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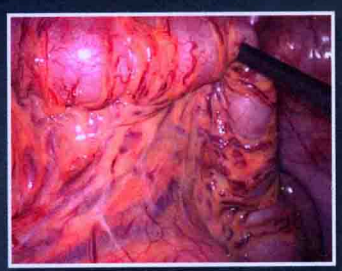
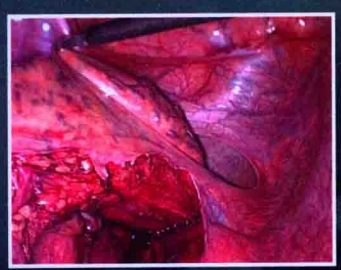
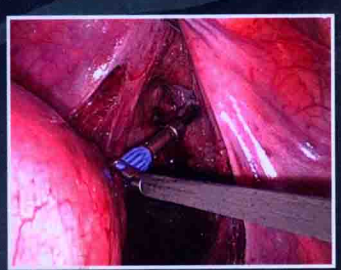
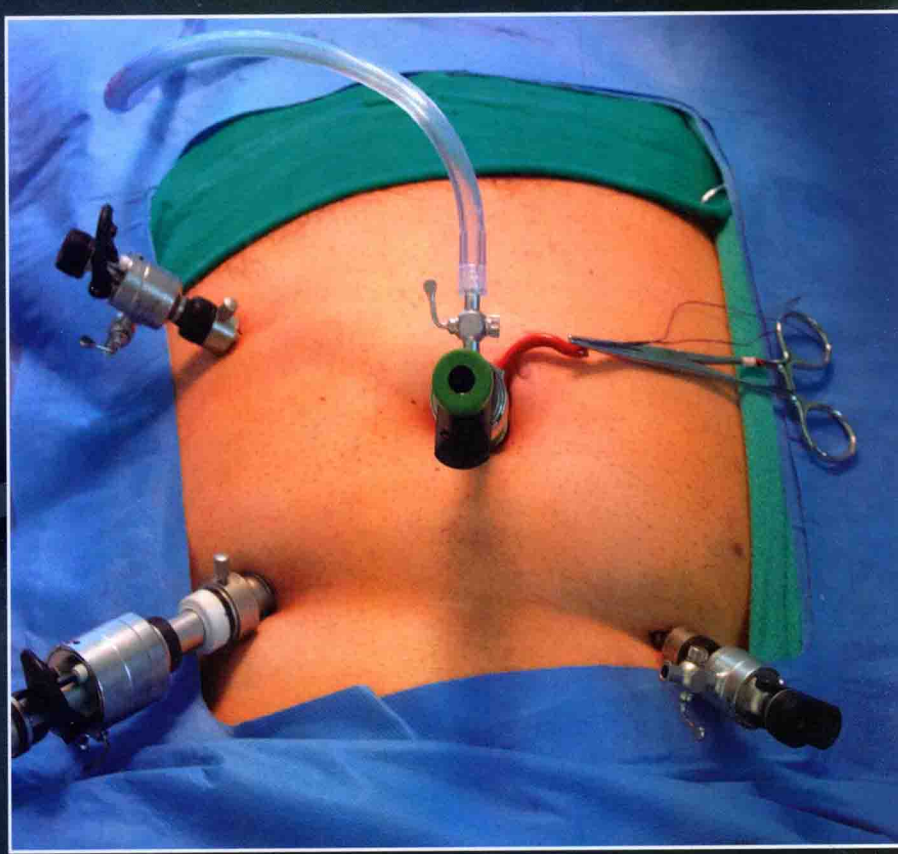
Operative Techniques in Laparoscopic Colorectal Surgery

SECOND EDITION









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Justin K. Lawrence • Deborah S. Keller • Bradley J. Champagne • Anthony J. Senagore

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For my wife Clare, whose love, patience and support allow me to accomplish everything I do. –C.P.D.

I want to express sincere gratitude to my wife, Patricia, for the support she has provided me throughout my career and has never received the recognition she truly deserves; without her support, none of my contributions to this work would have been possible. –A.J.S.

To my wife Elizabeth for her enduring support through a very emotional year, and our daughter Bridget—the miracle I came home to. –J.K.L.

To John Rombeau for starting me on my path, Conor Delaney for his direction, and my friends and family for their support along the way. –D.S.K.

I would like to dedicate this book to my exceptional wife Christina, and sons Alexander and Julian who make my life worthwhile! –B.J.C.

