Complex and Reoperative Colorectal Surgery: Setting Expectations and Learning from Experience

Cindy Kin, MD, MS, FACS¹

¹ Department of Surgery, Stanford University Medical Center, Stanford, California

Clin Colon Rectal Surg 2016;29:75–79.

Address for correspondence Cindy Kin, MD, MS, FACS, Department of Surgery, Stanford University Medical Center, 300 Pasteur Drive, H3680K, Stanford, CA 94305 (e-mail: cindykin@stanford.edu).

Abstract

Keywords

- complex surgery
- reoperative surgery
- complications

A range of topics are covered in this issue dedicated to complex and reoperative colorectal surgery, from radiation-induced surgical problems, to enterocutaneous fistulas and locally advanced or recurrent rectal cancer. Common themes include the importance of operative planning and patient counseling on the expected functional outcomes. Experts in the field offer their technical tips and clinical lessons to maximize outcomes and minimize complications in these challenging cases.

Surgeons who perform colorectal operations are bound to face their share of complex and reoperative cases. For many, these challenging operations are what attracted us to the field. To maximize success and minimize complications in these circumstances, the surgeon must ensure adequate preoperative planning with good imaging and enlistment of help from other specialists, set expectations for the patient and operating room staff, and be aware of his or her own abilities. This issue of *Clinics in Colon and Rectal Surgery* is meant to serve as a resource so that surgeons and patients may benefit from the lessons learned by our expert contributors over years of experience. From a health systems and policy standpoint, it is important to recognize that these complex and reoperative cases confer a higher risk for morbidity and mortality when reporting quality outcomes, and to consider ways to optimize outcomes by concentrating the experience.

Preoperative Preparation

Preparation for the operation is often as important as the operation itself and consists of setting expectations for all parties involved—the surgeon and the surgical team, the patient, the operating room staff, and the nursing staff on the surgical ward. Failure to do this may result in significant delays, complications, poor delivery of care, and patient dissatisfaction.

Imaging and Preoperative Assessment

Operative planning for complex and reoperative cases consists of obtaining high-quality imaging to reduce the risk of unplanned surgical findings. Other aspects of the workup include an assessment of the patient's risk for undergoing a general anesthetic and a major operation. Older patients are likely to undergo a full cardiopulmonary assessment to assess their readiness for a major operation based on the risk factor of age, and patients who are chronologically young yet frail due to their underlying illness should also undergo evaluation. Simple tools to measure a patient's frailty include gait speed, timed-up-and-go, and administration of screening questionnaires such as the Frail scale.^{1–3}

Assembling the Operating Team

Many complex and reoperative cases require a multidisciplinary approach, involving collaboration with other specialists including urologists, gynecologists, radiation oncologists, and plastic surgeons. The colorectal surgeon should function as the lead surgeon in these cases and coordinate the other players in the operative plan.

Another consideration for a surgeon embarking on a difficult case is to ensure that an experienced colleague is available to help should the need arise. This is especially important for junior surgeons, but even very experienced senior surgeons will face particularly challenging cases where

an extra set of eyes or hands to offer advice or good retraction and exposure are critical for completing the case safely.

Setting Expectations for the Patient

Preoperative preparation also entails setting expectations for the patient. Patients must be made aware that the risk of morbidity or mortality when undergoing a complex operation is significantly higher than the risk associated with straightforward operations. Many of these patients have already experienced a major operation and will naturally assume that their recovery with subsequent operations will be comparable. An example of this is the higher incidence of pouchitis in patients with ulcerative colitis who undergo ileal pouch operations involving S-pouch formation or transfusion—surrogate markers of operative complexity—highlighting the differences in functional outcomes between patients undergoing straightforward and those undergoing complex operations.⁴

Reoperative cases involving adhesiolysis are associated with a higher risk for inadvertent enterotomy, and these patients are more likely to experience more postoperative complications including urgent relaparotomy, admission to the intensive care unit, the need for parenteral nutrition, and longer hospitalization.⁵ These patients are also at risk for long-term complications such as readmission for small bowel obstruction.⁶

