Current Concepts and Controversies in Surgery for IBD

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Surgery improves the quality of life in patients with Crohn's disease (CD) and cures patients with chronic ulcerative colitis (CUC). There are several surgical controversies primarily involving techniques and long-term outcomes. Some debates are long standing; whether to perform a double-stapled ileal pouch–anal anastomosis (IPAA) or a mucosectomy and hand-sewn anastomosis, and whether to divert or not to divert in patients with CUC undergoing an IPAA. Other issues are more recent, such as the effects of age, pregnancy, pouch salvage, and laparoscopic IPAA. In patients with Crohn's disease the anastomosis technique, the management of perianal disease, and the role of laparoscopic surgery are topics of debate. This review shows the current concepts and controversies in the surgical management of patients with CUC or CD.

The term inflammatory bowel disease (IBD) incorporates chronic ulcerative colitis (CUC) at one end of the spectrum and Crohn's disease (CD) at the other. Indeterminate colitis (IC) resides somewhere in-between. The cause of IBD is unknown. The incidence of CUC has been stable over time, whereas the incidence of CD has increased.[1] Between 30% and 40% of patients with CUC will need surgery intervention in the course of their disease, whereas between 70% and 80% of CD patients will require surgery at some point after diagnosis of the disease. The proper role of surgery in patients with CD and UC is controversial. It is a multidisciplined approach between the patient, surgeon, and gastroenterologist that makes successful treatment of IBD possible. This review shows the current concepts and controversies of surgery for IBD.

CUC

The current controversies surrounding the surgical treatment of CUC center principally around modifications of the ileal J-pouch–anal anastomosis (IPAA) procedure. IPAA has become the standard of care and the most common surgical option offered to patients with UC and familial adenomatous polyposis. Since its introduction,[2] the technical points of IPAA have been debated. We discuss several of these controversies.

Mucosectomy Versus Double-Staple Technique

The elimination of colonic mucosa is the goal of surgical intervention. This therapeutic aim theoretically eliminates the risk for neoplastic transformation. Since the first description of the technique of double-stapled IPAA,[3] the controversy about the risk for dysplasia and residual disease in the remaining anal canal epithelium has been debated. The ease of use and benefits of improved function have made the double-stapled anastomosis the most widely used anastomotic technique. These benefits must be balanced against potential persistence of disease and malignant change in the retained mucosa (Table 1).

Double-stapled IPAA likely preserves the anal transition zone (ATZ) and its nerve endings better than endoanal mucosal resection. The ATZ is that portion of the anal canal between the uninterrupted squamous epithelium of the dentate line below and the uninterrupted columnar epithelium of the rectal epithelium above. The ATZ contains finger-like projections of columnar rectal epithelium and transitional epithelium. We reported in a prospective randomized trial that improved fecal continence at night occurred when the doubled-stapled technique was used. In this series, 64% of the hand-sewn group experienced occasional or frequent episodes of incontinence compared with 38% of the stapled group.[4] Higher anal canal resting pressures (49.4 vs. 78.3 mm Hg, $P < 0.05$) and squeeze pressures (144 vs. 195 mm Hg, $P < 0.06$) also were found when the stapled technique was used. These findings have been supported by other randomized, prospective, and retrospective trials.[5–8] However, other randomized trials have failed to find a difference in function between the double-stapled technique and mucosectomy.[9,10]

Abbreviations used in this paper: ATZ, anal transition zone; CUC, chronic ulcerative colitis; IC, indeterminate colitis; IPAA, ileal pouch–anal anastomosis.

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Table 1. Mucosectomy Vs. Double-Stapled Anastomosis

Findings	Double stapled	Mucosectomy
Technical ease	Yes	No
Preserves ATZ	Yes	No
Improved function	Yes	No
Decreases septic complications	?	?
Decreases dysplasia risk	No	Yes
Decreases cancer risk	No	No

Along with function, safety also has been shown to be improved.[11] In these series, it has been noted that leaks from a stapled anastomosis had a better prognosis than leaks from a hand-sewn anastomosis (although the reason for the difference is not apparent). Likewise, Ziv et al.[12] found that the double-stapled technique produced fewer septic complications and fewer sepsis-related pouch excisions than did the hand-sewn technique.

