Laparoscopic colorectal surgery: summary of the current evidence

EMAD H ALY

Laparoscopic Colorectal Surgery & Training Unit, Aberdeen Royal Infirmary, Aberdeen, UK

ABSTRACT

INTRODUCTION Laparoscopic colectomy has not been accepted as quickly as laparoscopic cholecystectomy. This is because of its steep learning curve, concerns with oncological outcomes, lack of randomised controlled trials (RCTs) and initial reports on port-site recurrence after curative resection. The aim of this review is to summarise current evidence on laparoscopic colorectal surgery.

PATIENTS AND METHODS Review of literature following Medline search using key words 'laparoscopic', 'colorectal' and 'surgery'.

CONCLUSIONS Laparoscopic colorectal surgery proved to be safe, cost-effective and with improved short-term outcomes. However, further studies are needed to assess the role of laparoscopic rectal cancer surgery and the value of enhanced recovery protocols in patients undergoing laparoscopic colorectal resections.

KEYWORDS

Laparoscopy – Colorectal surgery – Colectomy

CORRESPONDENCE TO

Emad H Aly, Consultant Surgeon, Laparoscopic Colorectal Surgery & Training Unit, Aberdeen Royal Infirmary, Foresterhill, Aberdeen AB25 2ZN, UK. E: emad.aly@nhs.net

Jacobs *et al.*¹ reported the first series of laparoscopic colonic resections in 20 patients in 1991. After this initial study, many other authors have reported on the use of laparoscopic approach for a variety of benign colorectal conditions. However, laparoscopic colectomy has not been accepted as quickly as laparoscopic cholecystectomy. This was because of its steep learning curve, concerns with oncological outcomes, absence of randomised controlled trials (RCTs) and early reports of port-site recurrence after curative cancer resection.²

Evidence from early randomised, controlled trials

The first RCT looking at late outcomes of laparoscopic surgery for colonic cancer was reported by Lacy *et al.*³ The study randomised 219 patients from a single institute between 1993–1998 with colon cancer into two groups – laparoscopic resection ($n = 111$) and open resection ($n = 108$). Significant advantages were seen with regards to reduced blood loss, early return of intestinal motility, lower overall morbidity and shorter duration of hospital stay in the laparoscopic-assisted group. Also, univariate analysis established a significantly better cancer-related survival in the laparoscopic group, but subgroup analysis stratified for tumour stage revealed that survival benefit was mainly limited to stage III disease. Multivariate analysis demonstrated

a better cancer-related survival in the laparoscopic group. However, the RCT was criticised for an increased (14%) locoregional recurrence rate in the open group, low number of patients receiving adjuvant chemotherapy in the conventional group and the low (< 12) number of lymph nodes harvested in both groups thus resulting in uncertainties on appropriate staging. In addition, limited use of adjuvant chemotherapy in the open group might have reflected as survival benefit in the laparoscopic group.

COST (Clinical Outcomes of Surgical Therapy) Study Group¹⁵ reported the outcome of 872 patients with colon cancer randomised into two groups (laparoscopic resection [$n = 435$] and open resection [$n = 437$]) from 48 institutions between 1994–2001. Only surgeons who had done ≥ 20 resections participated in the study. Median postoperative follow-up was 4.4 years. The laparoscopic resection group had longer operating times but quicker recovery, shorter hospital stay and trend towards intra-operative complications (not statistically significant). There was no significant difference in morbidity and mortality, tumour recurrence or overall survival. The group concluded: 'it is safe to proceed with laparoscopic resection in patients with cancer'.

The **COLOR** (Colon cancer Laparoscopic or Open Resection) Trial¹⁴ is a multicentre study that included 1248

patients with colon cancer randomised into two groups – laparoscopic resection ($n = 627$) and open resection ($n = 621$). Conversion rate was 17%. The laparoscopic resection group had longer operating times but less blood loss, earlier recovery of bowel function, fewer analgesic requirements and shorter hospital stay. There was no difference in radicality of resection or 28-day morbidity and mortality. The authors concluded: ‘laparoscopic surgery can be used for safe and radical resection of cancer in the right, left, and sigmoid colon’.