For patients who are elderly or frail, surgeons should have candid conversations about their goals of care, as major operations in this population are highly likely to result in complications as well as potentially permanent changes in their mobility and independence.^{7,8} Discussion of the potential risks and complications of surgery as well as expected functional outcomes can help patients make decisions about embarking on a major operation. Recently developed tools to improve the process of informed consent and medical decisionmaking seek to address the gap in knowledge between patient and physician, and the decision of whether to proceed with a complex or reoperative operation is often a difficult one that requires additional time and attention.⁹

Setting Expectations for the Operating Team

Other members of the health care team who will be involved in the operation must also be made aware of the magnitude of the operation and the intraoperative expectations. The surgeon should communicate with the anesthesiology team about expected blood loss and operation duration, both before and during the case. The operating room staff should be informed of special equipment that may be needed. For complex cases, it is preferable to work with surgical technologists and nurses who are familiar with colorectal cases, so this should be arranged if possible.

Scheduling

Complex and reoperative cases are significantly more time-consuming than straightforward cases. Reoperative cases require additional time just to perform the abdominal incision, and often require adhesiolysis, which may add hours to the case.¹⁰

Complex and reoperative cases should be scheduled earlier in the day to maximize the benefits associated with a fresh team of operating room staff that is familiar with such cases and to minimize the disruption of multiple shift changes that inevitably occur with operating room personnel in the afternoon and evening. Allotting adequate time on the operating room schedule for these cases will also reduce the potential for downstream disruptions to other cases on the schedule.

Complex and Reoperative Colorectal Surgery: The Topics

Complex and reoperative colorectal surgery spans a wide range of topics that can be broadly grouped into three categories: disease processes associated with inherently complex surgical management, reoperative issues and complications, and technical surgical strategies addressing particular challenges in colorectal surgery.

Inherently Complex Colorectal Diagnoses

The first set of topics we address in this issue pertains to diagnoses that present inherently complex surgical indications by the nature of their disease processes. These include severe inflammatory bowel disease in patients who are on maximal medical therapy, sequelae from chronic radiation bowel injury, complex perineal fistula disease, combined rectal and pelvic organ prolapse, and locally advanced rectal cancer.

Inflammatory Bowel Disease

Surgical patients with severe medically refractory Crohn disease or ulcerative colitis present several important challenges that must be considered in the perioperative period. Nutritional deficiencies are common, especially in patients who have suffered for prolonged periods of time with poorly controlled disease. The severity of the disease often does not allow for adequate preoperative optimization of nutritional status, and surgeons must take this risk factor into account when making surgical decisions about anastomoses and fecal diversion. The common use of systemic steroids in patients with severe inflammatory bowel disease has implications not only for potential wound healing and infectious complications but also for managing perioperative steroid dosing. Studies lack agreement over the effect of steroids on complications and the need for “stress-dose” perioperative steroids. Similarly, the literature on biologic therapy for inflammatory bowel disease is mixed with regard to whether preoperative biologic therapy increases postoperative complication risk and whether surgical decisions should take this factor into account. A hotly contested debate is whether patients with medically refractory ulcerative colitis on infliximab can safely undergo total proctocolectomy with ileal pelvic pouch creation, or if pelvic pouch creation should be delayed until full recovery from a total colectomy. Surgeons caring for these complex patients must make difficult clinical decisions taking into account multiple factors including nutritional status, perioperative use of steroids and biologic medications, disease severity, and the patients’ individual preferences.

Radiation Injury to the Bowel

Radiation therapy for pelvic malignancies not only affects the rectum but may also affect the sigmoid colon, a mobile distal ileum, and even a redundant transverse colon that finds its way into the pelvis. Radiation to the bowel may cause acute or chronic injury. Acute radiation injury may last for months after cessation of therapy, but is rarely a cause for stopping therapy and is not predictive of the development of chronic radiation injury. Chronic radiation injury to the bowel causes symptoms 6 to 12 months after radiation therapy and is characterized by an obliterative endarteritis leading to ischemic changes, which, in turn, may cause strictures, fistulas, bleeding, impaired absorption and motility, and even perforation. CT and MR enterography are useful in delineating the anatomy of chronic small bowel radiation injury sequelae for the purposes of surgical planning. Perioperative nutritional support is an important consideration as many patients with chronic radiation injury to the small bowel have difficulty eating due to strictures or impaired motility, or poor absorption of nutrients. Surgical intervention for symptomatic small bowel radiation injury should be undertaken only after devoting adequate time and attention to setting expectations and defining goals. Palliation of symptoms, rather than cure, is the goal of these operations. The optimal intraoperative surgical strategies for managing chronic small bowel radiation injury such as strictures include resection and bypass.

