Revolution and Evolution: 30 Years of Ileoanal Pouch Surgery

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Abstract: Ileal pouch-anal anastomosis (IPAA) has become the standard of care for the 25% of patients with ulcerative colitis who ultimately require colectomy. IPAA is favored by patients because it avoids the necessity for a long-term stoma. This review examines how 3 decades of experience with IPAA has molded current practice, highlighting 5- and 10-year follow-up of large series to determine durability and functional performance, in addition to causes of failure and the management of complications.

Key Words: ulcerative colitis, inflammatory bowel disease, ileal pouch-anal anastomosis

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Surgical treatment of severe ulcerative colitis (UC) evolved radically through the course of the 20th century. At first, appendicostomy and later ileostomy formation were used as a means to decompress and lavage the colon. Ileostomy was later combined with subtotal colectomy and completion proctectomy. Although this evolutionary process delivered relatively safe treatment options, the prospect of a permanent stoma remained unpalatable to many patients. Ravitch and Sabiston documented the use of a straight ileoanal anastomosis following proctocolectomy in 1947.[1] Unfortunately, functional results were poor.[2] Later, Parks and Nichols combined elements of Kock's continent pouch[3] with a technique of rectal mucosal excision, developed for the removal of rectal adenomata and hemangiomata.[4,5] The ileal pouch reservoir was anastomosed to the dentate line using a per-anal suturing technique.[6] In a relatively short period of time, this technique had become the preferred surgical option for the treatment of UC. The advent of stapling instruments greatly simplified ileal pouch-anal anastomosis (IPAA) surgery, but it remains a complex undertaking with the potential to cause significant morbidity.[7] Pouch surgery aims to deliver 5 or 6 semiformed bowel movements per day, with no nighttime evacuation and no incontinence. Successful outcomes are built upon sensible patient selection, clear preoperative counseling, an operative strategy appropriate to the patient, and expedient management of complications.

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PATIENT SELECTION

IPAA In People More Than 50 Years Old

IPAA was initially advocated for young patients. Prolonged anal dilatation, necessary for mucosectomy and per-anal suturing was believed to be unduly hazardous for the older adult sphincter. Following the advent of stapling devices, reports emerged of IPAA in people 50 to 70 years of age.[8–13] In the largest study of its kind, Delaney et al found no difference in daytime stool frequency (5–6 stools per day) in 1410 patients <45 years old as compared with 485 patients >45 years old, with a median follow up of 4.6 years.[14] Nocturnal frequency was worse (mean 1.93 versus 1.4) in older subjects but only for the first year. At 1 year, episodes of incontinence were reported by one fourth of patients under age 45 and one half of those >55 years old. Nighttime seepage occurred in one third and one half of these patients, respectively. These differences were maintained up to 5 years but became less apparent by 10 years. The overall proportion of patients experiencing unwanted symptoms gradually increased over time independent of age at operation.

Farouk et al found that nocturnal stool frequency, fecal incontinence, protective pad usage, and consumption of constipating medication were higher in patients ages 45 or older at the time of IPAA.[15] Pouch function deteriorated over time in older but not younger patients. Nevertheless, high levels of satisfaction were achieved among older patients despite inferior functional results. In summary, complications and pouch preservation rates appear to be independent of age at operation, whereas continence and quality of life are generally a little worse with advancing years. IPAA surgery is appropriate for well-motivated older adult individuals without symptomatic disturbance of the anal sphincters following adequate explanation of the likely outcome.

Indeterminate Colitis

The term indeterminate colitis (IndC) describes 10% to 15% of surgical specimens that cannot be histopathologically classified as either UC or Crohn's disease.[16–18] Distinction may be difficult in fulminant UC because the pattern of ulceration may mimic that normally associated with Crohn's disease. For example, a severely inflamed transverse colon may give an impression of rectal sparing, and the use of steroid enemas can compound this effect.[19] Ulceration may additionally be patchy, fissuring, or transmural in extreme cases.