PREFACE

Laparoscopic surgery has been established as a safe and effective approach for colorectal surgery. Compared to open colorectal surgery, the laparoscopic approach is associated with decreased postoperative analgesic requirements, faster return of bowel function and resumption of oral intake, shorter hospital stay, and better cosmesis. The initial uptake was slower than expected, primarily due to the steep learning curve required with the laparoscopic technique. With proven benefits in patient outcomes and healthcare utilization, its use has been steadily increasing.

Surgeons need appropriate training before incorporating laparoscopic colorectal surgery into their practice. Successful learning involves a multifaceted approach of technical knowledge for the operative steps of each procedure, observation for pattern recognition, and hands-on experience. With the appropriate learning tools, all surgeons can acquire the skills to perform laparoscopic colorectal surgery, regardless of their level of experience.

In this second edition of *Operative Techniques in Laparoscopic Colorectal Surgery*, we offer a tool to increase the familiarity of surgeons with laparoscopic approaches. The chapters contain a detailed textual description of the individual procedure steps and common pitfalls. To aid pattern recognition, every chapter is accompanied by photographs of important landmarks, as well as an edited video of the key steps of each procedure. The book ends with sections on management of intraoperative complications and other useful tricks.

This second edition has expanded the colorectal procedures covered and added chapters on hand-assisted surgery and robotics for surgeons interested in those approaches. The operative descriptions have been updated, all of the major operative videos are new.

We hope this book will be a useful resource for residents and fellows in training, for surgeons who are attending courses in laparoscopic colorectal surgery, and for surgeons who are at an early stage of integrating this technique into their practice. Knowing the interest of surgeons in watching how others do procedures, it may even be of interest to more experienced practitioners in the field!

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Instrumentation, Requirements, and Perioperative Care Pathways

CHAPTER 1

Training, Initial Case Selection, and Postoperative Care

KEY POINTS

1. Length of stay is being increasingly used as a marker of health-care quality, and prolonged length of stay has clinical and economical implications.
2. Enhanced recovery pathways (ERPs) integrate standardized preoperative, in-hospital, and postoperative care orders rooted in an evidence-based approach.
3. ERPs have shown significant reductions in perioperative morbidity, hospital length of stay, and costs.
4. Combining ERP with laparoscopic colorectal surgery may be the most efficient use of health-care resources.
5. In surveying general and colorectal surgeons regarding their last elective bowel resection, most looked favorably onto implementing ERP; however, only 30% practiced in hospitals where ERPs were established.
6. A standardized approach to cases provides a guideline for teaching and mastering laparoscopic colorectal surgery. A standardized approach with objective measures of operative progress that limits unduly long operations without increasing conversion rates or resource utilization.
7. Laparoscopic colorectal surgery has been proven safe for benign disease of the colon and rectum, and malignant diseases of the colon; research is ongoing to prove the safety in rectal cancer; currently, only experienced colorectal surgeons should apply laparoscopy to rectal cancer.

Over the last 20 years, there has been an evolution from conventional open to laparoscopic colorectal surgery. Laparoscopic colorectal surgery is the most significant technical development in colorectal surgery, and has a significant impact on training and patient outcomes. The expanded use of laparoscopy has improved early postoperative outcomes, permitting smaller incisions, accelerating gastrointestinal recovery, causing less pain, and reducing hospital stay, usually by 2 to 3 days.

There are fundamental differences in the skills required for laparoscopic surgery as compared to open surgery. The use of long instruments with the associated fulcrum effect and lack of tactile sensation, combined with a two-dimensional

image of which only the tips of the instruments are visible, provides a different set of challenges to the operating surgeon and to training individuals in laparoscopic techniques. The wide acceptance of more routinely performed laparoscopic abdominal procedures such as cholecystectomy and appendectomy has made development of laparoscopic skills among trainee surgeons more common, but laparoscopic colorectal surgery provides a number of specific difficulties which makes it more challenging to learn and perform.

Laparoscopic colorectal surgery involves operating in between one and four abdominal quadrants. It is necessary to divide vessels of a significant size and often remove a large specimen. Formation of a bowel anastomosis is often required and there are a variety of different operations that can be performed, meaning there is learning required for a number of different procedures. Perhaps the biggest difference between laparoscopic colorectal surgery and most other laparoscopic procedures is the extensive dissection required to mobilize the colon. This means that the trainee really needs to understand the mechanics of dissection, rather than say performing a gastrojejunal anastomosis. Two-handed skills become of paramount importance to maintain progress during procedures, where extensive dissection is required.