The strongest argument for mucosectomy is the potential risk for cancer developed in the retained anal canal epithelium. At the 10-year follow-up evaluation of the double-stapled IPAA, the incidence of dysplasia in the ATZ is approximately 5%.[13] Although there have been reports of cancer developing after IPAA, it has occurred after double-stapling[14,15] and endoanal mucosectomy.[16–19] Although endoanal mucosectomy theoretically removes all anal canal mucosa to the dentate line, we have shown that residual of rectal mucosa may remain in the denuded muscle cuff in up to 14% of patients and in up to 7% of patients at the anastomosis.[20] To decrease potential risks for developing dysplasia or neoplasia in the pouch and ATZ, yearly digital examination and endoscopic biopsy examination of the pouch and ATZ is performed. If dysplasia is found in the ATZ, transanal mucosectomy with ileal pouch advancement is advocated.[21]

In conclusion, stapled IPAA is safe and likely provides improved function compared with a hand-sewn anastomosis. However, in patients with dysplasia of the rectum, endoanal mucosal resection is the procedure of choice.

Role of Temporary Diverting Ileostomy

Among surgeons with the most experience in performing IPAA, the procedure of choice is to construct a temporary ileostomy to divert the fecal stream. Several investigators have, over the years, proposed that a single-staged surgery is no more morbid than a 2-stage procedure.[22–30] We first looked at these issues several years ago and reported on 37 patients who had a single-stage IPAA. These patients were compared with a case-matched group of 37 patients who had an IPAA performed with defunctioning ileostomy.[31] We found no statistical difference in complication rates, or in second surgery rates between the 2 groups. Functional outcomes also were similar in both groups. Others have reported similar long-term functional outcomes in patients undergoing single-staged IPAA.[32] Another even more controversial issue is performing an IPAA laparoscopically without diversion. Ky et al.[33] reported on 37 patients who underwent laparoscopic IPAA, 32 of whom had no diverting ileostomy. Results, in terms of morbidity and functional outcomes, were not different between groups.

It seems obvious that eliminating a temporary stoma would decrease the mechanical and functional complications associated with an ileostomy.[28,34,35] At the Mayo Clinic, we found[26] that mechanical complications occurred in 39 of 157 patients treated with diversion (retraction 16%, prolapse 1%, fistula 1%, abscess 1.0%, bowel obstruction related to stoma 6%). Functional complications occurred in 111 patients (peristomal irritation 54%, leakage 8%, high output 4%, incomplete diversion 6%). After stoma closure, bowel obstruction occurred in 15%, peritonitis in 7%, and wound infections in 2%. Although obstructions most often are managed nonsurgically, surgery occasionally is required. Complications such as high ileostomy output lead to dehydration and re-admission in as many as 20% of cases.[36]

Grobler et al.[34] compared 23 patients with IPAA and loop ileostomy with 22 IPAA patients without loop ileostomy. The double-stapled technique was used in all patients, none were on steroids, and all had uncomplicated surgeries. There were no statistically significant differences in postoperative complication rates or function.[34] We and others have used similar selection criteria. Other parameters such as general health, comorbid factors, nutritional status, anemia, age, and current use of steroids or other immunosuppressive drugs have been investigated. Furthermore, intraoperative considerations including absence of tension, adequate anastomotic blood supply, lack of intraoperative complications, and satisfactory intraoperative testing of the integrity of the anastomosis are critical. Although not preventing anastomotic complications, a diverting ileostomy likely mitigates their severe complications. At the Mayo Clinic, pelvic sepsis occurs in about 5% of patients undergoing IPAA.[37]

The data to support our current practice was reported by Garbus et al.[36]; none of 110 patients who had an ileoanal pouch had clinical evidence of leaks when a diverting ileostomy was used. Three of 36 patients who had IPAA without an ileostomy had leaks that required

fecal diversion. Williamson et al.[22] concluded that one-stage restorative proctocolectomy without a diverting ileostomy was associated with an increased risk of death. In 73 patients who developed pelvic sepsis after IPAA, the pouch failure rate (permanent diversion or pouch excision) was 26%, compared with 6% in patients without sepsis.[37] Although evacuation frequency was similar, fecal incontinence occurred more frequently in patients with pelvic sepsis.[37] Significant lifestyle restrictions also occurred more frequently.[37] Aside from the long-term poor functional outcomes, sepsis also may be life threatening.[22] It seems reasonable, therefore, to advocate that a diverting ileostomy remain an integral part of IPAA.

