Complications of Ileoanal Pouches

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ABSTRACT

Restorative proctocolectomy with ileal pouch-anal anastomosis is the surgical therapy of choice for patients with chronic ulcerative colitis and the majority of patients with familial adenomatous polyposis. It restores gastrointestinal continuity, re-establishes transanal defecation, and avoids a permanent stoma. Although this technically demanding procedure is associated with low mortality rates, it is frequently accompanied by early and late complications. This article will review these complications and discuss the interventions that are needed to provide appropriate treatment.

KEYWORDS: Restorative proctocolectomy, ileal pouch-anal anastomosis, complications, morbidity

Objectives: Upon completion of this article, readers will be familiar with the early and late complications associated with ileal pouch-anal anastomosis and the interventions needed to treat them.

Since its introduction in 1978, restorative proctocolectomy (RP) with ileal pouch-anal anastomosis (IPAA) has become the standard surgical management of chronic ulcerative colitis and for a majority of patients with familial adenomatous polyposis.¹ This procedure is technically demanding but avoids the need for permanent stoma, which can lead to a negative body image.

The procedure has undergone many improvements and modifications since its first original description.¹ Despite these modifications, RP/IPAA is frequently accompanied by early and late complications. Although rare, neoplastic transformation of the pelvic pouch and anal transition zone (ATZ) has also been reported.²

This article will review the early and late complications associated with IPAA and the interventions needed to provide appropriate treatment. A Medline search from 1965 to the present was used as the basis of this review. Keywords used in the search were restorative proctocolectomy, ileal pouch-anal anastomosis, complications, and morbidity, but complications common to all major operations were not included.

MORTALITY AND MORBIDITY

The mortality rate after IPAA is less than 1%,³⁻⁷ mostly because patients are typically young and do not usually have comorbid diseases and the operations are generally performed in tertiary referral centers on selected patients. The literature indicates that this procedure is efficient and safe and should always be done electively.

In contrast to the low mortality rate, the morbidity rate remains relatively high. In early studies, the incidence of major complications was reported to be as high as 54%, but it has declined to ~19% with increased experience.^{4,7,8} Table 1 gives an overview of the complications according to different centers' experiences.

Two types of complications generally occur after RP/IPAA: early (within 30 days after surgery) and late (after ileostomy closure).

EARLY COMPLICATIONS

The most common early complications are pelvic sepsis, anastomotic leaks, small bowel obstruction, and pouch bleeding.

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Table 1 Complications of Ileoanal Pouches According to Different Centers

	Seidel ^{11a} 1985–1996	Johnson ^{11b} 1984–1997	Blumberg ³ 1982–1995	Fazio ⁴⁴ 1983–1993	Kelly ⁶ 1981–1991	Meagher ⁸ 1981–1994
Institution	Vanderbilt	Norway	Ochsner	Cleveland	Mayo	Mayo
No. patients	55	64	145	1005	1193	1310
Mortality	0	0	1	10	2	3
Overall complications. rate (%)	54	36	39	63	–	19
SBO (%)	23	–	26	25	15	15
Leak (%)	9	–	2.1	2.9	–	–
Stricture (%)	17	3	–	14	–	–
Pouchitis (%)	24	19	10	23.5	28	–
Abscess (%)	17	5	7	8.2	5	–
Fistula (%)	–	11	1.4	6.8	–	–

SBO, small bowel obstruction; – indicates data not reported.

Sepsis

Pelvic sepsis is the most serious early complication of ileal pouch operations, which is one of the main causes of pouch failure. The rate of sepsis after ileoanal pouch construction ranges from 5 to 24%.^{5,9–11} This may be due to suture line leaks or bacterial contamination of the surgical space during the operation. Etiologic risk factors predisposing to pelvic sepsis are local and general inflammatory changes, such as malnutrition, prolonged steroid usage, hypoalbuminemia, anemia, and hypoxemia. Fever, perineal pain, purulent discharge, and leukocytosis are the most common presenting symptoms of sepsis.^{11a,11b} Early sepsis after IPAA usually occurs between the third and sixth postoperative day.

Controversy still exists whether the type of anastomosis (hand-sewn vs stapled) or omission of diverting ileostomy increases the risk of pelvic sepsis after RP/IPAA. Using intraluminal stapling instruments for pouch-anal anastomosis is among the most important technical modifications since the original description of IPAA. This technique necessitates preserving the ATZ and improves the functional results of RP/IPAA. In an earlier study from our institution, Ziv and colleagues¹² found that stapled IPAAs are safer than hand-sewn IPAAs in that they have fewer early septic complications. The rates of anastomotic disruption and parapouch abscess were found to be higher in patients undergoing hand-sewn IPAA.

