

Laparoscopic Colorectal Cancer Surgery

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Introduction

Laparoscopic surgery has long been accepted as the gold standard technique for cholecystectomy and fundoplication as it reduces postoperative pain and improves recovery. Following the first laparoscopic resection for colorectal cancer in 1991¹, controversy arose regarding the oncological safety of this procedure. Questions have been raised regarding port site metastases, the adequacy of tumour clearance and possible alterations in tumour cell dissemination by the use of laparoscopic techniques; these have now been answered. As a result the profile of laparoscopic colorectal surgery in the UK is increasing.

The benefits of laparoscopic colorectal surgery

The short-term benefits of laparoscopic resection have been emphasised by various studies. These include less post-operative pain, earlier restoration of bowel function, and earlier mobilisation²⁻⁴, which lead to shorter hospital stay and reduced direct costs⁵. In addition there is less morbidity from blood loss and transfusion requirements⁶, respiratory complications⁷, wound infections⁸, adhesions and incisional hernias⁹. A significant improvement in recovery, as assessed by quality of life (QOL) analyses, was reported 2 months following laparoscopic colorectal resection in a non-randomised study¹⁰. More recently in the much larger trial randomising between laparoscopic and open resection (the COST study), QOL improvements observed at 2 weeks following surgery underline the benefits of the minimal access approach¹¹.

The disadvantages of laparoscopic colorectal surgery

Although, there is a reduction in sensory feedback with both a loss of tactile sensation and stereoscopic vision, training in laparoscopic surgery and the use of precise pre-operative methods of tumour localisation e.g. India ink marking or barium enema, allow one to compensate. Blood loss causes absorption of light and reduces the laparoscopic view, but the magnification afforded by laparoscopic surgery allows excellent haemostasis virtually making blood loss a thing of the past^{2,7}. Removal of the specimen still requires an incision but this is usually only 4-5cm in length unless the tumour is large. Retrieval bags can be used to help minimise the length of this incision which is usually muscle splitting and akin to an appendicectomy wound. Conversion rates between 11-23% have been reported in large randomised series of colon cancer surgery^{2,3,12}. We have shown that obesity, adhesions, rectal surgery and benign disease result in a higher conversion rate due to technical difficulty¹³. During the early phases of a surgeons learning curve we advise either a low threshold for conversion or that such cases are avoided. Conversion rates will vary depending on the complexity of cases attempted laparoscopically. During the last 4 years in our unit, 96% of elective colorectal cancer resections have been attempted laparoscopically, with an overall conversion rate of 13% (8% for colonic and 26% for rectal). These figures need to be set in the context of 10 years experience and over 250 cases involving laparoscopic colorectal resection.

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 etc⁵, and it is likely that with experience the operating times of laparoscopic surgery will approximate to those of open surgery. A recent randomised study from Sweden

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%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.

Cancer controversies

Port site metastases were one of the early concerns of laparoscopic colorectal cancer surgery¹⁵. There is now ample evidence from 3 large randomised studies to show that the incidence of port site recurrences does not differ from the 0-1% seen in open surgery^{2,3,12}. It is difficult to explain some of the early reports of recurrence, but perhaps we now have a more meticulous approach to oncological principles in laparoscopic surgery: employing techniques such as minimal handling of the tumour, fixation of the trocars to the abdominal wall, wound cleansing with a tumouricidal agent and evacuating gas before removal of the trocars.

Current evidence confirms that tumour clearance and lymph node yields are comparable to open surgery^{2,3,12} and this also remains true for rectal cancer¹⁶. The most exciting work to date has come from Lacy's group in Barcelona². They 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-operatively¹⁷.

There have been 2 large randomised studies published this year. The first was a two centre study that randomised 403 patients with rectosigmoid cancer to either laparoscopically assisted or open surgery³. 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) is the only multi-centred randomised trial that has currently been published¹². 48 centres randomised 872 patients 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 and 21% in the COST study. 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 appears from these 3 large studies to be no worse for the laparoscopic group and may even be better in those patients with stage III disease. Laparoscopically assisted surgery is therefore a safe alternative to open surgery and with the added benefit of

improved short-term outcomes it may now become the procedure of choice for colorectal cancer surgery.