Age

IPAA generally is performed in young patients: the mean age at surgery is approximately 30–35 years in almost all of the large reported series. Recently, IPAA has been performed increasingly in older patients. Bauer et al.[38] reported on 66 IPAA patients who were greater than 50 years of age and compared them with 253 patients less than 50 years old. Overall morbidity, mortality, and functional outcomes were similar.[38] Interestingly, however, a recent large trial reported by Delaney et al. found that nighttime seepage, incontinence, and overall quality of life actually were decreased in older patients.[39] We, too, have found the incidence of nocturnal evacuation and incontinence to be increased in older patients,[40–42] although satisfaction remains high (age >65 years, 89% satisfied; age <65 years, 98% satisfied).[39,40] It appears that in the properly motivated patient, age may not be a contraindication to pouch surgery.

Indeterminate Colitis

Even with the entire colonic specimen in hand, surgical pathologists are unable to differentiate between CD and CUC in 10%–15% of patients. When no clear distinction can be made between CUC and CD, patients have IC. There is much confusion in the literature regarding IC. In reports of patients with IC from the Mayo Clinic, we confirmed the diagnosis of IC in those patients who had no evidence of CD preoperatively (specifically, no evidence of perianal pathology), but who on review intraoperatively had one more confounding factor (skip areas, deep ulcerations, and so forth). Thus, a patient is diagnosed with IC only when a preoperative diagnosis of CUC is confounded by histopathology suggestive of CD intraoperatively. When IC is diagnosed, IPAA is performed.

Although failure rates in patients with IC (6.5% to 19.0%)[43–45] are much better than in patients with CD (15% to 43%), the results still are not as good as those with CUC (1.4% to 8.0%).[46] Unfortunately, not only is failure of the pouch more frequent, but anorectal septic complications[47,48] are increased as well with IC. We found the long-term function to be noted as good in up to 73% of patients.[49,50] Although some of these IC patients go on to develop CD, it still is reasonable given the acceptable results to precede with IPAA in a patient with IC features and no ileal or perianal disease.

Pregnancy

Fecundity describes the biological ability to conceive and is based on the time periods of unprotected intercourse and expressed as fecundability (the probability of becoming pregnant per month with unprotected intercourse).[51] Women with UC are known to have fecundity equal to that of the general population.[52–54] After IPAA, parturition is normal and IPAA function appears to be unaffected.[55] Among 544 women who had IPAA and were under the age of 40, there were 142 pregnancies.[55] Of these, more than 50% had vaginal deliveries and many had multiple births after IPAA.

Two Dutch reports determined fecundity among patients after IPAA. The first study[56] assessed 237 women 12 months after stoma closure until the time of the study, or age 50 years. Birth rates were compared with the general population. The investigators found a slight decrease in the rate of fertility before IPAA at 87% of predicted ($P < 0.05$), but a significant decrease in fertility after IPAA of 49% of predicted ($P > 0.001$).[12,27] The second trial followed-up 290 women after IPAA and compared them with 661 women in a reference population.[51] The investigators found equivalent fecundity before IPAA, but after IPAA the fecundity decreased by 80%. This reduction in fecundity persisted over the 60-month follow-up period. The most likely cause of decreased fecundity is tubal occlusion from adhesive disease. These same problems have been reported in other series. Whether a laparoscopic approach might ameliorate this decreased fecundity after IPAA is unknown.

Revisional Pouch Surgery

IPAA fails in about 8% of patients, and some patients are candidates for pouch revision. We looked at outcomes of pouch revision and found that two thirds of patients had good clinical outcomes (Table 2).[56–64] When pelvic sepsis was the cause of pouch failure, the long-term outcomes were less optimistic. Others have reported as well that pouch failure caused by pelvic sepsis

Table 2. Reoperations for Failure After IPAA

Study	Year	No. patients	Salvage rate, %	Good result, %
Galandiuk et al.[57]	1990	114	80	70
Poggioli et al.[60]	1993	6	83	66
Sagar et al.[56]	1996	23	74	48
Herbst et al.[61]	1996	16	81	80
Ogunbiyi et al.[66]	1997	32	50	50
Fazio et al.[63]	1998	35	86	49
Cohen et al.[64]	1998	24	75	62
Fonkalsrud and Bustorff-Silva[62]	1998	164	97	93
Saltzberg et al.[59]	1999	29	60	NS
Zmora et al.[58]	2000	25	84	64

NS, not specified.

resulted in poor long-term outcomes.[65,66] However, with increasing experience, salvage rates have climbed from 50% to 90% (Table 1).

