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Elective and Emergent Surgery in the Ulcerative Colitis Patient

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Abstract

Ulcerative colitis (UC) requires surgical management in 20 to 30% of patients. Indications for surgery include medically refractory disease, dysplasia, cancer, and other complications of UC. Appropriate patient selection for timing and staging of surgery is paramount for optimal outcomes. Restorative proctocolectomy is the preferred standard of care and can afford many patients with excellent quality of life. There have been significant shifts in the treatment of UC-associated dysplasia, with less patients requiring surgery and more entering surveillance programs. There is ongoing controversy surrounding the management of UC-associated colorectal cancer and the techniques that should be used. This article reviews the most recent literature on the indications for elective and emergent surgical intervention for UC and the considerations behind the surgical options.

Keywords
- ulcerative colitis
- total proctocolectomy
- ileal pouch anal anastomosis
- surgery

Ulcerative colitis (UC) is a chronic immune-mediated inflammatory disorder, characterized by continuous mucosal inflammation from the rectum to the colon. Despite significant advances in the medical management of UC with the development of biologic agents, approximately 20 to 30% of patients will still require surgery in their lifetime.[1,2] This article reviews the indications for elective and emergent surgery for UC and the considerations behind the various techniques used to treat this disease.

Indications for Elective Surgery

Elective indications for surgery include medically refractory colitis, dysplasia, and cancer. Medically refractory colitis makes up 70% of patients eventually requiring surgery. The medical management of UC is beyond the scope of this article, but it is important to emphasize that a multidisciplinary discussion involving at least the patient's gastroenterologist and surgeon is imperative. Studies have shown that up to 40 to 50% of patients wished they had been offered surgery earlier,[3] which reveals the importance of early surgical referral and open communication between specialties.

With an array of biologic therapies currently available, the decision to escalate medical therapy or offer surgery remains complex. Several factors should be considered including symptom severity, the degree of endoscopic mucosal healing, side effects of medications, duration of corticosteroid use, patient risk factors, and patient preference. Prolonged medical therapy can lead to corticosteroid dependence, malnutrition, and physical deconditioning, all of which negatively impact surgical outcomes. Proctocolectomy can dramatically improve quality of life for patients with longstanding disease, but also comes with its own set of risks and morbidity. Thoughtful discussion between the patient and care providers on this risk/benefit balance is key to successful treatment.

Staged Operations for Ulcerative Colitis

Restorative proctocolectomy (RP) with ileal pouch-anal anastomosis (IPAA) is the preferred standard of surgical care for UC. This can be completed in one, two, or three stages. In the single-stage pouch, total proctocolectomy and IPAA are completed in one setting. There are few candidates that meet criteria for this approach, as most patients presenting for surgery have had longstanding disease, and/or have received significant treatment with combinations of immunosuppressives, biologic medications, and steroids. For

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this reason, the vast majority of patients undergo a two-stage (traditional or modified) or three-stage surgery. In the traditional two-stage approach, total proctocolectomy and IPAA are associated with a protective diverting loop ileostomy that is closed 2 to 3 months later. For patients who are not candidates for upfront IPAA, a three-stage or modified two-stage operation can be offered. The three-stage approach initially involves total abdominal colectomy with end ileostomy, followed by completion proctectomy with IPAA and diverting loop ileostomy. The ileostomy is closed in the final third stage. The modified two-stage also starts with total abdominal colectomy and end ileostomy but is followed by completion proctectomy and IPAA without fecal diversion. The latter two approaches are used in the acute setting and considered for elective patients unable to wean off steroids prior to surgery, patients with significant comorbidities including obesity, women considering pregnancy, and patients with an uncertain diagnosis.

Undiverted IPAA

Fecal diversion of the IPAA is a key feature of both the traditional two- and three-stage pouch. Creation of the defunctioning stoma is thought to decrease the severity of pelvic sepsis and improve pouch salvage rates should a leak occur. However, recent studies have called into question this dogma and the need for universal fecal diversion with IPAA. In a study by Widmar et al looking at 317 diverted and 670 undiverted pouches, there was no difference in anastomotic leak rates or need for long-term ileostomy defined as greater than 200 weeks after pouch creation. In those patients who leaked, there was a higher rate of pouch excision in the diverted group, but a higher rate of reintervention within 30 days in the undiverted group.[4] Similarly, a study by Lavryk et al examining 4,031 IPAA patients found no difference in pouch survival between diverted ($n = 326$) and undiverted patients ($n = 31$) who experienced pelvic sepsis (88% vs. 87% at 10 years). However, the undiverted group was associated with a higher reoperation rate (48% vs. 12%, $p < 0.0001$).[5] These findings suggest that initial diversion at the time of IPAA creation may mitigate the morbidity associated with pelvic sepsis, but does not influence long-term success of the pouch. This data must be taken with caution given the retrospective design and treatment selection bias inherent to these studies. Omission of fecal diversion for IPAA should only be considered in well nourished, healthy patients with minimal comorbidities, no intraoperative complications, and off any type of immunosuppression. For these reasons, a one-stage IPAA is very rarely performed.