Gecim and associates published the Mayo Clinic's experience and stated that the rate of abscess or fistula may be influenced by the experience of the surgeon. They also reported that high-dose steroids and other immunomodulants might contribute to fistula formation in the early weeks after IPAA. But in this study they could not find any statistically significant difference with either mucosectomy or stapled technique with regard to developing perianal abscess or fistula in the long term.¹³

The other question is whether pelvic sepsis is related to diverting ileostomy in RP. Sugerman and colleagues¹⁴ reported an abscess or enteric leak rate of

12% in patients who underwent one-stage procedure without ileostomy. They stated that there is no significant difference in the leak rate in patients who took steroids versus those who did not. The effect of steroids on development of postoperative pelvic sepsis also remains controversial. Fukushima and researchers reported that the amount of steroids given to the patients who developed postoperative pelvic sepsis was not different from that given to those who did not develop pelvic sepsis, but the steroid itself adversely affected wound healing and increased susceptibility to infection.¹⁵

In an earlier study from our institution, Tjandra and associates¹⁶ reported a higher rate of septic complications in patients without an ileostomy. The authors stated that RP without diversion is not as safe as RP with diversion, especially in patients taking more than 20 mg of prednisone per day. However, in a more recent study also from our institution, Ziv and associates¹² found a significant difference in the number of patients between groups who did have a diverting stoma compared to those who did not. The authors stated that, according to their results, the risk of complications associated with omission of diversion would decrease and act against the earlier findings of Tjandra et al, as many more patients in the stapled group had IPAA without ileostomy.

In a very recent study we compared the patients according to the presence ($N=1725$) or absence of ileostomy ($N=277$). There were no differences between the groups with respect to rates of septic complications such as anastomotic leak, pelvic sepsis, and fistula occurrence. However, patients with ileostomy had a higher rate of pouch-vaginal fistula complication compared with those with no ileostomy. At this time, however, diverting ileostomy is omitted in selected patients—those with a stapled IPAA, in whom there were no risk factors for anastomotic failure (e.g., anemia, malnutrition, chronic steroids), and in whom the pouch surgery was technically straightforward. Also equally important in making that decision was the conduct of the operation with good hemostasis, minimal

contamination, lack of tension on the anastomosis, and complete tissue donuts.¹⁷

Controversy still exists whether routine omission of ileostomy or the type of anastomosis affects the occurrence of septic complications after RP/IPAA.

Leaks

The overall leak rate after IPAA ranges between 5% and 18%.^{4,7,18–20} Leaks may develop from the pouch-anal anastomosis, from the pouch itself, or from the tip of the J pouch. Likely sites of leaks are shown in Figure 1. Anastomotic tension and bowel ischemia are the two main factors associated with high leakage rates after IPAA. Elderly patients, males, and those on corticosteroids are also at greater risk for developing leaks.²¹

Pouch-anal anastomotic leakage occurs more frequently in patients undergoing IPAA without a diverting ileostomy, according to the experience from our institution.¹⁶ Sugerman and group, on the other hand, reported a lower anastomotic leak rate after one-stage stapled ileoanal pouch procedure. They advocated the one-stage procedure for severely obese patients with ulcerative colitis or familial adenomatous polyposis, to eliminate the related tension on the anastomosis.¹⁴

Anastomotic leaks may be asymptomatic “sinuses” that originate from the anastomosis, and they are most often diagnosed at the time of pouchography when the patient returns for the take down of the ileostomy. Such radiologically detected leaks represent incomplete healing of the anastomosis or the ileal pouch. The leaks will

usually heal spontaneously by deferring the closure of the ileostomy for a few months. A repeat Gastrografin enema should be performed 3 to 6 months later for evaluation. If no abscess cavities are present and the sinus track leading from the anastomosis is narrowed or obliterated, then ileostomy closure can be performed.

In a symptomatic patient who is stable, not septic, and has no peritonitis, initial treatment for a leak should include intravenous antibiotic therapy, drainage, and bowel rest. Antibiotic coverage should include both aerobic Gram-negative and anaerobic organisms. In the presence of a sizeable pelvic abscess, percutaneous drainage under computed tomography (CT) guidance may prevent the need for relaparotomy. When the drain output decreases to less than 100 cc over 24 hours, a tube sinogram provides useful information that can help the surgeon decide whether to remove the drainage tube.

In some instances, a minor leak results in a small presacral collection. Examination under anesthesia allows evaluation of the abscess collection and passage of a transanal catheter into the cavity for daily irrigation. The catheter may be safely removed when there is clinical and radiologic evidence of resolution of the abscess cavity.

Bowel rest combined with frequent clinical evaluation and assessment is instituted initially in all symptomatic cases. When there are signs of clinical improvement, the patient may be advanced to oral liquids and eventually resume a normal diet.

Emergent surgical intervention may be required for patients who are treated with nonoperative therapy whose signs and symptoms worsen and those with generalized peritonitis or high-output pouch-cutaneous fistulas, although this is uncommon, especially in the presence of a diverting ileostomy. The surgical intervention should be preceded by immediate fluid resuscitation and administration of intravenous broad-spectrum antibiotics.

In patients with a diverting ileostomy and peritoneal contamination, thorough peritoneal lavage with copious amounts of warm saline followed by placement of wide-bore drains are the cornerstone of surgical therapy. In nondiverted patients with peritoneal contamination and small anastomotic defects, a case may be made for performing a diverting loop ileostomy after peritoneal lavage and drainage. In these circumstances, either an end ileostomy or loop ileostomy with oversewn distal limb would be our preferred techniques to avoid passage of stool into the efferent limb with continued sepsis through the anastomotic defect.