Laparoscopic IPAA

The use of laparoscopic surgery for diseases of the colon and rectum began in the early 1990s. The need for advanced skills is obvious given that surgeries on the colon involve all 4 quadrants and procedures are performed on organs that move. Likewise, the unforgiving and friable nature of the disease adds to the complexity of the procedure.

Initially it appeared that laparoscopic approaches to treat CUC added little or no benefit (Table 3)[67–70] compared with standard surgeries. Indeed, the earliest reports detailed increased morbidity and no benefits.[71–73] More recently, reports that laparoscopic IPAA is not only feasible, but may confer benefits over open IPAA, have appeared.[68–70,74,75] Benefits include improved cosmesis, reduced pain, earlier return of bowel function, decreased morbidity, earlier discharge from the hospital, improved nutrition,[76] preservation of immune response,[77,78] and decreased long-term complications.[74,79–82] Functional outcomes and quality of life after laparoscopic IPAA appear to be no different from open IPAA.[70]

Potential longer-term benefits include fewer adhesions and less hernia formation,[83–85] improved fertility, and better quality of life.[70,72] The consequences of the adhesions typically associated with open IPAA include: chronic pain, small bowel obstruction, ileus, and infertility.[86] The rate of small bowel obstruction after IPAA is about 20%, with half of patients requiring surgery. Moreover, the cumulative risk for small bowel obstruction at 10 years after IPAA is 31%.[87]

Although the actual technique of laparoscopic IPAA varies among institutions, at the Mayo Clinic we use a simplified 4-port technique, with extracorporeal mesenteric vascular ligation and J-pouch construction, through a 4–5-cm periumbilical incision. Our early experience with laparoscopic IPAA has been reported.[75] Seven patients undergoing laparoscopic IPAA were compared with 7 case-matched controls undergoing conventional open IPAA. We found significant reductions in intravenous narcotic use, time to resumption of regular diet (2 vs. 7 days, $P = 0.010$), and length of hospital stay (4 vs. 9 days, $P = 0.012$). Complication rates were the same in both groups. Surgical times were significantly longer with the laparoscopic approach (median = 340 vs. 237 minutes, $P = 0.013$), however, with experience, surgical times have diminished, with most procedures now requiring approximately 3 hours.

Marcello et al.[68] published their case-matched comparative study of open vs. laparoscopic IPAA and found that laparoscopic IPAA not only had the same complication rate as open IPAA (20% vs. 25%), but patients had a faster return of bowel function and shorter hospital stay as well. Similarly, Hasegawa et al.[69] reported that laparoscopic IPAA is both feasible and safe in their study of 18 patients. Dunker et al.[88,89] found cosmetic results and improved body image, as well as improved global physical function in patients after laparoscopic IPAA. In summary, laparoscopic IPAA may confer measurable benefits to patients requiring IPAA for CUC and the technique continues to evolve.

Laparoscopy in CD

Minimally invasive techniques are ideally suited for patients with CD. Both randomized and nonrandomized studies have shown that morbidity and mortality after laparoscopic resection are the same as after open resection (Table 4).[86,90–104] Duepree et al.[95] showed that patients undergoing laparoscopic ileocolic resection for CD had a shorter time to resumption of diet, time to bowel function, and length of hospital stay.[23] Moreover, Milsom et al.[90] found that recovery of pulmonary function returned earlier in the laparoscopic group, but time to first bowel movement and hospital stay were not significantly different.[90] Finally, Bergamaschi et al.[93]

Table 3. Laparoscopic IPAA

Study	Year	No. patients	Conclusion
Wexner et al.[73]	1992	5	No benefit
Peters et al.[67]	1992	2	—
Schmitt et al.[72]	1994	22	No benefit
Santoro et al.[80]	1999	5	Benefit
Dozois et al.[75]	1999	7 (7 matched)	Benefit
Marcello et al.[68]	2000	20 (20 matched)	Benefit
Dunker et al.[70]	2001	16	Benefit
Hasegawa et al.[69]	2002	18	Feasible

Table 4. Laparoscopic Surgery for CD

Study	Year	No. patients	Obstruction rates: open vs. laparoscopic	Hernia rates: open vs. laparoscopic	Morbidity	Length of stay (days)
Milsom et al.[101]	1993	9			0	7
Liu et al.[99]	1995	10				7
Ludwig et al.[100]	1996	31			2	6
Reissman et al.[102]	1996	51			14	5.1
Reissman et al.[103]	1996	72 total/49 CD			18 total	6.5
Bauer et al.[92]	1996	25			0	6.5
Wu et al.[104]	1997	46			7	4.5
Hildebrandt et al.[98]	1998	222			15	.5–8
Canin-Endres et al.[94]	1999	88			8	4.2
Hamel et al.[97]	2001	130			18	8.8
Milsom (PRT) et al.[90]	2001	31 laparoscopic/29 open			6	5
Duepree et al.[95]	2002	21			14.3	3
Bergamaschi et al.[93]	2003	39	35.4% vs. 11.1%			5.6
Duepree et al.[96]	2003	211 total/123 IBD	24.3% vs. 8.1%	14% vs. 3.3%		NR

