

Excellent outcomes after establishing laparoscopic colon surgery in a non-academic regional hospital

Conservative patient selection is shown to help when introducing a new minimally invasive procedure at a community facility.

ABSTRACT

Background: Laparoscopic colon surgery is a safe alternative to open surgery and results in improved patient quality of life and a shorter hospital stay. Because adoption of this procedure in nonacademic hospitals has been slow, we wanted to introduce laparoscopic colon surgery at our regional hospital, serving a population of 130 000, and examine the outcomes.

Methods: The study authors—two general surgeons—performed 102 colorectal resections over a 2-year period. Patients were selected for laparoscopic surgery using conservative criteria: patients with an emergency presentation, increased BMI, bulky tumors, lesions located at or below the peritoneal reflection, and multiple comorbidities were excluded. Eighty-one patients with one or more of these criteria had standard open resections. One case was converted to open surgery intraoperatively, leaving 20 laparoscopic colon resections for analysis in this study. For these patients a standardized protocol of multimodal perioperative analgesia and discharge criteria were employed.

Results: The surgeons performed 5 right hemicolectomies, 2 left hemicolectomies, and 13 sigmoidectomies. Two surgeries were performed with a hand port. The mean age of patients was 57, mean BMI 28, median ASA class was 2, and 60% were male. Seventeen cases (85%) were for benign disease. Of the three cases for malignant disease, the mean number of lymph nodes harvested was 15 (range 10–19). The mean total operative time was 208 minutes, the mean surgical skin-to-skin time was 153 minutes, and the median length of stay was 2 days. There were no mortalities, no intraoperative or immediate postoperative complications, and no readmissions within 30 days. One patient had a delayed complication of an incisional hernia.

Conclusions: With careful patient selection and a standardized protocol, including multimodal analgesia, laparoscopic colon surgery can be introduced in a nonacademic community hospital and result in excellent outcomes and a 2-day median length of stay. We recommend this approach to colleagues introducing these procedures to their institutions.

Background

Laparoscopic colon surgery has been shown to be a safe alternative to open colon resections for both benign and malignant disease.¹⁻³ Postoperative complications are reduced and length of stay in hospital is shorter.²⁻⁴ Patient quality of life within the first postoperative month is also improved as patients have less pain and are able to resume their normal activity sooner.⁵ Despite the advantages of a minimally invasive approach, laparoscopic colon surgery has been adopted slowly in nonacademic centres when compared with other laparoscopic procedures such as cholecystectomy. This is owing to technical difficulty and an extended learning process, generally accepted as requiring 20 cases.

The few studies that have examined the outcomes of laparoscopic colon surgery in community hospitals have shown equivalent outcomes to those in academic hospitals.^{6,7} We sought to examine the outcomes of two community general surgeons with

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a broad-based surgical practice. Both surgeons graduated from the University of British Columbia general surgery residency program in 2006. Neither received additional fellowship training in colorectal or minimally invasive surgery. During residency, both surgeons trained on tertiary colorectal and minimally invasive surgery services as well as at community hospitals that performed laparoscopic colon surgery. One surgeon participated in more than 40 laparoscopic colon cases and the other in more than 20 cases during residency.

After residency, both established practice in Vernon, BC. The Vernon Jubilee Hospital is a regional referral hospital with 138 acute care beds and a catchment population of approximately 130 000. Both surgeons also perform laparoscopic inguinal hernia, ventral hernia, splenectomy, and anti-reflux surgery. There are four other general surgeons at the hospital who do not have the same experience with advanced laparoscopic procedures.

Methods

Because advanced laparoscopic procedures were not well established before the arrival of these two surgeons at Vernon Jubilee, a rigorous patient selection process was employed to ensure excellent outcomes and foster confidence in the program by anesthesiologists, family physicians, nurses, and other health care workers. Out of 102 colorectal resections performed during the study period, 81 patients were excluded because they met one or more of the exclusion criteria listed in **Table 1**. Nurses in the pre-admission clinic, recovery room, and operating room on the ward were educated using in-service presentations. Anesthesiologists were engaged to resolve issues such as intraoperative positioning and perioperative pain management.

Table 1. Exclusion criteria for laparoscopic colon surgery.

Anatomic factors	Bulky tumors
	Lesions below peritoneal reflection
Patient factors	Multiple medical comorbidities
	Increased BMI
	Emergency presentation

All consecutive cases of laparoscopic colectomy were collected prospectively in a database over a 2-year period from July 2006 to June 2008. Demographic information, pathology, OR time, length of hospital stay, and complications were recorded and the data were tabulated and entered into a Microsoft Excel 2002 spreadsheet.

A standardized protocol was established for preoperative and postoperative management. No patients received an epidural or used patient-controlled analgesia (PCA). Patients with large polyps were tattooed endoscopically preoperatively to aid in intraoperative localization. In all laparoscopic cases one author of this study assisted the other or was assisted by a second certified surgeon or senior surgical resident.

A multimodal approach was used for postoperative pain control to minimize opioid use and resulting ileus. This included a high-volume (60–80 cc) bupivacaine rectus sheath block, oral or rectal acetaminophen and diclofenac at regular intervals, and judicious use of oral and intravenous hydromorphone. Criteria for discharge included mobility, adequate pain control with oral medications, passage of flatus, and tolerance of a clear fluid diet. Patients were told in advance that they would be discharged on the second postoperative day.

