

Laparoscopic colon resection: Experience from a community hospital

In a study at Chilliwack General Hospital, outcomes for laparoscopic colectomy were found to be similar to outcomes in the surgical literature.

ABSTRACT

Background: Laparoscopic colon resection is becoming a standard of care throughout the world. In British Columbia, the procedure is gradually being introduced into surgical practice at community hospitals. In an effort to determine if community-hospital outcomes are similar to those published in the surgical literature, we looked at the outcomes for this procedure at a community hospital.

Methods: A retrospective analysis was conducted on data from laparoscopic colon resections performed by four surgeons at Chilliwack General Hospital from June 2005 to June 2010.

Results: In 29 out of 136 cases (21%), it was necessary to convert to an open procedure. Operating time, duration of hospital stay, 30-day mortality/morbidity rates, and oncological outcomes were all similar to the published outcomes.

Conclusions: Laparoscopic colon resection can be introduced and performed in the community hospital setting with outcomes similar to those found in the surgical literature.

Background

Laparoscopic colon resection (LCR) is a well-documented and standard practice in many centres throughout the world. A Cochrane Collaboration review of 25 randomized control trials published in 2005 analyzed the short-term (30-day) benefits of LCR compared with open surgery, and demonstrated better outcomes in intraoperative blood loss, intensity of postoperative pain, postoperative hospital stay, duration of postoperative ileus, and pulmonary function.¹ Total morbidity and local (surgical) morbidity were reduced in the LCR groups. Until the 30th postoperative day, quality of life was also better for LCR patients. The Cochrane reviewers concluded that if the long-term oncological results of laparoscopic and conventional resection prove to be equivalent, “the laparoscopic approach should be preferred in patients suitable for this approach to colectomy.”

Another Cochrane review published in 2008 looked at 33 trials comparing laparoscopic or laparoscopic-assisted colectomy and open colectomy for colorectal carcinoma. The trials found similar long-term outcomes in both groups.² Four major studies (Barcelona trial, COST, COLOR, MRC-CLASSIC)³⁻⁶ showed no difference in

the survival, recurrence of tumor, resection margin, or lymph node harvest for both total number and number of positive nodes. The overall conversion rate from laparoscopic to open surgery for these four trials was 19% (range 11% to 25%). While the results showed a significant increase in operating room time for LCR when compared with open colon resections, they also showed a reduction in duration of hospital stay.

The 2006 UK NICE review⁷ confirmed findings about operating time and hospital stay, and showed a decreased frequency of early complications and 30-day mortality. As well, the UK NICE review found there was a tendency to harvest fewer lymph nodes and an increased risk of anastomotic leakage, although these findings did not reach statistical significance. (It should be noted that the National Cancer Institute⁸ has set a minimum standard of 12 nodes for

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resection, and the American College of Surgeons has suggested a resection of 15 lymph nodes improves cancer survival in colon cancer.⁹⁾

Based on the research findings described here, we hypothesized that surgical outcomes would be similar whether LCR was performed at a community hospital or at a university hospital. By gathering data from a BC community hospital to compare with findings published in the surgical literature, we sought to determine whether outcomes were equivalent in terms of safety (intraoperative and postoperative complications), surgical oncology technique (resection margins, lymph node count), operating time, conversion rate, and duration of hospital stay.

Methods

Office notes, hospital electronic records, and operating room records were used to conduct a retrospective analysis of outcomes for LCR performed by four surgeons at Chilliwack General Hospital from June 2005 to June 2010.

Cases selected for study included patients who received laparoscopic colectomy in the 5-year study period. Emergency surgery patients were excluded.

Microsoft Excel was used for collection and basic analysis of data. Demographic, operative, and postoperative data were summarized and reported as counts and percentages for categorical variables and as mean/median/range for continuous variables.

Results

From June 2005 to June 2010, laparoscopic colon resection was performed on 136 patients (53% male) at Chilliwack Hospital. Patients ranged in age from 20 to 90 (mean 68 years) and exhibited the disease characteristics summarized in **Table 1**. Image-based preoperative and postoperative TNM

Table 1. Disease characteristics for 136 patients undergoing laparoscopic colon resection at Chilliwack Hospital, June 2005 to June 2010.

Characteristics	n (%)
ASA status	
1	12 (9)
2	76 (57)
3	46 (34)
Benign disease	
Diverticulitis	17 (13)
Polyp	14 (10)
Ulcerative colitis	1 (1)
Crohn's	6 (4)
Volvulus	1 (1)
Rectal prolapse	1 (1)
Stricture	1 (1)
Constipation	1 (1)
Total	42 (31)
Malignant disease	
Colorectal cancer	91 (66)
Lymphoma	1 (1)
Carcinoid	2 (2)
Total	94 (69)

staging results were obtained for patients with malignant disease, as shown in **Table 2**. The surgeons involved in the study attended LCR courses to upgrade their skills and also invited an expert surgeon from a tertiary hospital to demonstrate hand-assisted LCR. (In the end, the hand-assisted technique was not adopted by any of the surgeons, who continued using the standard four-ports LCR technique and improved their skills by assisting each other.)