PRT, prospective randomized control trial; NR, not reported.

compared 39 laparoscopic ileocolectomies with 53 open ileocolectomies and found a shorter hospital stay in the laparoscopic group. Moreover, they found that the rate of small bowel obstruction was 35% and 11% in favor of the laparoscopic group.

Anastomotic Techniques

Whether the actual surgical techniques impact on the rates of recurrence and need a second surgery is unknown. Eventually about 80% of patients with CD will require surgery and 30% will require a second surgery within 5 years. Patients with the ileocolic variant of CD have the highest risk for recurrence; fully 42% of patients will require a second surgery by 15 years.[105,106] This rate of recurrence is not affected by achieving clear margins. Because disease can recur at the site of anastomosis, it seems reasonable to question whether the type of anastomosis constructed influenced the rate of recurrence of disease.

Several retrospective studies have found that a stapled anastomosis achieved longer intervals of time between recurrences. Moreover, the trials by Hashemi et al.,[107] Yamamoto et al.,[108] and Munoz et al.[109] have documented that stapled anastomosis is superior to hand-sewn techniques in this regard. However, these studies were not randomized, and will need to be addressed by a randomized trial comparing stapled vs. hand-sewn anastomosis.

Strictureplasty plays a prominent role in the surgical management of small bowel CD. Isolated strictures under 10 cm in length often are considered for strictureplasty. Our original experience with 35 patients in whom 71 strictureplasties were performed and who were followed-up for over 3 years found no significant increase in postoperative morbidity and symptomatic recurrence rates of 20%.[110] Two more recent reports of more than 1400 strictureplasties followed-up for more than 7 years found second surgery rates of between 34% to 44% and symptomatic relief in more than 95% of patients.[111,112] Strictureplasty is indeed valuable in the surgical treatment of CD.

Perianal Disease

The primary treatment approach for patients with CD with perineal involvement is combined medical and surgical management.[113] Either one alone is not efficacious. Surgically, a noncutting seton is used most commonly and its effectiveness in managing complex fistulas is well documented.[114–118] A seton is a nonabsorbable suture (or vessel loop) that is placed through the fistula tract. Passing it through the cutaneous opening of the fistula and out of the associated anal canal opening allows the 2 ends to be tied loosely together. Although sometimes these draining setons are uncomfortable for the patient, drainage is maintained, thus decreasing the risk for recurrent abscess while aggressive medical therapy is instituted.

Among 27 patients with fistulizing CD, Scott and Northover[117] reported that 85% of patients treated with noncutting setons experienced fistula closure. Although other investigators have reported good initial results by using such setons,[114,119] the recurrence rate approaches 40% after removing the seton. This high recurrence rate appears to lend legitimacy to our use of concomitant antibiotics, azathioprine, or 6-mercaptopurine and infliximab.[120,121] Recent experience at the Mayo Clinic showed that infliximab and surgery has led to the resolution of perianal fistulas in 68% of patients.[122] We also found that the addition of seton placement with infliximab reduced the rate of recurrent abscess. Topstad et

al.[123] found that 67% of patients had a complete response to combination therapy and 19% a partial response. In a comparative study by Regueiro and Mardini,[124] perianal fistulas were treated with infliximab alone vs. combination infliximab plus seton placement. They found that initial response was improved with seton placement (100% vs. 82.6%), lower recurrence rates (44% vs. 79%), and longer time to recurrence (13.5 vs. 3.6 months). At the Mayo Clinic, medical therapy is instituted together with placement of setons. Once the inflammation subsides, the seton is downsized as the fistula fibroses and narrows in caliber, or it is removed.

Summary

Controversies in IBD surgery are many and varied. There will no doubt be continued improvement in our understanding of both the techniques and outcomes of surgery for IBD. The most interesting and promising developments are the adaptation of minimally invasive techniques for CD and CUC patients and the recognition that medical and surgical management are required to manage perianal CD efficaciously.

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