Chronic radiation injury to the large bowel usually affects the rectum. Radiation proctitis is often successfully managed with topical or endoscopic therapies. More severe complications such as fistula or perforation may require proctectomy with either a permanent ostomy or, for select patients, a coloanal anastomosis. Radiation-induced fistulas occurring between the rectum and the vagina, urethra, or bladder neck are particularly challenging, and successful repair relies on the use of nonirradiated tissue for repair or interposition.

Complex Perineal Fistula

Complex perineal fistula caused by cryptoglandular disease, Crohn disease, complications from pelvic surgery, or obstetric trauma can cause significant distress and detriments to quality of life, which can be further exacerbated by failed repairs. Each failed repair makes subsequent attempts at surgical repair more difficult due to scar tissue, anatomic distortion, and decreased availability of tissue flaps. Deliberate management and assessment of the fistula and surrounding tissues and thorough surgical planning accounting for potential failures are crucial elements for surgical success. Complex perianal fistulas should be evaluated with examination under anesthesia in combination with endoanal ultrasound or MRI to assess the tissues, delineate the anatomy, and determine what the surgical options are. Vaginal fistulas from the rectum or ileal pouch often require either examination under anesthesia or contrast studies. Patients suspected to have Crohn disease as the underlying cause for fistula disease must undergo evaluation of the small bowel and colon to assess for active disease. Proper assessment and identification of the fistula anatomy, initial management of perineal sepsis, placement of drain and setons and possible fecal diversion,

and timing of definitive repair are as important for success as the actual surgical repair. Our authors will discuss various surgical options for repair, including fistula plugs, fibrin glue, stem cells, rectal advancement flaps, local tissue or muscle flaps, and ligation of intersphincteric fistula tract.

Concomitant Rectal and Vaginal Prolapse

Concomitant rectal and vaginal prolapse was historically managed as two separate problems by separate surgical specialties, but should be managed concomitantly with a multidisciplinary approach by both colorectal surgeons and urogynecologists as they originate from the same etiology. The combined sacral colpopexy and ventral rectopexy, as well as the perineal approach with uterosacral or sacrospinous ligament suspension combined with either Delorme or Altemeier perineal proctectomy, is described in this issue. Surgeons treating these diagnoses must be able to perform a full pelvic floor exam to assess for both vaginal and rectal prolapse before committing to a surgical intervention.

Locally Advanced Rectal Cancer

Another difficult surgical problem in the pelvis is locally advanced rectal cancer involving other structures. Treatment of such patients requires a multidisciplinary tumor board involving colorectal surgeons, radiation oncologists, and medical oncologists. Long-course neoadjuvant radiation is typically recommended, with some centers giving systemic chemotherapy as well prior to surgery. Surgery for curative intent must achieve an R0 resection, and in locally advanced rectal cancer, it is likely to require the collaborative management of multiple specialists aside from the colorectal surgeon including urologists, gynecologists, vascular surgeons, radiation oncologists, and plastic surgeons.

Reoperative Surgery and Surgical Complications

The next set of topics center around the challenges of surgery in reoperative fields and managing complications in colorectal surgery. The articles in this issue discuss the management of locally recurrent rectal cancer, failed ileal pouches, enterocutaneous fistulas, anastomotic leaks, and genitourinary complications.