We recently presented our experience with leaks that originated from the tip of a J pouch after RP. Among 1309 patients, there were 14 (1%) who had a leak from the tip of the J pouch. Steroid dependency was the only risk factor for this problem. We suggested using CT, pouchogram/fistulogram, and/or pouchoscopy as the diagnostic tools. In a stable patient who presents

Figure 1 Likely locations of leaks. Printed with permission of The Cleveland Clinic Foundation, Cleveland, Ohio.

before ileostomy closure and with no peritonitis, the initial treatment can consist solely of CT-guided drainage. Surgical repair of the leak is performed at a later date and involves suture ligation or restapling of the J-pouch tip. The ileostomy may be closed at the time of the repair or deferred. In a nondiverted patient or one who presents after ileostomy closure, laparotomy, drainage, and a diverting ileostomy should be performed as the initial treatment. Surgical repair of the leak should be attempted since none of these leaks healed conservatively, and ileostomy closure can be performed either concurrently or at a subsequent setting.²²

Sinuses or leaks that persist after treatment may suggest the presence of underlying Crohn's disease.

Small Bowel Obstruction

Patients undergoing RP are at particularly high risk for small bowel obstruction because of the combined abdominal and pelvic dissection, the need for multiple operations, and the higher possibility of septic complications. The overall frequency of small bowel obstruction ranges from 15 to 44%, and the incidence of obstruction requiring operative intervention ranges from 5 to 20%.²³ Postoperative adhesions, volvulus, internal herniation of the bowel, or torsion of an ileostomy may result in partial or complete small bowel obstruction. Obstruction may also occur shortly after closure of a temporary ileostomy due to luminal stenosis or adhesions at the closure site.

In our series¹⁷ embracing the patients who had undergone RP and IPAA at our institution between 1983 and 2001, 1725 had a diverting ileostomy and 277 did not. In terms of postoperative small bowel obstruction, patients without an ileostomy had higher rates than patients with an ileostomy (18% vs 10%). Furthermore, we found that early and late complications of small bowel obstruction were more common in patients with an ileostomy. We also found that patients in the ileostomy group presenting with small bowel obstruction required more frequent laparotomies than the patients without an ileostomy.¹⁷

Sugerman and colleagues presented their results with one-stage stapled ileoanal pouch procedure without temporary ileostomy diversion and reported a comparatively low frequency (5%) of small bowel obstruction necessitating laparotomy. The authors emphasized that many of the obstructions reported in the literature occurred at the ileostomy closure anastomosis. They also noted that it is technically difficult to bring out an ileostomy in an obese patient with a large amount of subcutaneous tissue.¹⁴ Patients with a diverting ileostomy are at an increased risk of small bowel obstruction because of small bowel rotation around the ileostomy and difficulties in fully mobilizing the ileostomy after closure.

In a recent study from Toronto, MacLean and associates published their results using a large series of

1178 patients who underwent IPAA. They reported a cumulative risk of small bowel obstruction of 9% at 30 days, 18% at 1 year, 27% at 5 years, and 31% at 10 years. They found that in patients requiring laparotomy, the obstruction was most commonly due to pelvic adhesions (32%), followed by adhesions at the ileostomy closure site (21%). They emphasized in their conclusion the importance of reducing the risk of adhesions in this group of patients to improve patient outcome and decrease health-care costs.²⁴

Postoperative adhesions occur in 67 to 100% of abdominal surgical patients. Although good data are lacking, it is apparent to any experienced surgeon that adhesions become dense and fibrous from the second week to the twelfth week postoperatively. The visceral damage at reoperative surgery is due to the development of dense postoperative adhesions and again surgical experience suggests that this risk is greatest between the second and sixth week postoperatively. Before this time easily dissectable adhesions have been noticed, making this known as a "window period." If surgery is indicated and if the window period has passed, an experienced surgeon usually defers reoperation until the adhesions become less dense²⁵ (3 to 6 months). However, surgery is delayed at the cost of discomfort for the patient, risk of disease progression, and the considerable costs of home parenteral nutrition with a PEG tube for decompression in many cases. But in our experience we wait during this period unless the patient has an associated uncontrolled sepsis or ischemia. In this way, we try to allow the adhesions to become less aggressive naturally. The majority of patients resolve with this conservative therapy. Ultimately, the patients may need surgery after 3 to 6 months' time if the obstruction does not resolve.

There has been recent interest in bioabsorbable barrier methods, which are effective in reducing the incidence, extent, and severity of postoperative adhesions. It seems likely that the use of such materials can modify the time course and severity of adhesions and may reduce or abolish this time period when the bowel or other organs are at high risk of injury from reoperation.²⁶

In conclusion, patients undergoing RP/IPAA are at higher risk for small bowel obstruction, although most do not require surgical intervention. The management of small bowel obstruction after IPAA can be classified as early and late. In patients who present with early bowel obstruction after IPAA or after an ileostomy closure, we respect the concept of the window period. Strategies for reducing the risk of adhesions are warranted to improve patient outcome and quality of life.