The modified two-stage approach allows optimization of the patient's nutritional status, control of comorbidities, and the opportunity to wean off immunosuppression prior to IPAA, making the patients suitable candidates for omission of diversion. Proponents of the modified two-stage IPAA have questioned the need for a three-stage approach. Swenson et al looked at a small number of patients undergoing three-stage ($n = 31$) and modified two-stage ($n = 23$) IPAA. They found no difference in anastomotic leak or functional outcomes, but did find significantly decreased hospital cost in the modified two-stage group.[6] In a larger study comparing the traditional two-stage ($n = 223$) versus modified two-stage IPAA ($n = 237$), those in the modified two-stage group had a lower rate of anastomotic leak (15.7% vs. 4.6%, $p < 0.01$).[7] This may be due to less steroid and immunosuppressant use prior to IPAA creation in the modified two-stage group, but this was not specifically analyzed. Despite these promising results in favor of a modified two-stage IPAA, its acceptance in the inflammatory bowel disease (IBD) colorectal community remains limited due to the retrospective design of these studies. At least in the United States, most IPAA are performed in three stages.[8] The IDEAL trial, a prospective, multicenter randomized controlled trial comparing completion proctectomy and IPAA with and without diversion in patients with UC or indeterminate colitis should shed more light on the applicability of the modified two-stage procedure in UC.[9]

Staged IPAA and Biologic Use

It is well established that preoperative corticosteroids at a dose greater than 20 mg/day are associated with a higher risk of postoperative pouch-related infectious complications.[10,11] However, the preoperative use of monoclonal antibody therapy remains controversial. There is conflicting data in retrospective reviews linking the use of biologic therapy with postoperative infectious complications (►**Table 1**). The PUCCINI trial (Prospective cohort of UC and Crohn's disease patients undergoing surgery to identify risk factors for postoperative INfection I) addressed the debate regarding anti-tumor necrosis factor (TNF)-α therapy with a large prospective, multicenter analysis of 955 patients undergoing surgery for IBD. The study did not identify any difference in infectious complications between patients with or without anti-TNF therapy.[12] However, this study included a variety of operations for any IBD diagnosis and was not specifically focused on IPAA for UC. Gu et al compared the outcomes of patients on anti-TNF therapy undergoing a traditional two-stage versus three-stage procedure. They found that the use of anti-TNF therapy was an independent risk factor for pelvic sepsis in those patients who had a two-stage IPAA, but not among those treated with a three-stage approach.[13] Given the conflicting data and ongoing debate, a three-stage or modified two-stage approach should be preferred for patients on biologic therapy, particularly in those with other risk factors for postoperative infectious complications.

Staged IPAA and Obesity

Although a substantial proportion of patients with UC are underweight and malnourished, the number of obese patients with IBD is increasing.[14] The excess visceral fat in this patient population can limit the flexibility of the mesentery in reaching the deep pelvis and increased body mass index (BMI) is an independent predictor of pouch abandonment during IPAA.[15] Khasawneh et al found that the chance

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Table 1 Studies on association between biologic therapy and 30-day postoperative morbidity after total proctocolectomy and IPAA for UC

Author	Year of publication	Study design	Biologic medication	Patient numbers (biologics/no biologics)	Infectious complication rate (%, biologics/no biologics)	*p*-Value	AL rate (%, biologics/no biologics)	*p*-Value	Pelvic sepsis rate (%, biologics/no biologics)	*p*-Value
Selvasekar et al[42]	2007	RC	IFX	47/254	28/10	< 0.01	9/2	0.02	11/5	NS
Mor et al[43a]	2008	RC	IFX	46/46	NR	—	17.4/2.2	0.023	21.7/2.2	0.016
Coquet-Reinier et al[44]	2010	RCM	IFX	13/13	NR	—	0/7.7	NS	7.7/0	NS
Gainsbury et al[45]	2011	RC	IFX	29/52	17.2/26.9	NS	3.5/9.6	NS	13.8/13.5	NS
Selvaggi et al[46]	2015	MA	IFX	162/468	26/8	< 0.00001	NR	—	NR	—
Kim et al[47]	2020	RCM	VDB	25/54	8/20	NS	NR	—	4/0	NS