An accurate diagnosis may be obtained if preoperative biopsy specimens are examined. Alternatively, one can follow the histopathological changes in the retained rectum. In UC, florid inflammatory changes bearing the histological hallmarks of this disease are typical. Lymphoid hyperplasia with ulceration of overlying mucosa is another common feature. In sharp contrast, the Crohn's rectum tends to improve after fecal diversion.[20–23] Where the dominant histological findings are those of UC but areas of transmural inflammation, fissuring ulcers, or granulomas are found within the defunctioning (i.e., no contact with the fecal stream) rectum, the histopathologist should not be deterred from making a diagnosis of UC.[21]

Appendiceal orifice inflammation sometimes termed the appendiceal "skip lesion" can be an additional source of confusion.[24–26] This is considered to be a normal variant of UC, being found in 24/94 patients (26%) with active subtotal ulcerative colitis.[27]

The issue of outcome following IPAA for IndC has been addressed in 2 major studies. The Mayo Clinic compared outcome after IPAA for patients with IndC,[82] versus UC ($n = 1355$).[28] More Crohn's disease emerged in patients with IndC (15% versus 2%); median follow-up of 7 years. As a consequence, pouch failure was significantly higher for the IndC group (27% versus 11%; $P < .001$). Outcome in patients with IndC who did not convert to Crohn's disease was similar to those with UC, although more non-Crohn's IndC patients did manifest pouch fistulas; 85% of pouches were retained at 10 years. Preoperative features most associated with a subsequent diagnosis of Crohn's disease were atypical disease distribution such as skip lesions and rectal sparring.

The Cleveland Clinic reported more encouraging results, but during a period of only 3 years.[29] A postoperative pathological diagnosis of IndC was recorded in 171/1911 IPAA patients (9%). Pouch failure rates were 3% for both UC and IndC. Conversion to Crohn's disease occurred in 4% of IndC versus 0.4% of matched UC controls. Whereas daytime stool frequency was equivalent (6 times), those with IndC had worse nighttime frequency (2 times versus 1 time) and proportionally more soiling (36% versus 28%). Rates of incontinence did not differ (25% moderate, 1% severe). Although there was less overall satisfaction with pouch surgery among patients with IndC, 93% declared that they would have the operation again.

The consensus among most surgeons is that patients with bona fide IndC are suitable candidates for pouch surgery as long as they are fully informed and accept the risks involved. In our view, patients with a suspicious history of pelvic sepsis or perineal fistula should not be considered for IPAA surgery. Those with an equivocal picture following colonic biopsy should be considered for subtotal colectomy to maximize the chance of making a definitive diagnosis before embarking on pouch surgery.

Crohn's Colitis

Following ileal pouch surgery for UC, a number of patients are found to have Crohn's disease. MacRae et al report 20 such cases from a total of 551 (3%)[30]; 11/20 patients (55%) eventually lost the pouch. Others have confirmed that unsuspected Crohn's disease is a leading cause of pouch failure.[31,32] After a diagnosis of Crohn's disease, failure was observed to increase 9-fold over a baseline figure of 4%; median follow-up 4 years.[33] Pouches were lost as a consequence of unacceptable function or complex fistulas. Patients with Crohn's disease who retained the pouch had satisfactory function. A controversial study detailing 10-year follow-up of 41 patients with either known colonic Crohn's disease but no preoperative perianal or small bowel disease (26/41) or histological features suggestive of Crohn's disease following panproctocolectomy and IPAA (15/40) reported comparatively favorable results.[34] Early postoperative complications occurred in 25%, chronic perianal problems in 25%, and pouch failure in 0.7% (3/41). Function was generally good. Complication rates were proportionally much higher where the diagnosis of Crohn's disease was unequivocal based on the presence of epithelioid granulomas. Controversy exists where minor pathological criteria are used to establish the diagnosis of Crohn's disease. This subgroup may be more appropriately labeled as indeterminate. Crohn's disease remains an absolute contraindication to IPAA in most people's opinion. There may be a role for pouch surgery in a highly selected group of patients with Crohn's disease who possess a normal anus, have no small bowel disease, and are prepared to accept the increased risks of failure and reoperation.

Dyspasia or Cancer in the Proctocolectomy Specimen

The presence of dysplasia or potentially curable cancer either within the colon or high in the rectum does not preclude IPAA, although in locally advanced cases it would seem prudent to defer pouch formation if postoperative radiation therapy is contemplated.[35,36] As units move toward neoadjuvant chemoradiation therapy for advanced rectal cancer, the need to postpone pouch formation is diminished. We would consider mucosectomy and a hand-sewn pouch-anal anastomosis in patients with multiple tumors or multifocal dysplasia, especially when these lesions encroach on the lower rectum. It should be noted that surveillance of the mucosectomised cuff for tumor recurrence is not necessarily straightforward. Dysplastic cells

may survive deep within the muscular rectal cuff,[37,38] possibly re-presenting as "pouch tumors."[39] Reconstructive pouch surgery is therefore probably not appropriate for the patient with low rectal cancer.