Pouch Bleeding

The ileal reservoir may bleed postoperatively either from the suture line or because of pouch ischemia. Blood from

the suture line is generally bright red in color and if significant, may require examination under anesthesia, endoscopy with abundant irrigation and fulguration, or suturing of the bleeding point. Copious dark red blood with clots implies pouch ischemia, although this does not seem to be a common problem. Fazio and associates⁴ reported bleeding from the pouch in 38 (3.8%) of 1005 patients. Thirty of their patients were treated with local irrigation of 0.9% saline and adrenaline 1:200,000, and 8 with transanal suturing.⁴

We recently presented our current experience with perioperative pouch bleeding in 34 patients.²⁷ Eighteen patients bled within 7 days of undergoing IPAA and 16 bled 7 days after the procedure. After initial resuscitation, 20 of the 34 patients underwent pouchoscopy. A bleeding point was identified and coagulated in 6 of these 20 patients. In the remaining 14 patients, generalized oozing with no distinct bleeding point was found; the pouch was irrigated with iced saline and saline with epinephrine (1:100,000) enemas. None of the patients in our series required reoperation for bleeding.²⁷

Bleeding that occurs after 5 to 7 days after the operation may suggest a partial dehiscence. This should

be investigated by gentle digital examination and if necessary, the anastomosis should be revised.

Primary sclerosing cholangitis, an uncommon disease of unknown cause that is characterized by chronic fibrosing inflammation of the bile ducts, is associated most commonly with chronic ulcerative colitis. Patients with primary sclerosing cholangitis who undergo proctocolectomy with a permanent ileostomy have an increased risk of peristomal varices. Kartheuser and group evaluated the risk of perianastomotic bleeding after IPAA in patients with both ulcerative colitis and primary sclerosing cholangitis. They concluded that in patients with both conditions, IPAA is safe and not associated with perianastomotic bleeding. However, in such patients, the risk of postoperative complications is high, and these patients require detailed preoperative clotting studies.²⁸

Postoperative pouch bleeding after IPAA can be successfully managed nonoperatively. Pouchoscopy with clot evacuation and cauterization of visible bleeding points followed by iced saline or saline with epinephrine enemas is successful in managing perioperative pouch bleeds after IPAA. Figure 2 provides a comprehensive treatment algorithm for pouch bleeding.

Figure 2 The algorithm for the management of perioperative pouch bleeding.

LATE COMPLICATIONS

Pouchitis, pouch fistula, and pouch stricture are the most common late complications of ileoanal pouches. Pouch failure occurs less commonly. Malignant transformation is rare but has been reported.

Pouchitis

Pouchitis is the most common complication following IPAA. This is an acute or chronic inflammation of the ileal reservoir that causes such symptoms as increased stool frequency, urgency, crampy abdominal pain, bright red bleeding, fecal incontinence, diarrhea, fever, and extraintestinal manifestations of inflammatory bowel disease such as arthritis, iritis, and pyoderma gangrenosum. Histology exhibits an acute granulocyte infiltration. The prevalence of pouchitis among patients with IPAA varies from 15 to 50%, with an incidence of 15 to 18% during the first postoperative year, a 36% incidence within the first 5 years following surgery, and a 46 to 48% incidence by the tenth postoperative year.²⁹ The cause of pouchitis is poorly understood and is probably a multifactorial event involving genetic, immune, microbial, and toxic mediators. Possible causes include fecal stasis, increased anaerobe/aerobe bacterial ratio, ischemia, and underlying disease.³⁰ A male predominance in pouchitis patients has also been reported.³¹ Pouchitis is a disease-related condition that occurs with a much greater incidence in patients with ulcerative colitis. Salemans and associates reported a pouchitis incidence of 44% in patients with ulcerative colitis and a 0% incidence in patients with familial polyposis.³²

The diagnosis of pouchitis should be made on the basis of clinical, endoscopic, and histologic features. The pouchitis disease activity index (PDAI) developed at the Mayo Clinic provides a useful guide to abnormal findings and is the most commonly used instrument.³³ An overall PDAI score is simple to calculate from three separate scales: clinical symptoms, endoscopic findings, and histological changes. A total score of 7 or higher is defined as pouchitis (Table 2).