Abbreviations: AL, anastomotic leak; IFX, infliximab; IPAA, ileal pouch-anal anastomosis; MA, meta-analysis; NR, not reported; NS, not significant; RC, retrospective cohort study; RCM, retrospective case-matched study; UC, ulcerative colitis; VDB, vedolizumab.
[a]Also included patients with indeterminate colitis.

of an unsuccessful pouch rose from 2% in patients with a BMI of 30 to 15% with a BMI of 40.[16] Furthermore, obesity has been associated with an increased risk of postoperative infectious complications (►**Table 2**). To maximize chances of short- and long-term pouch success, a staged approach with a goal BMI of less than 30 kg/m^2 prior to IPAA should be considered.

Staged IPAA and Fertility

Multiple studies have shown that proctectomy with or without IPAA has an adverse impact on fertility (►**Table 3**). The cause of infertility is likely due to anatomical changes in the pelvis after surgery. Oresland et al specifically looked at these anatomical distortions in 21 patients after IPAA. They found that only one-third of the patients retained normal fallopian tubes, while 52% developed unilateral tubal occlusion and 48% developed adherence to the pelvic floor.[17] Minimally invasive approaches to IPAA may minimize the adhesion formation and distortion of fallopian tubes, thus decreasing the risk of postoperative infertility. In a cross-sectional study of 50 patients attempting to conceive after IPAA, Bartels et al found that those who underwent laparoscopic IPAA had a higher pregnancy rate compared with patients who had open procedures.[18] In contrast, Gorgun et al reported no difference in infertility rates between laparoscopic ($n = 18$) and open procedures ($n = 143$), but found that time to conception was faster in the laparoscopic group (3.5 vs. 9 months, $p = 0.01$).[19] Though much of the evidence is hindered by small numbers and recall bias, the available data suggests an overall negative association between proctectomy and infertility. Given these findings, a staged approach with delayed proctectomy should be discussed and strongly considered for women seeking pregnancy. If patients wish to pursue IPAA, a minimally invasive approach is preferred.

Ileorectal Anastomosis in Ulcerative Colitis

Though IPAA is the preferred surgical approach for UC, total abdominal colectomy with ileorectal anastomosis (IRA) may be considered in select patients with limited rectal disease. IRA is technically less challenging, is associated with improved functional outcomes,[20] and potentially decreased rates of pelvic sepsis, urinary and sexual dysfunction, and female infertility when compared with IPAA. Despite these presumed advantages, IRA is associated with refractory proctitis and failure rates up to 27 and 40% at 10 and 20 years, respectively.[21] Close surveillance is required as these patients are at risk for development of metachronous cancer in the remaining rectum, with an incidence of 1.4, 3.2, and 7.3% at 5, 10, and 20 years, respectively. Risk factors include duration of IBD, synchronous primary sclerosing cholangitis, and presence of colonic adenocarcinoma.[22] We recommend consideration of IRA in patients with limited rectal disease, adequate rectal compliance upon endoscopic air insufflation, and appropriate resources available for endoscopic surveillance. Unless significant comorbidities preclude RP, patients

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Table 2 Studies on association between BMI and postoperative complications after IPAA

Author	Year of publication	Study design	Diagnosis	Patient numbers (obese/ nonobese)	Overall complication rate (%, obese/ nonobese)	*p*-Value	AL rate (%,obese/ nonobese)	*p*-Value	Pelvic sepsis rate (%, obese/ nonobese)	*p*-Value
Kiran et al[48]	2008	RC	UC, IC, FAP, CD	345/1671	94.9/88[b]	0.006	NR	—	6.7/5.3	NS
Canedo et al[49]	2010	RC	UC, FAP, CD	65/65	67.7/53.8	NS	6.4/3	NS	6.5/1.5	NS
Klos et al[50]	2014	RC	UC	75/103	80/64[b]	< 0.03	NR	—	21/17	NS
McKenna et al[51]	2017	RC	UC	154/755	54.6/47.2	NS	NR	—	8.4/9	NS
McKenna et al[52]	2018	RC	UC	587/2208	NR	—	NR	—	12/8[a]	0.003
Leeds et al[53]	2022	RC	UC/IC	631/2669	21.4/19.8	NS	NR	—	9.5/8.2	NS
Emile et al[54]	2021	MA	UC, FAP, HNPCC, IC, CD	686/2774	83.1/71.5[b]	< 0.001	8.7/3.6	0.036	7.7/6.3	NS

Abbreviations: AL, anastomotic leak; BMI, body mass index; CD, Crohn's disease; FAP, familial adenomatous polyposis; HNPCC, hereditary nonpolyposis colorectal cancer; IPAA, ileal pouch-anal anastomosis; IC, indeterminate colitis; MA, meta-analysis; NR, not reported; NS, not significant; RC, retrospective cohort study; UC, ulcerative colitis.