Locally Recurrent Rectal Cancer

Surgical salvage for locally recurrent rectal cancer presents a similar set of challenges as locally advanced rectal cancer, but with the added challenges of working in a reoperative field. Such cases need to be discussed in a multidisciplinary tumor board, and the surgeon must engage in frank discussions with the patient regarding the magnitude of the operation and the expected functional and oncologic outcomes. An experienced exenterative team with strong leadership by the colorectal surgeon is paramount. The authors of this article will discuss the use of repeat irradiation in patients who underwent initial radiation therapy more than two years prior.

The Failed Ileal Pelvic Pouch

While the J-pouch has offered excellent quality of life to most patients, it is fraught with a high rate of significant

complications. Surgeons who perform ileal J-pouches must also be able to manage these complications. Pouch failure can be due to a variety of etiologies, including technical errors in the initial pouch operation, anastomotic leak, infection, functional problems, and development of Crohn disease. If pouch complications cannot be salvaged by nonoperative means, revisional surgery may be required and may involve a redo J-pouch, continent ileostomy, excision of J-pouch with anusectomy and end ileostomy, or simply fecal diversion. These surgical revisions—especially redo J-pouch or continent ileostomy—often warrant referral to colorectal surgeons who have subspecialized in these surgical indications and perform these reoperative pouch operations frequently.

Enterocutaneous Fistula

Enterocutaneous fistulas originate from iatrogenic causes such as anastomotic leak or missed enterotomy to inflammatory colorectal conditions such as Crohn disease and diverticulitis. Successful nonoperative closure is more likely to occur in long, low-output, and end fistula, without underlying sepsis, inflammation, or obstruction. Success rates are also higher if one is treated at a tertiary care center. Core treatment principles consist of maintaining the skin in good condition with local wound care and effective pouching, treating sepsis by ensuring that all undrained fluid collections are addressed, maximizing nutrition to counteract the catabolic losses from chronic sepsis, defining fistula anatomy using multimodal imaging strategies, and, if needed, a surgical procedure to definitively address the fistula. The tincture of time is a worthy ally in these cases, not only to allow the density of adhesions to lessen but also to optimize nutritional status and be convinced that the fistula actually needs a surgical fix. Waiting 6 to 12 months before operating is ideal to avoid the potential severe complications of additional enterotomies and fistulas that can result when one operates too soon.

Anastomotic Leaks

Perhaps the worse plague of colorectal surgery is the anastomotic leak, and all surgeons performing colorectal operations must be adept at managing them as they inevitably occur despite ensuring good blood supply and a tension-free anastomosis. Traditional management strategies involve reoperation for washout and either takedown of the anastomosis or proximal fecal diversion, or percutaneous drain placement of abscesses. Transanal drainage is an alternative to percutaneous drainage for leaks from low pelvic anastomoses. Newer techniques under investigation include placement of covered stents across leaking anastomoses and other endoscopic innovations.

Genitourinary Complications

Iatrogenic injury to the genitourinary system is another dreaded complication of complex and reoperative colorectal surgery, especially in cases involving inflammatory processes. While adherence to surgical principles will keep the colorectal surgeon out of the genitourinary system in the vast majority of cases, cases involving inflammatory processes

or fibrotic processes due to radiation or prior surgical trauma may obliterate the normal anatomical planes and thus increase the risk for injury. The surgeon must maintain a high suspicion for such injuries during the case, to prevent the even worse complication of a missed injury. Colorectal surgeons who do not have the benefit of an available urologist to provide intraoperative assistance for repair of an injury must be adept at managing these injuries on their own. Preoperative ureteral stent placement should be considered in patients who are expected to have distorted anatomy in the pelvis and are at high risk for intraoperative injury.

Implications for Surgical Quality

The final set of topics addresses specific surgical strategies for two common problems that arise in many complex and reoperative colorectal operations—creating a stoma under difficult circumstances and managing the perineal wound.

The Difficult Stoma

Creating a well-placed and well-functioning ostomy is of great importance as stoma function is intrinsic to the patient's postoperative quality of life. Surgical challenges arise when patients are obese or have a shortened mesentery, and surgeons must be adept in techniques to bring up enough bowel length to optimize pouching while maintaining adequate blood supply. Complications related to the stoma include ischemia, retraction, stenosis, hernia, and prolapse. Management of these complications is discussed elsewhere in this issue.