Training surgeons in laparoscopic colorectal surgery does pose difficulties in terms of case numbers as it has been recognized that there is a measurable learning curve in acquiring the required skills in order to reach a steady state in terms of technique, time, and complications. We assessed the learning curve for right- and left-sided laparoscopic colonic resections. Using cumulative sum control chart (CUSUM) analysis and adjusting for case mix, we reported that 55 cases were required for right-sided resections and 62 for left-sided resection. This was consistent with other studies that reported a learning curve between 30 and 70 cases. A problem is that the average general surgery resident graduates with an average of 1 abdominoperineal resection, 7 rectal resections, and 20 to 30 colon resections logged during their training. Once in practice, the average general surgeon performs approximately 10 colorectal resections per year, which complicates completion of a laparoscopic learning curve.

Currently, training in advanced colorectal surgery is generally obtained by undertaking a colorectal fellowship after completion of residency training. The availability of laparoscopic colorectal training, however, has been restricted to a limited number of specialized centers. This is changing, particularly following publication of the COST trial, as more colorectal surgeons are proactively seeking training. Laparoscopic colorectal workshops, utilizing both animal and human cadaver models, have been developed, often in conjunction with industry support, in order to facilitate training, and try to shorten the learning curve. However, training with experienced surgeons who consistently perform a significant number of laparoscopic colorectal procedures remains the optimal way to acquire the required skills.

Day before Surgery

- Boost or glucose drink evening before surgery
- Bowel prep as directed
- Voltaren 100 mg evening before surgery
- Gabapentin 3 d preop
- Oral antibiotics
- Information sheet about expected endpoints
- Baseline CRP, type and screen, WBC

Preoperative Holding Area

- Gabapentin 300 mg po 1–2 h before surgery
- Alvimopan 12 mg po 1–2 h before surgery (for open and lap resection cases only)
- Bowel prep as directed
- Thromboprophylaxis: Heparin 5,000 iu sc tid, and PAS stockings
- Antibiotics at induction as needed
- Steroid at induction as needed

Postoperative Holding Area

- Morphine or dilaudid PCA for all patients, unless morphine bolus for selected lap patients
- Prophylactic antibiotics are NOT routinely continued after surgery, except for specific therapeutic indications (doses in operating room (OR) only)

Nursing Floor

General orders:

- CBC and BMP daily postop, at least every second day
- CRP on postoperative day 2
- Ambulate ×5 in hallways q day
- Sit out of bed 4–6 h per day
- Remove Foley on POD1 for laparoscopic and POD2 for open cases
- Heplock IV fluids POD1 for laparoscopic

Dietary Orders

- Chewing gum, 1 stick × 60 min tid
- Clear liquids given as tolerated after surgery
- Boost, 1 can twice daily po
- Soft diet on POD1 for laparoscopic and POD2 for open cases

Medication Orders

- Gabapentin 300 mg po tid for 72 h if in hospital
- Alvimopan 12 mg po bid while in hospital or to a maximum of 7 d (open cases)
- Toradol 15 mg IV q6h ATC for open and laparoscopic patients, except in those with renal dysfunction, HTN, elderly, etc., as per guidelines
- Heparin 5,000 iu sc tid, and PAS stockings
- Bisacodyl 10 mg twice daily po
- Use Vistaril 25 mg IM q6h prn (generally for first 24–48 h), or Reglan 10 mg IV q6h (generally after first 24–48 h) as first-line treatments for nausea
- Ambien 5 mg or Restoril 15 mg po qhs starting from postop day 1
- Hydrocortisone 50 mg IV tid for patients with hx of steroids within 6 mo

Oral Analgesia

- Laparoscopic patients (and stoma closure): POD1: Hold morphine except for BTP. Start Tylenol 3, 1–2q 4–6h prn (write for oral analgesia to be given 30–60 min prior to stopping PCA or epidural)
- Open patients: POD2: Hold morphine except for BTP. Start Percocet 5/325, 1–2 q4–6h prn (write for oral analgesia to be given 30–60 min prior to stopping PCA or epidural)

FIGURE 1.1. EPR example: University Hospital—Case Medical Center Colorectal Abdominal Surgery Perioperative Guidelines.

CASE SELECTION

Appropriate case selection is an essential component of surgical practice and this remains true for laparoscopic colorectal surgery. Inappropriate selection of patients is likely to result in an increased rate of complications and conversion to open procedures. A number of factors have been identified that influence the likelihood of conversion to an open procedure. Body mass index (BMI), ASA score, surgeon experience, type of resection (left more difficult than right), and presence of intra-abdominal abscess, or enteric fistula have all been shown to be important factors influencing likelihood of conversion. The requirement to convert is not necessarily detrimental, provided the decision to convert is made early. The impact of specific factors is relative as a number

of series have reported good results following laparoscopic colorectal procedures in patients with high BMI and in patients with enteroenteric fistulas, though in both cases, this involved experienced laparoscopic colorectal surgeons.