[a]Used organ-space infection as surrogate for pelvic sepsis.

[b]Overall complications for entire study periods.

with a colonic malignancy should not routinely be offered IRA.

Nonrestorative Procedures

Although RP is the preferred approach for UC patients who wish to reestablish intestinal continuity, not all patients are suitable candidates for IPAA. Total proctocolectomy with end ileostomy is an alternative surgical option for patients with fecal incontinence, abnormal sphincter function, barriers to adequate surveillance, advanced age, and significant comorbidities which may predispose them to increased risk of pouch failure or dysfunction.

For patients with a contraindication to IPAA who wish to maintain continence without restoration, a continent ileostomy (Kock pouch) can be considered.[23] This approach is not routinely offered given the high rates of pouch dysfunction that require reoperative intervention. It is therefore contraindicated in patients with a suspicion of Crohn's disease, as the risk of recurrent disease and need for pouch excision may result in significant malabsorption.

Dysplasia and Malignancy

Patients with UC are at increased risk of developing colorectal cancer. Most cases are thought to arise from dysplasia; therefore, endoscopic surveillance is recommended using chromoendoscopy and targeted biopsies or high-definition endoscopy with virtual chromoendoscopy (i.e., narrow band imaging) and random biopsies. In most patients, surveillance should start 8 to 10 years after disease diagnosis and continue every 1 to 5 years. The timing of endoscopic surveillance can be adjusted depending on risk factors including extent of colonic inflammation, primary sclerosing cholangitis, family history of colorectal cancer, and history of dysplasia.[24]

The surgical management of dysplasia in UC has changed drastically with improvements in medical disease management and endoscopic technology. Most areas of visible dysplasia that were once referred for surgery currently undergo endoscopic resection and continued surveillance.[25] Surgery is reserved for patients with unresectable visible dysplasia, invisible high-grade dysplasia, multifocal low-grade dysplasia, and invasive adenocarcinoma.[26] Patients found to have an invasive colon or rectal cancer should undergo routine cancer staging followed by neoadjuvant therapy (if indicated) and surgery. Total proctocolectomy with or without IPAA is generally recommended to remove all at-risk tissue, though IRA may be considered in patients with significant comorbidities or those who are not candidates for IPAA who wish to preserve intestinal continuity. As discussed earlier, such patients must be counseled on neoplasia risk and undergo close surveillance of the remaining rectum.

For patients diagnosed with locally advanced rectal cancer, there is little evidence to support or refute the decision to perform IPAA following external beam radiation treatment (EBRT). The largest series published examined 12 patients

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Table 3 Studies examining the association between infertility and IPAA

Author	Year of publication	Study design	Diagnosis	No IPAA INF/FER	No IPAA infertility rate (%)	IPAA INF/FER	IPAA infertility rate (%)	RR
Gorgun et al[55]	2004	RC	UC, FAP	48/79	38	76/59	56	< 0.001[a]
Waljee et al[56]	2006	MA	UC	60/551	14.6	231/250	48	3.17
Rajaratnam et al[57]	2011	MA	UC, FAP	112/448	20	289/169	63	3.91
Tulchinsky et al[58]	2013	RC	UC	0/26	0	10/17	37	0.0006[a]
Sriranganathan et al[59]	2022	MA	UC	105/688	13.3	344/458	43.0	4.17

Abbreviations: FAP, familial adenomatous polyposis; FER, fertile; INF, infertile; IPAA, ileal pouch-anal anastomosis; MA, meta-analysis; RC, retrospective cohort study; RR, relative risk; UC, ulcerative colitis.
[a]Indicates calculated *p*-value. The relative risk was not reported in these studies.

receiving EBRT prior to IPAA and 7 after pouch construction. Pouch function was acceptable among patients receiving neoadjuvant therapy but long-term outcomes were poor for those receiving radiation with the pouch in situ.[27] Though EBRT in the course of neoadjuvant treatment is not a contraindication to IPAA, patients should be counseled extensively on the risk of long-term function and pouch survival. Postoperative radiotherapy is contraindicated in patients with IPAA due to high risk of radiation damage leading to pouch dysfunction.