Since the PDAI consists of three principal components, this instrument remains costly. Therefore, we conducted a study to find a diagnostic instrument that is less expensive, is simple to apply, and does not sacrifice sensitivity and specificity. As a result, we created the modified pouchitis disease activity index (mPDAI) in which the histology component is omitted. We found that the mPDAI offers similar sensitivity and specificity in diagnosing patients with acute or acute relapsing pouchitis. This approach simplifies pouchitis diagnostic criteria, reduces the cost of making a diagnosis, and avoids delay in determining the histology.³⁴

The treatment for pouchitis includes antibiotic therapy and symptomatic relief with antidiarrheal agents. The most effective agents are metronidazol and cipro-

Table 2 Pouchitis Disease Activity Index³³

Criteria	Score
Clinical Symptoms	
Stool frequency	
Usual postoperative stool frequency	0
1–2 stools/day > postoperative usual	1
≥3 stools/day > postoperative usual	2
Rectal bleeding	
None or rare	0
Present daily	1
Fecal urgency or abdominal cramps	
None	0
Occasional	1
Usual	2
Fever (temperature > 37.8°C)	
Absent	0
Present	1
Endoscopic Inflammation	
Edema	
Granularity	1
Friability	1
Loss of vascular pattern	1
Mucous exudates	1
Ulceration	1
Acute Histological Inflammation	
Polymorphic nuclear leukocyte infiltration	
Mild	1
Moderate + crypt abscess	2
Severe + crypt abscess	3
Ulceration per low-power field (mean)	
<25%	1
25–50%	2
>50%	3

floxacin. Bertoni and researchers reported that 80% of patients were treated successfully with metronidazol.³⁵ The usual dose is 250 mg to 500 mg three times a day PO for 7 to 10 days. The response to antimicrobial therapy usually occurs within a few days. Five to ten percent of patients with acute pouchitis develop refractory or rapidly relapsing symptoms that require long-term therapy. Probiotics also appear to be effective in preventing flare-ups of acute relapsing pouchitis.³⁶ Proposed mechanisms of probiotics as maintenance therapy for pouchitis include (1) suppression of resident pathogenic bacteria, (2) stimulation of mucin glycoprotein by intestinal epithelial cells, (3) prevention of adhesion of pathogenic strains to epithelial cells, and (4) induction of host immune responses.³⁷ A recent trial evaluated the use of a probiotic named VSL#3 for the maintenance of acute relapsing pouchitis after remission was induced using ciprofloxacin and rifaximin. Only 15% in the probiotic group relapsed within the 9-month follow-up, whereas 100% in the placebo group developed a relapse.³⁸

Steroids, 5-aminosalicylates, azathioprine, and 6-mercaptopurine comprise the other major category of treatment. These four agents have also been used to induce symptomatic improvement but must be studied further in randomized control trials. Surgical management of pouchitis refractory to medical treatment is limited to defunctioning stoma or pouch excision.

A substantial number of patients symptomatic after IPAA do not meet the diagnostic criteria for pouchitis. Therefore, we designed a study to assess the etiology in this group of patients. We described a unique subgroup of patients with IPAA who present with pouch symptoms but have normal endoscopic and histologic findings. We considered this subgroup to have irritable pouch syndrome (IPS), which is indicated by a PDAI of <7 and the absence of cuffitis. The etiology of symptoms in IPS is not clear, and there is no algorithm for its management. Nearly 50% of patients with IPS respond symptomatically to regimens typically used in irritable bowel syndrome, including reassurance, dietary modification, dietary fiber supplementation, antidiarrheal, antispasmodic, and antidepressant therapy.³⁹

Approximately 1 to 2 cm of anal canal mucosa is retained after IPAA without anal canal mucosectomy, which increases the risk of inflammation and cuffitis. This cuffitis is defined as endoscopic and histological inflammation of the rectal cuff and no inflammation of the pouch. This entity was found in 4% of patients with preserved anal mucosa after IPAA in a study from our institution.⁴⁰ In this series, all patients responded well to local treatment with hydrocortisone suppositories or enemas.⁴⁰

Fistulae

A fistula after ileoanal pouch construction may occur in the form of a leak in the early period, but it is more frequently seen as a late complication some months after the procedure. The main risk factors for anastomotic leak and subsequent fistulas are prolonged steroid use, hypoalbuminemia, anemia, hypoxemia from cardiac or respiratory insufficiency, ischemia of bowel ends, and tension on the anastomosis. There is a very close relation between Crohn's disease and fistulas. Patients undergoing IPAA may be later diagnosed with underlying Crohn's disease. Fazio and group found that patients with a postoperative pathologic diagnosis of Crohn's disease had a pouch failure rate of 25%.⁴

A review from our institution⁴¹ revealed that pouch-related fistulas occurred in ~59 (6%) of 1,040 patients who had pelvic pouch surgeries from 1983 to 1995. The most common sites were vaginal, perineal, cutaneous, and presacral. Most of the fistulas were treated surgically with construction of a transanal-ileal advancement flap.⁴¹ Simple perianal fistulas may be treated with fistulotomy or seton placement. Abscess drainage,

prolonged ileal diversion, and antibiotics may help pouch fistulas to close spontaneously.