Thus, ideal cases to start on to help climb the learning curve are those that allow the surgeon the opportunity to go through the simple steps of right and left hemicolectomy. Cases with a low BMI should be chosen, who have not had prior abdominal surgery. A cecal polyp is a good option, although cancer precautions must be taken as up to 20% of cases can harbor invasive malignancy. Similarly, terminal ileal Crohn disease may be suitable. In either case if complications or other difficulties arise, then the patient should be converted to open surgery, knowing that a conversion is far safer than progressing through a complex case when inadequately experienced. For left colectomies, polyp and simple uncomplicated recurrent diverticulitis are likely to be the best options.

POSTOPERATIVE CARE PATHWAYS

Traditional postoperative management of patients undergoing major abdominal surgery used to involve routine use of nasogastric tubes and abdominal drains, prolonged bladder catheterization, copious analgesia, and prolonged abstinence of oral intake until the patients had begun to pass flatus. This management resulted in a hospital stay for patients of between 5 and 10 days following major abdominal surgery such as colonic resection, with average stay in many centers being over 10 days. Such results are greatly impacted by the surgeon, and the culture from which these data come, and in some countries length of stay has traditionally been close to 3 weeks after bowel resection.

Length of stay following major abdominal surgery has significant clinical and economic implications, both at the individual patient level and at the national level. For the individual, a longer stay increases the risk of nosocomial infections and complications. From a national perspective, Medicare data from 1999 to 2000 reported a mean postoperative stay following major intestinal or colorectal resection in the United States of 11.3 days. This was derived from 161,000 resections in patients of greater than 65 years of age, and corresponded to a total of 1.8 million bed days with an estimated overall postoperative care cost of US $1.75 billion per annum.

The importance of reduction of length of stay has become increasingly recognized and is reflected by published literature. Between 1985 and 1990, there were 13 publications in the literature relating to length of stay, though none discussed methods to shorten this. From 1995 to 2000, there were 122 publications that included multiple prospective randomized and cohort comparisons with the aim of reducing length of stay. There are a variety of pressures encouraging reduction in length of stay in hospital. The availability of resources, such as hospital beds, in first world health-care systems is being reduced as the size of the elderly population increases. There is reduced financial reimbursement to hospitals and physicians,

combined with increasing costs. Finally, there is increasing emphasis on standardization and optimization of quality of care and this is easier to demonstrate on the background of defined management protocols and discharge criteria that are an essential component of strategies to reduce hospital stay.

Tubes, Drains, and Catheters

A variety of approaches have been developed to reduce hospital stay. Preoperative assessment and detailed preoperative information to be given to the patient is essential. This is combined with patient education, standardized preoperative orders, and information about postoperative expectations. A meta-analysis of the use of nasogastric tubes after intestinal surgery assessed 26 trials with a total of 3,694 patients. Fever, atelectasis, pneumonia, and days of toleration of diet were significantly less without a nasogastric tube. There was increased vomiting and abdominal distension when nasogastric tubes were not used, but no other complication was increased with a reinsertion rate of 5%. Early removal of the urinary catheter also allows improved mobilization during recovery from surgery. Drains are used selectively such as for ultra-low anterior resections and are removed early at between 24 and 48 hours postoperatively.

Pain Control

The issue of pain control has been addressed in a number of ways. Management of the patient's pain is essential to encourage early mobilization. It has been considered that prevention of pain and hence reduction of the neurophysiologic and biochemical consequences of pain may be more beneficial than the treatment of established pain. This "pre-emptive analgesia," however, has failed to show any effect on postoperative pain in a systematic review of more than 80 randomized clinical trials nor has the suggested physiologic benefit demonstrated an evidence-based improvement in clinical benefit.

Opioid analgesia is the most commonly used form of analgesia, although it does have well-recognized side effects, including nausea and ileus. Administration by intravenous patient-controlled analgesia may allow lower doses to be administered and patients can later switch to oral analgesia. Epidural-based anesthesia has been shown to provide effective pain relief and may be better than intravenous administration for the control of pain in the first 24 to 48 hours. It has been suggested that the use of local anesthetic rather than opioid-based infusions via the epidural may improve gastrointestinal function. Kehlet has suggested that epidural analgesia is a prerequisite for enhanced recovery programs following major surgery; however, Zutshi et al. reported a randomized controlled study comparing intravenous patient-controlled analgesia with epidural analgesia in the context of an enhanced recovery program and showed no difference in time to discharge or patient satisfaction.