The management of UC-associated colorectal strictures remains complex, as the presence of malignancy cannot be completely ruled out by endoscopic biopsy. In a study done by Fumery et al, 5% of patients undergoing surgery for stricture with negative biopsies were found to have an underlying malignancy.[28] Therefore, UC-associated strictures require careful surveillance, with a low threshold to recommend surgery, particularly in high-risk patients or if the stricture cannot be adequately assessed and biopsied endoscopically.

IPAA Construction—Double Stapled versus Mucosectomy

The initial IPAA report by Parks and Nicholls described a handsewn anastomosis with mucosectomy.[29] However, with the development of modern circular staplers, most IPAA are now performed using the double-stapled technique, which is both less technically demanding and associated with improved functional outcomes. In a meta-analysis of 4,183 patients, stapled IPAA was found to have better preservation of anal canal physiology, improved nocturnal continence, and decreased pad usage.[30] A study done at the Cleveland Clinic showed that compared with the double-stapled technique, patients who underwent mucosectomy with handsewn anastomosis had increased rates of anastomotic leak, postoperative hemorrhage, fistula, stricture, small bowel obstruction, pouch failure, and need for redo IPAA.[31] This difference might be even greater in the hands of surgeons inexperienced with this technically demanding procedure in the era of circular staplers.

From an oncologic standpoint, the major concerns surrounding the double-stapled technique are the risk of synchronous dysplasia in the retained anal transitional zone (ATZ), the development of metachronous neoplasia in the pouch, and the ability to obtain an adequate distal resection margin for UC-related colorectal cancers.

Regarding synchronous dysplasia, Kiran et al assessed 348 patients who underwent proctocolectomy for dysplasia. There was no dysplasia or cancer identified in the mucosectomy specimen of 41 patients who underwent mucosectomy with handsewn IPAA for colonic dysplasia. In contrast, in the 135 patients with rectal dysplasia, 56 underwent mucosectomy with handsewn anastomosis and 9 (16%) of these patients had dysplasia in the mucosectomy specimen.[32] With regard to metachronous neoplasia, the overall risk of developing dysplasia or cancer in the ileal pouch is low, with reported incidences of 0.9, 1.3, and 4.2% at 5, 10, and 20 years, respectively.[33] The hypothesis that mucosectomy would decrease this risk, has never been confirmed by evidence. The largest series done at the Cleveland Clinic looking at 3,203 patients showed no difference in ileal pouch or ATZ neoplasia occurrence between the two techniques. While dysplasia or malignancy (assessed in combination as a single variable) in the colectomy specimen was found to be an independent risk factor, mucosectomy was not protective of neoplasia risk.[33] Similarly, Silva-Velazco et al retrospectively reviewed 532 patients with stapled IPAA for UC, and found a dysplasia rate of 2.9 and 3.4% at 10 and 15 years, respectively. There were no cases of cancer detected. ATZ dysplasia detection was significantly associated with preoperative and pathologic findings of colorectal dysplasia ($p < 0.001$ for both) and cancer ($p = 0.025$ and $p < 0.001$). All patients were managed expectantly or with mucosectomy and no pouch excisions were required. Overall pouch survival rates at 10, 15, and 20 years were 99.6, 98.9, and 92.6%, respectively.[34] The management of ATZ dysplasia in this study is in line with current guidelines for dysplasia found on surveillance colonoscopy as discussed previously. While endoscopic guidelines do not specifically address the issue of mucosectomy versus stapled anastomosis, it is intuitive that if the colon can be preserved without inevitably requiring surgical removal the same would hold true for the mucosa in the ATZ.