POUCH-VAGINAL FISTULA

Development of a pouch-vaginal fistula (PVF), which can lead to poor functional results, is one of the main causes of pouch failure. Underlying factors are sepsis, anastomotic leaks, type of pouch construction and change in postoperative diagnosis to Crohn's disease. As a technical risk factor, entrapment of the posterior vaginal wall in a stapled anastomosis can be mentioned. Thus a key point to note is that when the circular stapler is introduced transanally, the trocar should emerge posterior to the stapler line before "marrying" with the anvil so that the risk of vaginal wall entrapment is minimized (Fig. 3). The majority of patients with PVF can be managed initially by local procedures. More commonly, the transanal-ileal advancement flap is employed. The technique of this advancement flap is similar to a transanal advancement flap for anal fistulas. The tenets of a successful transanal-ileal advancement flap for PVF repair are control of sepsis, careful hemostasis, excision of concurrent strictures, and a tension-free closure. This may involve drainage of any associated abscess before repair and insertion of a draining seton if any accompanied perianal fistulas exist. Although transvaginal repair of a pouch-vaginal fistula has also been proposed with acceptable results,⁴² we believe that it is more advantageous to close the pouch side of the fistula because of the higher pressure. In a recent study from our clinic,⁴³ we reviewed our experience with management of pouch-vaginal fistulas in patients who had undergone RP. We identified 60 women with PVF. Of these, 33 had undergone RP at our institution and an additional 27 women had undergone RP at an outside institution. Most of these patients were initially managed with local methods, most commonly ileal advancement flaps. Fecal diversion was used in 65% of patients at the time of the PVF repair. Primary healing occurred in 17 patients (44%), and fistula closure occurred in another 4 patients with repeat ileal advancement flap surgery.

The overall success rate for pouch-vaginal fistula repair is 52%. Recurrence and pouch failure rates are high, portending a substantial risk of pouch excision and a permanent ileostomy. Temporary fecal diversion at the time of local repair procedures may augment healing rates. The success of primary healing seems to be better in PVF occurring within 6 months compared with those occurring later. This temporal difference in outcome is likely related to a delayed diagnosis of Crohn's disease. The outcome in these patients is worse compared with non-Crohn's patients. Where local repair is not possible or has failed, repeat RP via a combined abdominoperineal approach may also be successful.⁴³

Figure 3 The inadvertent creation of pouch vaginal fistula. Printed with permission of The Cleveland Clinic Foundation, Cleveland, Ohio.

POUCH-VESICAL FISTULA

This complication is rare. Patients with pouch-vesical fistulas present with pneumaturia and recurrent urinary tract infections. The bladder dome is usually involved. Surgical treatment consists of disconnecting the fistula and closing the defects of the bladder and ileal pouch, preferably with omental interposition. Temporary fecal diversion should also be performed.

POUCH-ANAL FISTULA

These should be treated in a manner similar to that used for cryptoglandular anal fistulas. Thus, the options include simple fistulotomy for low inter- or trans-sphincteric anal fistulas and setons for high fistulas and those involving a substantial portion of the anal sphincter complex. A transanal mucosal advancement flap can be considered for patients with more complex fistulas after control of any associated sepsis.

Anastomotic Strictures

Fibrosis followed by partial dehiscence of the IPAA or marginal anastomotic ischemia may result in anal stricture. If severe, the stricture may obstruct the outlet of the pouch and result in evacuation problems, pouch dilatation, and bacterial overgrowth. The anal canal typically narrows by some degree after IPAA. A lumen that allows the admission of the distal interphalangeal joint of the index finger or a 1-cm diameter proctoscope is satisfactory. Many strictures are webs and can be either dilated by fingers or dilators. For this reason, either at the initial 6-week postoperative visit or at the time of the ileostomy closure it has been our practice to perform a routine digital and proctoscopic assessment and dilatation. We believe that this practice prevents fibrous webs from

progressing to subsequent stricture development. An anastomotic stricture can be defined as a symptomatic narrowing of the ileoanal anastomosis requiring either two or more outpatient dilatations or at least one dilatation under anesthesia. In the office, Hegars dilators (nos. 13 to 18) can be used to gradually dilate mild strictures. Severe stricture (5 mm or less) may merit dilatation under general anesthesia. Occasionally, surgical incision is necessary.

The rate of stricture in large series ranges from 7.8 to 14%.³⁻⁷ Senapati and colleagues⁴⁴ from St. Mark's Hospital found that between 1976 and 1990, anal stenosis occurred in 14% of patients with a hand-sewn anastomosis and 40% of patients with a stapled anastomosis. On the other hand, a recent series from the Mayo Clinic showed that the incidence of strictures was 12% and that a greater number of them were observed after hand-sewn anastomosis than after stapled anastomosis⁴⁵ ($P = 0.03$). They concluded that strictures were commonly associated with intraoperative or postoperative complications, often necessitated surgical therapy to salvage pouch function, and were eventually responsible for pouch failure.

However, in our experience,¹² because stapled anastomoses result in fewer complications than hand-sewn ones, it may well be that stapled anastomoses, when performed safely and in the absence of postoperative septic complications, result in a lower number of strictures.