TECHNIQUE

Pouch Configuration

Parks and Nicholls originally devised a triple-limb S-shaped pouch.[6] This was relatively complicated to construct and suffered from kinking of the efferent limb when it was >1 cm in length.[40] Several alternative designs have been used, including a high-capacity "W" pouch and a "J" pouch[42] that is some what easier to construct. Lewis et al examined factors associated with good functional outcome in S, J, and W double-stapled pouches.[41] Of 100 patients, 57 attained perfect anal continence and could discriminate flatus from feces; the remainder experienced episodes of minor incontinence. Anorectal physiology was performed preoperatively and at 1 year. Compliance of the ileal reservoir, a strong anal sphincter, and intact anal reflexes correlated with good outcomes, whereas pouch design played no part.

Most surgeons now favor the modified J pouch of Utsunomiya because of the ease of construction and the fact that less intestine is used in the process.[42] Functional results are equal to those of the other reservoir designs because the J pouch will ultimately accommodate up to 400 mL feces and empty spontaneously.[43–45] The pouch is formed from the terminal 40 cm of ileum using several applications of a linear, cutting stapler to join the antimesenteric border of two 20-cm ileal limbs.

Mucosectomy Versus Double Stapling

Stripping the columnar mucosa above the dentate line was initially advocated to prevent recurrence of UC. Mucosectomy was combined with a per-anal hand-sewn anastomosis, allowing precise placement of the pouch-anal anastomosis at the dentate line. During this procedure, the anal canal remained dilated for an average of 20 min (range 14–44 min).[46] Concern arose that this manipulation was detrimental to the sphincter complex. A study from Cleveland indicated that fecal incontinence was more common after mucosectomy.[47] In addition, ~50% of patients subsequently experience nighttime soiling.[43,48,49] Mucosectomy also involves excision of the anal transition zone (ATZ). This area of cuboidal transitional epithelium separates columnar and squamous epithelia within the anal canal. The ATZ is richly innervated by sensory nerve endings that mediate anal sampling reflexes.[50] The ability to discriminate solids and liquids from gases is an integral part of the continence mechanism.

The "double-stapled" IPAA technique preserves this theoretically important area with no requirement for prolonged anal dilation. A transverse stapler fired from above separates the rectum (which is then removed) from the top of the anal canal. A circular EEA stapler inserted via the anus joins the ileal reservoir to the upper anal canal. Proponents of stapling claimed that less sphincter trauma occurred using this technique. Compared with traditional hand-sewn methods stapling improved postoperative anal resting pressures and continence,[51] with greater preservation of anal sampling reflexes.[52] Several personal series reported favorable results.[53–56] One randomized controlled trial compared high versus low stapling of the anal canal and surmised that high stapling avoided injury to the ATZ.[57] Indeed, high anastomotic placement favored both daytime and nighttime continence. A large prospectively evaluated series also concluded that complete day and nighttime continence was achieved more frequently following a stapled rather than a hand-sewn anastomosis.[58] Four randomized controlled trials and 1 case-controlled study, however, failed to show a difference between the 2 techniques with respect to complication rates, anal physiology, and pouch function.[46,59–62] Closer examination of the Hallgren et al report reveals that marked functional differences did indeed exist between treatment groups, but these did not reach statistical significance because the study was underpowered.[60] Physiological data from Reilly et al point toward more robust sphincter function when the ATZ is preserved with a tendency toward better continence at night.[62] This is an outcome also shared by the study of McIntyre et al.[61] Failure to prove clinical benefit may reflect the small number of patients randomized within each of these trials and the complex nature of defecation. The small numbers of patients examined may also hinder proper assessment of the relative complication rates. Ziv et al reported the Cleveland Clinic's experience of hand-sewn and stapled surgery in 692 patients with colitis.[63] They concluded that there was a significantly higher rate of anastomotic disruption and para-pouch abscess following hand-sewn anastomosis. Pouch excision was consequently more frequent in this group. The complications of hand-sewn anastomoses did not reflect the surgeon's learning curve. This group subsequently devised a Cleveland Clinic pouch failure model and used this to conclude that anastomotic technique did not in fact influence the rate of pouch failure in 1965 patients undergoing pouch surgery for all indications between 1983 and 2001.[33]