The preferred approach for patients with UC-associated colorectal cancer remains unclear. In contrast to sporadic colorectal cancer, UC-associated cancer is commonly

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associated with flat mucosal features, making the distal tumor margin difficult to identify.[35] This is less problematic for adenocarcinoma of the colon or upper rectum, where a generous distal margin can be achieved. Thus, many surgeons view a stapled IPAA for UC-related adenocarcinoma of the colon or upper rectum as acceptable. The approach for mid to low rectal cancers is more controversial. One concern is that it can be difficult to identify the appropriate distal resection margin to ensure an R0 resection. In addition, a more distal rectal cancer might be associated with an increased risk of synchronous areas of dysplasia in the ATZ and/or in the retained rectum just cephalad to the ATZ. With this in mind, the oncologic safety of RP in low rectal cancers has been questioned. Hotta et al reviewed nine patients who underwent RP with mucosectomy and handsewn anastomosis for low rectal adenocarcinoma. Eight of the nine patients had a flat mucosal phenotype. The median length of the distal margin was 22 mm and there were no local or distant recurrences in follow-up. Five-year and 10-year overall survival rates were 100 and 66.7%, respectively. The authors concluded that RP for low rectal adenocarcinoma is safe and feasible.[35] Regarding the double-stapled technique for mid to low rectal cancer, Merchea et al performed a retrospective review of 41 patients with UC-associated rectal cancer. Eleven of these underwent IPAA, 6 of whom underwent stapled anastomosis while the remaining 5 underwent mucosectomy and handsewn anastomosis. The authors could not identify any association between overall survival or recurrence and the type of surgery performed.[36]

In summary, the double-stapled IPAA is associated with better functional outcomes compared with mucosectomy with handsewn anastomosis and is overall the preferred approach. It is a safe technique for colorectal dysplasia and colon cancer. For patients with dysplasia in the ATZ, mucosectomy should be strongly considered. RP is safe for mid to low rectal cancers but there is insufficient data regarding the optimal technique for anastomosis. There is no evidence to indicate a stapled IPAA is contraindicated in this setting but given the uncertainty of the distal margin for some lesions, this technique should be used with caution particularly when treating low rectal cancers.

Emergent Indications for Surgery

Emergent indications for surgery include acute severe UC (ASUC) refractory to medical management, uncontrollable sepsis, colonic perforation, toxic megacolon, and severe bleeding. ASUC is a clinical diagnosis traditionally based on the criteria described by Truelove and Witts which included in their original publication frequency of bloody stool, temperature, heart rate, hemoglobin level, and erythrocyte sedimentation rate.[37] Initial management is with intravenous corticosteroids, followed by infliximab or cyclosporine if there is insufficient improvement with steroids alone. Early surgical consultation is important to help identify those patients that require urgent surgical intervention. For those who fail medical management, the preferred surgical approach is total abdominal colectomy with end ileostomy. Proctectomy is almost never indicated in the acute setting as even patients with severe proctitis improve significantly after colectomy alone. It is important to avoid pelvic dissection during this initial operation as this is associated with significant morbidity. In addition, a proctectomy can have a profound impact on future operations and in particular on the ability to restore intestinal continuity. To avoid the complicated management of an intra-abdominal rectal stump dehiscence, the rectal stump can be implanted into the fascia under the skin or matured as a mucous fistula. This may also facilitate retrieval of the rectal stump at the time of the subsequent completion proctectomy. There is some data to support this technique, showing a decreased incidence of pelvic sepsis.[38] However, the benefits of rectal stump implantation may not be as pronounced in laparoscopic surgery, with at least one study showing no difference in pelvic sepsis between patients with an intraperitoneal versus subcutaneous stump.[39] The decision to create a subcutaneous rectal stump should be based on intraoperative findings, the overall condition of the rectum, and surgeon experience.

A technique referred to as Turnbull–Blowhole colostomy and ileostomy, or ileostomy without resection can be used in the setting of fulminant colitis and toxic megacolon to minimize colonic manipulation and risk of colonic perforation. When used in pregnancy, the Turnbull–Blowhole is an option which also helps avoid prolonged anesthesia and operative trauma to the mother and fetus.[40] Though reports of this technique had shown successful outcomes, there may be significant maternal and fetal morbidity associated with leaving the colon in situ. More recent data in the era of improved medical management and obstetrical care has questioned the need for this. Dozois et al examined five women who underwent subtotal colectomy with ileostomy for fulminant UC while pregnant. All patients had successful pregnancies and no maternal or fetal deaths occurred.[41] We recommend the Turnbull procedure or ileostomy without resection only in those patients who are severely ill and unstable. For all others, total abdominal colectomy and end ileostomy is a safe alternative.

Concluding Remarks

The surgical management of the UC patient is complex and continues to evolve with ongoing advances in medical, endoscopic, and surgical technology. Total proctocolectomy is curative and IPAA continues to be the preferred surgical approach. Further studies are needed to better understand the effect of biologics on IPAA, determine the role of fecal diversion, and evaluate the safety of IPAA in locally advanced low rectal tumors.

Conflict of Interest
None declared.

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