Fazio and Tjandra described a pouch advancement and neoileoanal anastomosis technique for tight recalcitrant anal strictures. With this technique, a circumferential incision is made at or just above the dentate line and below the stricture, the pouch is mobilized with the strictured segment beyond the anal verge, and the freshened edge of the ileal pouch is anastomosed with

Figure 4 Pouch advancement and neileoanal anastomosis for anastomotic stricture.

the anal canal (Fig. 4). The drawback of this technique is that it is unlikely to be successful in cases where the stricture extends beyond 5 cm.⁴⁶ When local procedures fail, radical revisional surgery to salvage the pouch may be required, such as ileoanal anastomotic disconnection, revision, and repeat IPAA.

Pouch Failure and Reoperation

IPAA preserves the normal route of defecation usually with good functional results. However, pouch failure increases slightly with prolonged follow-up.^{46a,46b} Despite the wide range of surgical approaches for pouch salvage, roughly 6% of patients require pouch excision or construction of a permanent ileostomy, which is defined as pouch failure or pouch loss. The permanent stoma decision, which may or may not be accompanied by pouch excision, is made respecting patients' symptoms, desire, and risks of complications related to pouch excision (infertility/sexual dysfunction). In the Mayo Clinic series,⁸ the cumulative risk of failure at 10 years was estimated at 9%. In another large series from our institution consisting of 1911 patients with IPAA, the rate of pouch failure was 3.5% at 5.5 years' follow-up.⁴⁷ The most frequent causes of failure are pelvic sepsis, high stool volume, Crohn's disease, and uncontrollable fecal incontinence.

Heuschen et al⁴⁸ devised a classification system for septic complications that takes into account the form and localization related to the failure after IPAA. They distinguished three levels within the pouch-anal region: level I comprised the upper and middle part of the pouch as well as potential blind limb; level II represented the rectal cuff; and level III represented the pouch-anal anastomosis. According to that study, the risk of pouch failure was significantly higher when septic complications occurred in level I or level III than in level II.

We recently conducted a study to identify the main risk factors associated with ileal pouch failure and to develop a predictive model for quantifying the risk of ileal pouch failure in individual patients on a longitudinal basis.⁴⁹ For this study, our clinic's pouch failure rate was 4.1%. We found eight factors that were independent predictors of ileal pouch failure. Each of these risk factors was categorized into relevant subgroups, and a relatively simple additive scoring system for calculating the risk of ileal pouch failure at particular time intervals for patients undergoing RP was described. The eight risk factors were:

1. Pathologic diagnosis (Crohn's vs not Crohn's)
2. Patient comorbidity
3. Prior anal pathology

4. Diminished anal sphincter manometry measurements
5. Anastomotic separation
6. Anastomotic stricture
7. Pelvic sepsis
8. Perineal fistula formation

This Cleveland Clinic Foundation Ileal Pouch Failure Model is simple to use and can readily be applied in everyday surgical practice. This model was found to be accurate in predicting the risk of pouch failure.⁴⁹

Pouch salvage operations and repeat pouch surgeries are usually performed in an attempt to improve the results of the IPAA and lower the failure rates. Repeat IPAA is defined as an operation for a malfunctioning pouch with pelvic dissection and abdominal exploration with drainage of intra-abdominal abscess, ileoanal anastomotic disconnection, and revision with complete or partial reconstruction of the reservoir.

Repeat pelvic surgery is challenging and has not been popular among surgeons because of concerns about pelvic nerve injury, recurrent anastomotic complications followed by sepsis, and pelvic fibrosis. Fazio and group reported our experience with 46 repeat pouches in 13 Cleveland Clinic patients who had undergone an IPAA between 1983 and 1998 and in 33 patients who were referred from other institutions. The patients were followed for 18 months. Our colleagues reported an overall salvage rate of 86%. The rate increased to 96% in patients with ulcerative colitis but fell to 60% in patients with Crohn's disease. A high rate of seepage and pad use was observed in these patients. However, 30 (86%) of the patients stated that they would still chose to have surgery again.⁵⁰

MacLean and colleagues from Toronto reported the Mount Sinai Hospital's experience with pouch failure. They operated on 57 patients with pouch-vaginal fistula, long outlet, pelvic sepsis, ileoanal anastomotic stricture, pouch-perineal fistula, or chronic pouchitis.

They suggested using abdominoperineal reconstruction in the first attempt at addressing pouch failures and concluded that reconstructive pouch surgery has a high success rate when done by an experienced surgeon.⁵¹

Dayton⁵² conducted a study to assess the outcomes after J pouch treated with repeat IPAA surgery in a large institutional series. They concluded that the rate of pouch failure or loss should continue to decrease to ~1 to 2% because of the technical improvements in repeat surgery.⁵² Table 3 gives the results of the studies with repeat IPAA.

We reported our experience with repeat IPAA and documented the functional outcome and quality of life between patients without any septic indications.⁵³ Patients who underwent repeat IPAA for septic indications had a better functional outcome and higher satisfaction rates in terms of quality of life with fewer dietary, social, and work restrictions. In this study, the patients' overall quality of life and happiness with the procedure were recorded such that 97% of the patients stated that they would undergo surgery again if needed and 98% would recommend it to others.⁵³

From a technical perspective, after performing pouch dissection, we recommend using the same pouch to preserve bowel length. If the original reservoir is not viable because of ischemia or irreparable damage, the pouch should be excised and a new one with the appropriate configuration constructed.