There have been few reports looking specifically at laparoscopic rectal surgery and the majority of these examine laparoscopic abdominoperineal resection. Morino et al¹⁸ however, have published the results of a prospective study examining 100 consecutive patients treated with laparoscopic total mesorectal excision (TME). The median follow up was nearly 4 years and there was a single port site metastasis. The overall locoregional recurrence rate was 4.2%, which compares well with other publications in which TME is performed.

Laparoscopic colectomy: Surgical technique

Preoperatively all patients undergo full colonic examination with either colonoscopy or barium enema and when necessary tumours are marked with India ink. The rest of the preoperative investigations and staging are the same as for open surgery.

Patients are placed in a Lloyd Davis position with the hips fully extended and knees slightly flexed allowing the surgeon or assistant to stand between the legs. A Trendelenburg position with lateral tilt is often used which permits gravitational retraction of the small bowel and omentum. We typically use 4-7 ports, the position varying slightly depending on the resection undertaken. We have a dedicated theatre sister who also is the principal camera operator. The harmonic scalpel is used for the majority of the dissection with clips applied to all named vessels.

Laparoscopic colonic mobilisation is usually undertaken within the retroperitoneal plane in a medial to lateral direction, unlike open surgery where mobilisation begins at the peritoneal reflection. This difference in approach has been adopted to maintain fixation of the colon until the retroperitoneal dissection is complete. Early ligation of vascular pedicles is undertaken to

allow access to the retroperitoneal plane but may also confer an oncological advantage¹⁹. The principles governing rectal resections are those proposed by Heald and colleagues²⁰.

Specimen retrieval is generally performed through small transverse muscle splitting incisions: a supraumbilical incision for right and transverse colonic resections and a left iliac fossa or Pfannenstiel incision for left sided or rectal resections. Anastomoses are usually performed extracorporeally for right sided resections and using an intracorporeal stapled technique for left sided or rectal resections.

Training and Courses

Currently there is no formal training or accreditation for laparoscopic colorectal surgery. The AESGBI and ACP are developing a preceptorship programme for consultant surgeons. This will comprise three elements: 1) a requirement to see 10 laparoscopic colorectal resections live and attend at least one of the structured 2 day courses available. 2) The consultant needs to address funding, governance and staffing issues in their hospital so that when the preceptorship has been completed there will be no delay in implementing the technique. In order to reorganise and train theatre staff a team visit, including the consultant and nurses, should occur to observe practice in the preceptor's hospital. The importance of an experienced theatre team, and particularly the camera operator, cannot be emphasised enough in this development. 3) Lastly it is proposed that the consultant taking on the technique be preceptored for 2-4 operations by a surgeon who is involved in the programme and who will have performed more than 100 resections. In line with the recommendations for introducing new techniques, a local audit should be undertaken of outcomes and it is mandatory that the Association of Coloproctology minimum dataset is recorded.

It is preferable that immediately following the preceptorship programme surgeons aim to perform at least two laparoscopic colectomies per month, bearing in mind the guidelines on appropriate case selection, in order to maximise the training benefit.

Registrar training in the UK and through overseas fellowships is currently limited. Details of available training may be accessed via the Dukes' Club website (www.thedukesclub.org.uk).

While training opportunities are limited apprenticeships may involve less personal operating experience than they will in future years. It is important during this time that trainees spend at least 6 months in a specialist unit that allows them to see the complete range of laparoscopic colorectal surgery. This will permit them to develop their own expertise safely and independently, provided that initial case selection is judicious.

Current guidelines from the National Institute for Clinical Evidence (NICE) state that: 1) for colorectal cancer, open rather than laparoscopic resection should be the preferred surgical procedure and 2) laparoscopic surgery should only be undertaken for colorectal cancer as part of a randomised controlled trial. This guidance is to be reassessed later this year, and in light of the evidence of the 3 large randomised trials^{2,3,12}, laparoscopic surgery should become the preferred option in colorectal cancer surgery for suitably trained surgeons. In the meantime, the councils of both the Association of Endoscopic Surgeons of GB & I and the Association of Coloproctology of GB & I (ACP) have issued a letter of guidance (after discussion with NICE) stating that laparoscopic surgery for colorectal cancer can be undertaken as long as: 1) surgeons are suitably trained, 2) they keep the minimum dataset as advised by the ACP and 3) they secure the backing of their own Trust.

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