The Perineal Wound

Pelvic radiation, advanced distal rectal tumors, and extralevator abdominal perineal excision techniques for low rectal cancers result in perineal wounds at higher risk for dehiscence. The options for perineal wound closure include primary closure, with or without mesh, or flap reconstruction. The authors discuss the various options and their relative merits and downsides. Decisions for perineal wound management depend on risk factors such as expected defect size and radiation, prior incisions that may compromise flap blood supply, and the need for bilateral stomas in cases of pelvic exenteration.

Implications for Surgical Quality

Surgical quality has taken front and center stage, and there are growing implications for complications that affect providers in the form of public reporting and reimbursement. However, complex and reoperative cases are inherently more prone to complications and poorer outcomes. Policymakers must account for the higher risk of these cases so that policies that reward good outcomes do not result in the unintended consequence of creating disincentives for providers to take care of patients with complex problems.

Analyses of the American College of Surgeons National Surgical Quality Improvement Project (ACSNSQIP) database have demonstrated a higher incidence of complications in more complex cases. Surgical site infections are more likely to occur in more complicated cases such as colorectal operations

involving pelvic exenteration, resection of multiple organs, disseminated cancer, history of radiation therapy, obstruction, perforation, fistula, and history of ulcerative colitis or Crohn disease.^{11,12} The open approach (compared with minimally invasive approach) is used as a surrogate of complexity and was associated with surgical site infections as well as higher rates of readmission.^{12,13} Another surrogate of operative complexity is case duration, and longer cases are also associated with higher rates of readmission.¹³ It is inevitable that more difficult cases are at higher risk for surgical complications; therefore, risk adjustment for operative complexity is crucial for making sound policy decisions and drawing conclusions about surgical outcomes and quality.

Some complications are used as surgical quality metrics. One example of this is "accidental puncture or laceration," a patient safety indicator identified by a federal agency as a marker of surgical quality. While these occur more commonly in reoperative cases, they are not necessarily associated with poorer postoperative outcomes. In colorectal operations, serosal injuries or enterotomies are the most common accidental punctures or lacerations, and often occur in the course of adhesiolysis in reoperative surgery, but were found to be more a marker of surgical complexity than of surgical quality.^{14,15} We may be able to use such markers to identify cases of greater complexity and, thus, perform risk adjustment to ultimately improve the accuracy of surgical quality metrics.

The Effect of Surgeon and Hospital Volume on Complex Operations

The beneficial effect of surgeon and hospital volume on outcomes is well-documented in colorectal surgery. Surgeons who perform higher volumes of colorectal resections were found to have lower in-hospital mortality rates than those who perform fewer resections.¹⁶ While most colorectal cancer operations in the United States are performed at low-volume hospitals, there has been a trend toward the centralization of cancer care, with an increasing likelihood of treatment in a high-volume center. Over the same time period, in-hospital mortality has improved as well.¹⁷ Patients with colon and rectal cancer are now traveling farther than they used to, which may represent a barrier to accessing cancer care.¹⁸ National Cancer Institute–designated cancer centers are more likely to perform complex cancer operations such as synchronous colon–liver resections and locally advanced rectal cancers requiring resection of adjacent organs. While the rates of superficial surgical site infections are higher in these hospitals, the mortality rate for colorectal operations is lower.¹⁹

Summary

While all operations require preparation and communication with team members and patients, the success of complex and reoperative colorectal surgery demands it. In the operating room, our greatest asset is our collective experience, and the goal of this issue is to disseminate the lessons learned by our expert contributors.