Dysplasia and Malignancy

With IPAA, the ileal pouch mucosa and the anal canal are left behind, which increases the potential risk for recurrent inflammation and dysplastic, invasive neoplastic changes.

In most patients with IPAA, the ileal pouch mucosa undergoes a series of histologic changes from slight villous atrophy to temporary moderate or severe

Table 3 Results of Repeat Ileal Pouch-Anal Anastomosis to Salvage Complication of Pelvic Pouches

	Zmora ^{46a} 1991–1999	Dayton ⁵² 1983–1999	Heuschen ⁴⁸ 1988–1999	MacLean ⁵¹ 1982–2000	Fazio ⁵⁰ 1983–1998	Sagar ^{46b} 1981–1995	Baixauli ⁵³ 1985–2001
Institution	Florida	Salt Lake	Heidelberg	Toronto	Cleveland	Mayo	Cleveland
No. patients	411	650	706	1200	1680	1700	–
Reoperation	32	29	107	57	35	23	112
Repeat IPAA	5	6	4	17	31		101
Septic complications	16	–	107	14	35	4	64
Fistula	3	3	87	23	25	4	47
Stricture	1	–	–	5	14	1	35
Abscess	–	1	8	–	25	4	46
Salvage	21 (84%)	29 (100%)	99 (92%)	42 (77%)	30 (86%)	17 (74%)	70 (82%)
Pouch failure	4	0	8	15	5	0	14
Complications after reoperation	9	6	–	32	34	6	46

IPAA, ileal pouch-anal anastomosis; – indicates data not reported.

atrophy followed by normalization of the mucosal architecture. However, pathological changes observed in the reservoir mucosa include chronic inflammation, severe villous atrophy with loss of villi along with crypt hyperplasia, and increased goblet cells with a transformation into the appearance of the colonic cells. These features may represent colonic metaplasia, and colonic-like mucosa in the neorectal mucosa could be a potentially premalignant condition. Indeed, Gullberg et al⁵⁴ reported neoplastic characteristics such as aneuploidy and different degrees of dysplasia in their study. This supports the concerns that many surgeons have about whether chronic inflammation of the ileal mucosa as it is seen in preoperative backwash ileitis and postoperative pouchitis in patients with ulcerative colitis leads to malignant transformation. In 1997, Cox and coworkers⁵⁵ reported an invasive adenocarcinoma that developed in a long-standing Kock continent ileostomy. Heuschen and associates⁵⁶ reported a case of ileal pouch cancer that developed from long-standing inflammation in the form of backwash ileitis before surgical therapy and subsequent pouchitis after IPAA. They suggested postoperative follow-up with periodic pouchoscopy and random biopsies for all patients after RP, especially for patients with intensified backwash ileitis and chronic pouchitis.

The retained islets of rectal mucosa are the major concern for developing adenocarcinoma in pelvic pouch patients using double-stapling technique. Baratris and colleagues reported a case of adenocarcinoma in the anus after IPAA for ulcerative colitis. They emphasized the two potential problems of retained anal mucosa: the risk of persistent inflammation that may cause symptoms, and the risk of dysplasia and invasive dysplastic changes. However, they also added that even mucosectomy does not guarantee elimination of disease. Thus, residual islets of colonic mucosa may appear in excised pouches despite mucosectomy.⁵⁷

With these concerns in mind, we attempted to establish the risk of dysplasia in the ATZ and the outcome of a conservative management policy for ATZ dysplasia. A total of 178 patients with stapled IPAA who were followed for at least 10 years and who underwent serial biopsies of the ATZ were included in the study. The estimated incidence of ATZ dysplasia was 4.5%. No patient developed cancer or lost his or her pouch because of cancer or dysplasia in the ATZ. This study confirmed that the risk of long-term dysplasia remains low.

These findings suggest that a careful follow-up of all patients after IPAA, which would include periodic digital and endoscopic examination of the ileal pouch and ATZ, is warranted despite the rarity of cancer in the ATZ or in the ileal pouch. Our suggestion is outlined in Figure 5. In addition, we do not recommend ATZ preservation in patients with a known diagnosis of rectal cancer or dysplasia in the lower two thirds of the rectum before IPAA surgery. But ATZ preservation appears to be safe for patients with dysplasia of the colon or the upper one third of the rectum.⁵⁸

CONCLUSION

The standard operative option for patients with ulcerative colitis and familial polyposis remains RP with IPAA. Most series in the literature demonstrate an acceptable complication rate with good-to-excellent functional and quality of life results. Surgical experience, peri- and postoperative care, and proper and competent intervention of complications affect surgical outcome and patient satisfaction. With increasing experience and better management of complications, an overall improvement in the results will be achieved. A detailed preoperative evaluation for underlying pathology, sphincter function, and general health including

Figure 5 Recommended algorithm for management of risk of ATZ dysplasia.

comorbid diseases can help the surgeon predict whether complications are likely and mentally prepare both himself or herself and the patient.

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