The surgeons performed 78 right, 42 sigmoid, 5 left, 2 subtotal, 1 transverse, and 1 segmental colon resection, as well as 6 anterior resections. In 29 cases (21%), conversion from laparoscopic to open surgery was necessary. Intra-abdominal adhesions led

Table 2. Preoperative and postoperative TNM staging results for patients with malignant disease.

TNM stage	n (%)
Preoperative results	
0	2 (2)
I	50 (55)
II	10 (11)
III	17 (19)
IV	12 (13)
Postoperative results	
I	22 (24)
II	30 (33)
III	27 (29)
IV	13 (14)

Table 3. Reasons for conversion from laparoscopic to open colon resection.

Adhesions	17
Iatrogenic bowel injury	2
Inability to tolerate pneumoperitoneum	1
Carcinomatosis	1
Large tumor	3
Splenic tear	1
Local advanced tumor	2
Dense mesentery	1
Inability to visualize tattoo mark	1

to conversion in 17 cases (59%). Other reasons for conversion are shown in **Table 3**, while early and late complications for the procedure are shown in **Table 4**. Late complications include only those reported by patients who sought medical attention. Patients were routinely followed for 4 weeks in the postoperative period, unless they had complications or surgical issues that required ongoing care. In addition to these complications, there were five deaths in the postoperative 30-day period. Two were secondary to cardiovascular events (pulmonary embolism and stroke), one patient died at home after a fall and broken hip, and two patients died as a result of intra-abdominal sepsis (abscess and duodenal perforation).

Table 4. Early and late complications for laparoscopic colon resection patients at Chilliwack Hospital, June 2005 to June 2010.

Early	
Prolong ileus	12
Superficial wound infection	5
Pneumonia	3
Anastomotic leak	2
C-diff colitis	2
Pulmonary embolism	2
Ulnar neuropathy	1
Diabetes insipidus (metastatic cancer)	1
Delirium	1
Intra-abdominal abscess	1
Ventral hernia	1
Wound dehiscence	1
Bowel perforation	1
Stroke	1
Perforated duodenal ulcer	1
Late	
Enterocutaneous fistula	2
Anastomotic stricture	2
Incisional hernia	6
Wound site tumor	1

Other data collected indicate that the mean operating time for the first 68 cases was 132 minutes (range 60 to 245), and that for the remaining 68 cases it was 106 minutes (range 27 to 205). The radial margins were clear in 100% of cancer cases, and the mean number of lymph nodes harvested was 13.2 (median 13). All findings were compared with the results of other benchmark studies, as shown in

Table 5.

Conclusions

The results of our study are similar to those of major trials of laparoscopic colon resection for colon cancer, and of two other studies from community hospitals in British Columbia and Washington state.^{10,11} Our lymph node harvest numbers were higher than in any study published to date. The mortality rate in our study was similar to mortality rates in other studies, although only two of the five deaths were related to surgical complications.

Our study adds to the limited data available showing that LCR can be introduced and performed in community hospitals with surgeons who are

already performing minimally invasive surgical procedures. With tighter resource allocation and reduced operating room time, many surgeons are concerned that laparoscopic colectomy is more time-consuming than open technique. In our experience, the operating time was not excessive and did not make an impact on operating room use. We believe that the excessive time reported for laparoscopic colon resection in the major published trials may represent the added time surgeons in the trials spent learning. The majority of those trials were conducted when laparoscopic colon surgery was being introduced into wider surgical practice. This is also confirmed by our data, which show an average reduction of 26 minutes in operating time during the second half of the study period.

Overall, our findings confirm that outcomes for laparoscopic colon resection performed at a community hospital are similar to results described in the literature, and that laparoscopic technique can be safely introduced and performed at a community hospital.

Table 5. Chilliwack Hospital outcomes for laparoscopic colon resection compared with outcomes from four major trials.

	Mean operating time (minutes)	Median duration of hospital stay (days)	Number of lymph nodes harvested	Number of conversions to open surgery	Percentage of positive resection margins	Number of cases with early (30-day) complications	30-day mortality rate
Chilliwack	119 (range 27–245)	5 (range 2–57)	13 (median)	29 (21%)	0%	35 (26%)	4%
Barcelona	+24*	5.2	11.1 (mean)	12 (11%)	—	8 (8%)	<1%
COST	+55*	5	10 (median)	90 (21%)	1%	92 (21%)	<1%
COLOR	+30*	8.2	12 (median)	91 (17%)	2%	111 (21%)	1%
MRC-CLASSIC	180 (range 140–220) [†]	8 (range 6–11)	12 (median)	61 (25%)	1%	36 (27%)	4%

* Average additional operating time for laparoscopic surgery group compared with open surgery group

[†] Total anesthetic time for both colon and rectal surgery

Competing interests

None declared.

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