Two large series have evaluated the effect of ATZ preservation in slightly different ways. Gemlo et al essentially audited a change in practice from S pouch combined with mucosectomy to J pouch with double-stapled anastomosis.[64] Functional results were reported (mean follow-up, 70 months) for 235 pouch procedures. Double stapling was associated with a significant reduction in both major and minor nighttime incontinence, whereas minor daytime incontinence was also reduced. Meanwhile Choi et al subclassified 138 patients following stapled IPAA according to the epithelial composition of the distal donut.[65] Those with predominantly squamous

epithelium (ATZ excised) had significantly lower postoperative maximal resting pressures compared with those with mostly columnar epithelium. Values did not deviate from the normal range, however. Sphincter length and recto-anal inhibitory reflex preservation did not differ between groups. Surprisingly, continence was not reported. These studies tend to suggest that ATZ preservation is a good idea, although the role of anal dilation confounds the first study, whereas a lack of functional results hampers the latter.

Winter et al reported results of a randomized controlled trial comparing perianal application of 0.2% glyceryl trinitrate ointment with placebo in 60 patients before circular stapler insertion.[66] Glyceryl trinitrate significantly reduced intraoperative mean anal resting pressure (MRP) and the need for anal digitation before insertion of the circular stapler. Postoperative MRP did not deviate from preoperative values, and function was excellent at 3 and 12 months. Following placebo, postoperative MRP was significantly reduced and function was worse, even at 12 months. These findings suggest that local trauma arising from stapler insertion can induce sphincter damage and that pharmacological intervention affords some protection.

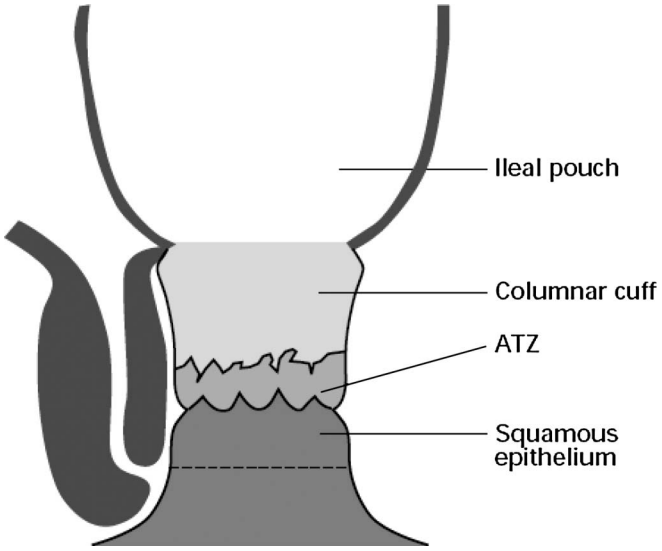

FIGURE 1. Distribution of epithelial subtypes in a typical double-stapled pouch-anal anastomosis. Reprinted with permission from *British Journal of Surgery*.[67] Copyright 1998, John Wiley & Sons.

Columnar Cuff

The ATZ forms a relatively small proportion of the anal canal.[67] Following a conventional double-stapled restorative proctocolectomy 1.5 to 2.0 cm of columnar epithelium will lie above this area (Fig. 1). Recurrent UC within the columnar cuff, termed "cuffitis," can cause discomfort, urgency, bloody discharge, and increased stool frequency. Retrospective analyses estimate the prevalence of cuffitis to be between 9% and 22% when a combination of histological and endoscopic criteria are used to make the diagnosis.[68,69] In a small, uncontrolled study with appreciable dropout, mesalazine suppositories reduced symptoms attributable to cuffitis, with endoscopic and histopathological appearances also improving.[70]

Dysplasia or carcinoma may theoretically arise within this columnar cuff, and there are reports of adenocarcinoma arising distal to the IPAA.[39,71–75] Such malignancies tend to follow resection of severely dysplastic or malignant colorectal tissue, and it remains possible that residual disease is left following proctectomy.