References

- 1 Afilalo J, Eisenberg MJ, Morin JF, et al. Gait speed as an incremental predictor of mortality and major morbidity in elderly patients undergoing cardiac surgery. *J Am Coll Cardiol* 2010;56(20):1668–1676
- 2 Robinson TN, Wu DS, Sauaia A, et al. Slower walking speed forecasts increased postoperative morbidity and 1-year mortality across surgical specialties. *Ann Surg* 2013;258(4):582–588, discussion 588–590
- 3 Abellan van Kan G, Rolland YM, Morley JE, Vellas B. Frailty: toward a clinical definition. *J Am Med Dir Assoc* 2008;9(2):71–72
- 4 Lipman JM, Kiran RP, Shen B, Remzi F, Fazio VW. Perioperative factors during ileal pouch–anal anastomosis predict pouchitis. *Dis Colon Rectum* 2011;54(3):311–317
- 5 Van Der Krabben AA, Dijkstra FR, Nieuwenhuijzen M, Reijnen MM, Schaapveld M, Van Goor H. Morbidity and mortality of inadvertent enterotomy during adhesiotomy. *Br J Surg* 2000;87(4):467–471
- 6 Parker MC, Wilson MS, Menzies D, et al; Surgical and Clinical Adhesions Research (SCAR) Group. The SCAR-3 study: 5-year adhesion-related readmission risk following lower abdominal surgical procedures. *Colorectal Dis* 2005;7(6):551–558
- 7 Reisinger KW, van Vugt JL, Tegels JJ, et al. Functional compromise reflected by sarcopenia, frailty, and nutritional depletion predicts adverse postoperative outcome after colorectal cancer surgery. *Ann Surg* 2015;261(2):345–352
- 8 Keller DS, Bankwitz B, Nobel T, Delaney CP. Using frailty to predict who will fail early discharge after laparoscopic colorectal surgery with an established recovery pathway. *Dis Colon Rectum* 2014;57(3):337–342
- 9 Kruser JM, Nabozny MJ, Steffens NM, et al. "Best case/worst case": qualitative evaluation of a novel communication tool for difficult in-the-moment surgical decisions. *J Am Geriatr Soc* 2015;63(9):1805–1811
- 10 Beck DE, Ferguson MA, Opelka FG, Fleshman JW, Gervaz P, Wexner SD. Effect of previous surgery on abdominal opening time. *Dis Colon Rectum* 2000;43(12):1749–1753
- 11 Kwaan MR, Melton GB, Madoff RD, Chipman JG. Abdominoperineal resection, pelvic exenteration, and additional organ resection increase the risk of surgical site infection after elective colorectal surgery: an American College of Surgeons National Surgical Quality Improvement Program analysis. *Surg Infect (Larchmt)* 2015;16(6):675–683
- 12 Lawson EH, Hall BL, Ko CY. Risk factors for superficial vs deep/organ-space surgical site infections: implications for quality improvement initiatives. *JAMA Surg* 2013;148(9):849–858
- 13 Esemuede IO, Gabre-Kidan A, Fowler DL, Kiran RP. Risk of readmission after laparoscopic vs. open colorectal surgery. *Int J Colorectal Dis* 2015;30(11):1489–1494
- 14 Kin C, Snyder K, Kiran RP, Remzi FH, Vogel JD. Accidental puncture or laceration in colorectal surgery: a quality indicator or a complexity measure? *Dis Colon Rectum* 2013;56(2):219–225
- 15 Mavros MN, Bohnen JD, Ramly EP, et al. Intraoperative adverse events: risk adjustment for procedure complexity and presence of adhesions is crucial. *J Am Coll Surg* 2015;221(2):345–353
- 16 Karanicolas PJ, Dubois L, Colquhoun PH, Swallow CJ, Walter SD, Guyatt GH. The more the better?: the impact of surgeon and hospital volume on in-hospital mortality following colorectal resection. *Ann Surg* 2009;249(6):954–959
- 17 Stitzenberg KB, Meropol NJ. Trends in centralization of cancer surgery. *Ann Surg Oncol* 2010;17(11):2824–2831
- 18 Stitzenberg KB, Sigurdson ER, Eggleston BL, Starkey RB, Meropol NJ. Centralization of cancer surgery: implications for patient access to optimal care. *J Clin Oncol* 2009;27(28):4671–4678
- 19 Merkow RP, Bentrem DJ, Chung JW, Paruch JL, Ko CY, Bilimoria KY. Differences in patients, surgical complexity, and outcomes after cancer surgery at National Cancer Institute–designated cancer centers compared to other hospitals. *Med Care* 2013;51(7):606–613