The MRC CLASICC (Conventional vs Laparoscopic-Assisted Surgery in Colorectal Cancer) Trial was done between 1996 and 2002 in 27 UK centres. It randomised 794 patients with colon and rectal cancer into laparoscopic resection ($n = 526$) open resection ($n = 268$) with a ratio of 2:1. The CLASICC trial was the first RCT to include patients with rectal cancer. The study reported a 29% conversion rate. Patients who had conversion ended up with raised complication rates. Also, there was higher incidence of positive circumferential resection margin after laparoscopic anterior resection but this did not reach statistical significance. There was no difference in hospital mortality or quality of life at 2 weeks and 3 months postoperatively. The authors concluded: ‘*laparoscopic resection for colon cancer is as effective as open surgery. However, impaired short-term outcomes after laparoscopic resection for rectal cancer do not yet justify its routine use.*’

The evidence from the early randomised controlled trials suggests that the short-term outcomes of laparoscopic colorectal surgery are probably marginally better; however, there was a clear trend towards a less favourable outcome of patients who had conversion.

Evidence from meta-analysis (short-term outcomes)

Abraham *et al.*¹⁶ reported the outcome of the meta-analysis of RCTs up to 2002. They compared the short-term outcomes of laparoscopic resection and open resection for colorectal cancer. They included 12 RCTs with 2521 procedures. Laparoscopic resection was 30% longer to perform but had less morbidity, earlier return of bowel function (33%), reduced analgesia requirements (37%) and reduced hospital stay (20%). There was no difference in peri-operative mortality or oncological clearance. The authors concluded: ‘laparoscopic resection for colorectal cancer is associated with better short-term outcomes without compromising oncological clearance’.

Evidence from meta-analysis (long-term outcomes)

Jayne *et al.*¹⁷ reported the 3-year follow-up results for the UK MRC CLASICC Trial Group. There was no difference

between open and laparoscopic groups in the 3-year overall survival, disease-free survival or local recurrence. The higher positivity of the circumferential resection margin after laparoscopic AR, did not lead to an increased incidence of local recurrence. There was no difference in the quality of life. The authors concluded that: ‘long-term outcomes for patients with rectal cancer were similar in those undergoing open surgery and support the continued use of laparoscopic surgery’.

Laparoscopic rectal surgery

Laparoscopic rectal surgery involves several challenges which include an even longer learning curve when compared to colonic laparoscopic surgery, difficult retraction, and difficult intra-operative localisation of the tumour. Also, the existing laparoscopic stapling instruments can only angulate to a maximum of 65°. This makes horizontal division of the rectum difficult from one side. In the current laparoscopic stapling device technology, the staples are deployed at the same time as the built-in knife divides the rectum. The need for several firings creates the potential to generate steps and dog-ears in the anastomosis.¹⁸

Outcomes following laparoscopic rectal surgery

Reported outcomes of laparoscopic rectal surgery include decreased blood loss, increased circumferential resection margin involvement,¹⁵ increased anastomotic leak rate (9–17%)¹⁹ and increased risk of male sexual dysfunction.²⁰ Many studies emphasised the increased anastomotic leakage rate after laparoscopic low anterior resection. This led some authors to recommend that all laparoscopic rectal cancers should be defunctioned.^{21,22} An alternate for low anastomosis described by some authors is the use of open stapler through a slightly wide Pfannenstiel incision that is required for extraction of the specimen. This approach combines some of the potential advantage of the laparoscopic approach such as laparoscopic mobilisation of the splenic flexure with reduced risk of splenic trauma, good views, reduced blood loss and a reduced incision with better cosmesis and earlier recovery.¹⁸

Enhanced peri-operative recovery protocols and laparoscopic colorectal surgery

Enhanced peri-operative recovery protocols (ERPs) involve a multidisciplinary approach to reduce the surgical stress response and enhance recovery. Studies report no increase in mortality and decreased hospital stay to 2–3 days.²³