Coull et al undertook annual endoscopic surveillance of the columnar cuff in 135 UC patients, with a median follow-up of 5 years.[76] No dysplasia or carcinoma was located in any proctocolectomy specimen. Surveillance revealed chronic inflammatory changes in 94% of cuff biopsies classified as severe in one third. No dysplastic or neoplastic transformation occurred during the course of the study. The investigators concluded that routine surveillance of the anal canal was not necessary for at least 10 years following IPAA if dysplasia or malignancy were absent from the proctocolectomy specimen. Two separate reports, each of >100 patients (30-month median follow-up) have corroborated these findings.[77,78]

The Cleveland Clinic's experience is slightly different. Of 178 patients, 8 (4.5%) who were subject to endoscopic surveillance and serial biopsy of the columnar cuff for a minimum of 10 years developed dysplasia[79]; 6 were considered low grade and 2 high grade. No carcinomas were detected. One high-grade lesion showed evidence of mucosal irregularity; however, all of the patients remained asymptomatic. Low-grade dysplasia persisted over a 2- to 3-year period in 2/6 individuals, leading to mucosectomy and endo-anal pouch advancement in each case. Low-grade dysplasia was found in each surgical specimen. In the remainder, repeated biopsies revealed no further abnormality. The 2 patients found to have high-grade dysplasia had a history of colonic dysplasia or cancer. A second severely dysplastic biopsy was forthcoming in each case. One arose from the columnar cuff and this patient underwent mucosectomy. The other came from the ileal pouch in a patient who also had pouchitis. Further pouch biopsies were negative and this patient was simply observed. Because no cancers developed nor were any pouches lost, the investigators maintained that routine mucosectomy was unnecessary in the absence of rectal carcinoma or proven dysplasia within 8 cm of the anal verge. They recommended 3 to 6 monthly samplings of severe dysplasia, with excision of the anal canal in persistent cases. For low-grade dysplasia, 3 consecutive positive samples mandated a mucosectomy. Unfortunately, small islands of rectal mucosa may survive within the denuded rectal muscular tube in one fifth of patients after mucosectomy.[37,38]

In conclusion, many surgeons (including the present authors) favor the double-staple technique because this is the

simpler operation and it may have a lower risk of failure.[80] It may also facilitate pouch surgery under difficult circumstances such as an obese patient or where adequate mesenteric length is an issue. Comparison with hand-sewn IPAA suggests that postoperative sphincter tone is improved, although definitive clinical improvement is harder to judge. Whereas the randomized trials reveal no difference in complication rates between techniques, they undoubtedly lack power.[46,59–62] In a large institutional series, double stapling was associated with significantly less pelvic sepsis. The risk of dysplasia within the columnar cuff following double stapling seems to be small, and the anal canal is amenable to endoscopic inspection if desired. Mucosectomy should be considered in patients with rectal dysplasia/malignancy or in those with multifocal lesions. As a final note of caution, care should be taken when stapling across the anorectal junction to avoid an error of judgment that may result in the formation of a pouch-rectal anastomosis. The transverse stapling instrument should be positioned 2 to 3 cm above the anal margin, a distance roughly equivalent to the length of the distal 2 metacarpals of the index finger.

1-Stage IPAA

IPAA may be performed as a 1-, 2-, or 3-stage procedure. To date, most surgeons have favored creation of a temporary defunctioning loop ileostomy after IPAA surgery because this avoids what can be catastrophic pelvic contamination in the event of anastomotic dehiscence.[81] To omit a defunctioning ileostomy is essentially an exercise in risk management. Data from the Cleveland Clinic have shown that anastomotic separation occurred in 5.3% of 1965 IPAA patients,[33] although leak rates of up to 14% are described for 1-stage IPAA.[82,83] In comparison, the overall complication rate for 1504 ileostomy closures following IPAA was 11.4%. These complications comprised small bowel obstruction (6.4%, one fourth requiring operation), wound infection (1.5%), abdominal sepsis (1%), and enterocutaneous fistulae (0.6%).[84] Published complication rates from other institutions range from 10% to 30%.[85–92] The Cleveland data suggest that ileostomy closure will result in less major morbidity than a 1-stage IPAA.

Studies favoring a 1-stage strategy generally lack the power to properly evaluate rates of pelvic sepsis. Heuschen et al reported results of 57 1-stage procedures and 114 matched controls.[93] The anastomotic stricture rate was increased in the defunctioning group, although this may simply reflect case selection. Separate studies have yielded contrasting results with anastomotic leakage leading to more serious complications and more frequent relaparotomy when a covering ileostomy is not used.[81,82] Pouch failure rates from St. Marks were higher in patients without a covering stoma—15% versus 8%[94]—although MacRae et al have published contrasting figures with fewer than 1% of 1-stage pouches failing.[30] In practice, we omit stomas in approximately 25% of cases based on the perceived risks (e.g., steroids, nutrition, age, anemia), uneventful operation, and discharge arrangements in terms of access to our hospital.