Results

Out of 102 patients requiring a colorectal resection, 21 were treated laparoscopically over the 2-year study

period. One case was converted to open surgery intraoperatively. This case was excluded from further analysis. Of the 20 remaining cases, 5 were right hemicolectomies, 2 left hemicolectomies, and 13 sigmoidectomies. A hand port was used in two of the sigmoidectomies. One of the sigmoidectomy patients had a left oophorectomy during the same anesthetic. The mean age of patients was 57 (range 36–79), mean BMI was 28 (range 20–45), mean ASA class was 2 (range 1–3), and 60% of the patients were male.

Seventeen patients had benign conditions: diverticular disease (10), benign adenomatous polyps (6), and Crohn's colitis (1). In the three malignant cases, the mean number of lymph nodes harvested was 15 (range 10–19). These three cases included a T1N0 adenocarcinoma within a large villous adenoma, a malignant carcinoid of the terminal ileum with positive lymph nodes, and a malignant polyp that was resected endoscopically.

The mean total operative time was 208 minutes (range 143–262) and surgical time was 153 minutes (range 105–206). The sigmoidectomies took longer than the hemicolectomies by an average of 64 minutes.

The mean length of stay in hospital was 2.2 days and the median was 2 days. Most patients were discharged on the second post-op day with three patients discharged on the third. The 30-day readmission rate was zero. There were no mortalities and no

Table 2. Comparison of outcomes from three studies of laparoscopic colon surgery.

	N	Mean age (y)	Mean BMI	Male	Malignant pathology	Conversion rate	Mean operative time (min)	Median length of stay (d)	30-day mortality	Anastomotic leak	30-day readmission	30-day post-op complications
Hwang and Wiseman	21	57	28	60.0%	15.0%	5.0%	153	2	0.0%	0.0%	0.0%	0.0%
Tang and Campbell ⁶	62	71	26	47.0%	66.0%	14.0%	190	4	0.0%	0.0%	2.0%	18.0%
Do et al. ⁷	154	60	Not reported*	45.4%	21.4%	9.6%	120 [†]	5	2.1%	0.7%	Not reported	21.6%

* 18.5% were BMI >30

[†] reported as median operative time

intraoperative complications. There were no apparent immediate postoperative complications and there was one delayed complication of an incision hernia. This occurred at the mini-laparotomy site in the first patient in the series.

Conclusions

While studies that have examined the financial impact of laparoscopic colon surgery have shown a greater intraoperative cost, this is offset by a shorter hospital stay.⁴⁻⁸ At \$1000+ per patient-bed day in the Canadian health care system, a 2-day hospital stay offers significant cost savings compared with the hospital stay required after open colectomy. Also, with an increased demand for acute care beds, reducing the hospital stay allows more patients to be treated with the same level of bed resources. Achieving routine discharges on the second postoperative day was achieved by educating patients, avoiding opioid analgesia (including epidurals and PCA), and employing multimodal nonopioid analgesia. The high-volume rectus sheath block⁹ provides 10 hours or more of excellent incisional analgesia and we feel that this component is critical to minimizing postoperative ileus and facilitating early discharge. To our knowledge, ours is the shortest reported mean or median length of

stay in an academic or community facility in the literature, reported at 3.1 to 9.3 days.⁷ To our knowledge there are also no other studies that report zero complications in the immediate postoperative period or a zero 30-day readmission rate.

Many factors that increase complications have been identified, including Crohn's disease, patient weight, diagnosis of malignancy, patient age, and surgeon experience.¹⁰ To reduce the chance of complications, patients with an increased BMI, bulky colon adenocarcinomas, and comorbidities had standard open resections instead of laparoscopic resections. In addition, no emergency cases were attempted laparoscopically. Hand ports were used in two patients deemed to be potentially difficult from a technical point of view (one with Crohn's disease and one with a BMI of 45) who preferred a minimally invasive approach rather than an open resection.

Results from this study show equivalent or better outcomes than two similar studies (see **Table 2**). A 2007 study by Tang and Campbell⁶ describes a series performed by a single surgeon who was fellowship trained in minimally invasive surgery. A 2005 study by Do and colleagues⁷ describes a large series performed by three community surgeons who did not receive advanced laparoscopic

training in residency or fellowship. It is not specified exactly how they learned the technique, but the outcomes are equivalent to those in academic centres.

When introducing a new procedure, especially if the surgeons have not yet mastered the technique, a more conservative patient selection reduces the complication rate, reported as 21.6% in the Do study along with a mortality rate of 2.1%. In our study, both surgeons were proficient in the procedure from residency training. However, because the procedure was new to the hospital we chose to be conservative in patient selection. Now that laparoscopic colectomy has been established as a safe and effective procedure at our institution, the indications can be expanded to include more technically challenging cases, patients with more comorbidities, and emergency cases. In this series, we chose to use the hand port in two technically challenging cases and were able to achieve the same level of excellent outcomes. Other studies have shown hand-assisted colectomy to be effective in the community setting,¹¹ and at our centre we will likely expand our indications by further utilizing this technique.

Introducing laparoscopic colon surgery in a community hospital can lead to excellent outcomes and a

With an increased demand for acute care beds, reducing the hospital stay allows more patients to be treated with the same level of bed resources.

2-day median length of stay when careful patient selection and a standardized protocol including multimodal analgesia are used. We recommend this approach to colleagues introducing these procedures to their institutions. **BCMJ**

Competing interests

None declared.

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