Literature gives conflicting evidence on the role of ERPs when combined with laparoscopic colorectal surgery. King *et al.*²⁴ reported that patients undergoing laparoscopic resection within ERPs had better short-term outcomes

when compared to those who had open surgery within ERPs with no increased morbidity, deterioration in quality of life or increased cost. However, MacKay *et al.*²⁵ and Basse *et al.*²⁶ reported that laparoscopic colorectal resection does not appear to reduce the duration of ileus or hospital stay with the use of a multimodal rehabilitation regimen. Further, large, randomised trials are required to confirm these findings. This question might be better answered by the ongoing Laparoscopy And/Or FAsT Track Multimodal Management Versus Standard Care (LAFA Trial)²⁷ which is a multicentre RCT and includes four groups: (i) fast-track open surgery; (ii) fast-track laparoscopic surgery; (iii) standard open surgery alone; and (iv) standard laparoscopic surgery alone.

Hand-assisted laparoscopic colorectal surgery

Centres favouring hand-assisted colorectal surgery report shorter learning curve, shorter operating time, and more complex procedures could be done while patients still retain short-term benefits associated with laparoscopic resection.²⁸

Laparoscopic colorectal surgery: other issues

Cost

The implications of increased laparoscopic resections for healthcare resources are significant. Potential increased cost of laparoscopic colorectal resections has always been a concern. However, despite higher operative spending, laparoscopic colorectal resections were found to be significantly cheaper than conventional open resections due to reduced hospital stay.²⁹

Old age

Stewart *et al.*³⁰ compared laparoscopic with open colorectal resections in 42 and 35 patients, respectively, with a median age of 84 years in each group. Median hospital stay was 9 days for patients having the laparoscopic operation, and 17 days in the open cases. At 4 weeks after operation, 30 of the 35 independent patients surviving the operation in the laparoscopic group and 16 of 28 in the open group were back to pre-operative activity levels. They concluded that laparoscopically assisted colorectal surgery was safe and was associated with a low incidence of complications, short hospitalisation and a rapid return to pre-operative activity levels when compared with open colorectal resections in this age group. This was confirmed by a more recent study by Frasson *et al.*³¹

Obesity

Scheidbach *et al.*³² reported that laparoscopic colorectal surgery is more demanding in the obese patient and associated

with tendency for increased intra-operative complications (not significant). However, it was not associated with increase in postoperative complications and thus the pathologically overweight patient can benefit to a particular degree from the laparoscopic modality.

Port-site recurrence

In the early 1990s, reports began to appear of unusual patterns of recurrence after laparoscopic resections for malignancy.^{33,34} These recurrences were at the sites of the port insertion wounds, and 80% of cases presented within 12 months of surgery. The incidence from multiple case reports and small series ranged from 1% to 21%.³⁵ The reported incidence in open surgery is about $1.0 \pm 1.5\%$.³⁶ Vukasin *et al.*,³⁷ in 1996, suggested that perhaps the incidence of port-site recurrences was overstated. Data from a prospective voluntary audit from 1992 to 1995 showed an incidence of 1.1%. So, the incidence of wound recurrence is similar to that for open surgery at about 1%. In addition, most cases arise after surgery for advanced disease, either a serosal primary or carcinomatosis. Tumour recurrence rates generally seem in line with those seen in open surgery.³⁸

Laparoscopic colorectal surgery: the current evidence

Laparoscopic colorectal surgery proved to be safe, cost-effective and with improved short-term outcomes. However, further studies are needed to assess the role of laparoscopic rectal cancer surgery and the value of ERP in patients undergoing laparoscopic colorectal resections.

On-going randomised controlled trials

COLOR II (Laparoscopic Versus Open Rectal Cancer Removal)

This is a RCT started in 2005. The estimated enrolment is 1275 patients. The estimated study completion date is 2017 with estimated primary completion date 2011. For more information, see <<http://clinicaltrials.gov/ct2/show/NCT00297791>>.

EnRoL

The aim of the trial is to compare two different approaches to surgery for bowel cancer (open and laparoscopic), within an enhanced recovery programme. For more information, see <<http://www.octo-oxford.org.uk/alltrials/trials/EnRoL.html>>.

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