enough studies to suggest that making a small incision of surgeon's glove size does not take away the advantage of laparoscopic surgery [22,23].

### Increase operation time

Laparoscopic colorectal surgery has a steep learning curve which translates into increase operative time. As the numbers grow, the learning curve becomes flat and operative time comes down [24].

### Increased cost

Concerns have been raised regarding the increased costs of laparoscopic surgery especially direct costs relating to disposable

equipment, and increased theatre time. These costs have been shown to be offset by the lower postoperative costs of hospital stay, convalescence, wound care etc. [25], and it is likely that with experience the operating times of laparoscopic surgery will approximate to those of open surgery. A recent randomized study from Sweden [26] has compared laparoscopic with open surgery for colonic cancer and concluded that within 12 weeks of surgery there was no significant difference in total costs to society despite the fact that there was no reduction in the mean hospital stay and the conversion rate was 14%. The study looked at 210 patients and included all direct medical costs as well as indirect costs such as loss of productivity because of time absent from work. The most significant benchmark for any therapy for cancer is long-term recurrence and 5-year disease free and overall survival. Most retrospective studies as well as prospective randomized trials have demonstrated that laparoscopic surgery for colorectal cancer is at least equivalent to open surgery in these aspects. Another potential advantage of reduced incidence of small bowel obstruction. In a randomized study of 40 patients, a "second look" laparoscopy performed 3 months later, revealed the presence of significant adhesions in 80% of open group as compared to 10% in laparoscopic group [27].

### Long term recurrence and survival

Lacy et al. [6] group in Barcelona randomised 219 patients with colonic cancer to either laparoscopically assisted or open surgery. With a median follow-up of 43 months the rate of tumour recurrence, site of recurrence and overall survival were not significantly different between the two groups. However, the cancer related survival was significantly higher in the laparoscopic group and stratification according to tumour stage showed that this difference was due to improved outcomes in stage III disease. In patients with stage III disease the laparoscopic group had significantly better results for tumour recurrence, overall survival and cancer related survival. One hypothesis for this unexpected finding is that the minimally invasive technique has a less suppressive effect on cell mediated immunity thus reducing tumour cell dissemination peri-operatively.

The two large randomised studies have been published, first was a two centre study that randomised 403 patients with rectosigmoid cancer to either laparoscopically assisted or open surgery [7]. The median follow up was 52 months in the laparoscopic group and 49 months in the open group. There was no significant difference between the groups in probability of tumour recurrence (22.2% lap vs 17.6% open,  $p=0.37$ ), cancer related 5-year survival (75.3% lap vs 78.3 % open,  $p=0.45$ ) and overall survival at 5 years (76.1% lap vs 72.9% open,  $p=0.61$ ). The Clinical Outcomes of Surgical Therapy Study Group (COST) multi-centred randomised trial 48 centres randomised 872 patients [14] with colonic cancer to either laparoscopically assisted or open surgery. With a median follow up of 4.4 years there was no significant difference in the rate of tumour recurrence (16% lap vs 18% open,  $p=0.32$ ). The overall survival rate at 3 years was also similar between the 2 groups (86% lap vs 85% open,  $p=0.51$ ). One criticism of both these studies is the high conversion rates: 23% for the Hong Kong group [7] and

21% in the COST study [14]. This may imply that some surgeons in these studies have not yet approached the end of their learning curve. Relatively high conversion rates may dilute the benefits seen in single centre studies like those from Barcelona where conversion rates were lower. Similarly, a selective approach to including patients in the COST study (the average number of patients randomised per surgeon being 13) may indicate that many contributors were relatively inexperienced laparoscopic colorectal surgeons.

The long-term outcome these 3 large studies appears to be no worse for the laparoscopic group and may even be better patients with stage III disease. Laparoscopic surgery is therefore a safe alternative to conventional surgery for colorectal cancer with the added benefit of improved short-term outcomes, equal cancer related survival, similar recurrence pattern and incidence. It has all the potential to become the procedure of choice for colorectal cancer surgery in near future. However to prove its superiority in terms of long term survival and recurrence over conventional technique, we will have to wait for long term results.

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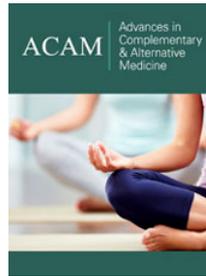
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