Laparoscopic IPAA

Avoidance of wound pain, early restoration of intestinal function, reduced intraabdominal adhesion formation, and better cosmesis are the aims of laparoscopic surgery. The complexity and difficulty of laparoscopic colorectal techniques have hindered rigorous assessment of these endpoints through large clinical trials. Early reports focused on the feasibility of laparoscopic IPAA.[95,96] Of 32 patients, 2 experienced significant intraoperative complications following 1-stage IPAA; 1 developed rectal perforation, and 1 patient had a staple line misfire.[97] Defunctioning was required for postoperative complications in an additional 3 patients.

Twenty laparoscopic IPAAs were compared with case-matched open controls.[98] Return of bowel function and length of hospital stay (median 6 versus 8 days) were improved following laparoscopic surgery, whereas complication rates did not differ. Separate investigators have not shown a benefit.[99–101] A prospective randomized controlled trial of hand-assisted laparoscopic colonic mobilization and open rectal dissection (via an 8-cm Pfannenstiel incision) versus open surgery through the midline in 60 patients showed no difference in postoperative quality-of-life measurements.[102] Although open pelvic dissection is expedient and facilitates distal stapling, it may negate some benefits of the laparoscopic approach. Refinement of dissection techniques and the production of dedicated equipment have greatly facilitated the performance of laparoscopic IPAA in some centers.

Accelerated recovery programs have already delivered some of the benefits promised by laparoscopic colorectal surgery. In a recent randomized observer- and patient-blinded trial, 60 patients underwent elective laparoscopic or open colonic resection, with the principles of fast-track rehabilitation applied to both groups.[103] The median postoperative stay was 2 days, with rates of readmission on the order of 20% to 25%. More patients thought that their stay was too short following open (30%) versus laparoscopic surgery (17%). Functional outcome did not differ. These data combined with our experience suggest that optimized perioperative management has much to offer the ileal pouch patient.

It is our opinion that laparoscopic IPAA has some way to go to prove its usefulness. Patients are certainly impressed by the improved cosmetic appearance. It is hoped that the incidence of adhesional small bowel obstruction may be reduced following minimally invasive surgery.

COMPLICATIONS

Hemorrhage

Bleeding from the pouch is estimated to complicate 3.5% of IPAA cases.[7] Primary intraluminal hemorrhage may follow

formation of a sutured or stapled pouch, and it is therefore important to carefully inspect the mucosal surface before the pouch-anal anastomosis is constructed. Reactionary intraluminal hemorrhage, within 24 hours of the operation, is likely to originate from the suture or staple lines. Irrigation of the pouch with a 1:200000 adrenaline solution controls 80% of clinically significant hemorrhages.[7] Continued bleeding necessitates a return to the operating room. The pouch is inspected using an Eisenhammer anal speculum (Seward, London), proctoscope, or sigmoidoscope. Suction and irrigation are used to accurately locate the bleeding point, which is then sutured or injected with 1:10000 adrenaline solution. Secondary hemorrhage is less common and usually heralds pelvic sepsis. The pouch should be inspected in the surgical theater, with special attention given to the ileoanal anastomosis for evidence of localized anastomotic breakdown. Points at which bleeding occurs are sutured and collections drained, preferably via the original defect. A small mushroom or Foley catheter may then be placed transanally into the cavity.

Intraabdominal hemorrhage may arise from mesenteric vessels or the pelvic side wall. The rectal stump may bleed following hand-sewn pouch-anal anastomosis. In exceptional circumstances, inspection of the lower pelvis is facilitated by detachment of the pouch. The stump is approached endoanally using a Lone Star retractor (Lone Star Medical Products, Houston, Tex). The pouch may then be exteriorized as a left iliac fossa mucous fistula if reanastomosis is considered unsafe. Uncontrollable pelvic hemorrhage requires packing the cavity, with a second look 48 hours later.

Small Bowel Obstruction

Small bowel obstruction (SBO) is unfortunately a common complication following IPAA. Of 1178 pouch patients from Toronto, 272 (23%) suffered 351 episodes of SBO, with a median follow-up of 8.7 years.[104] The cumulative risk of SBO was 9% at 30 days, 18% at 1 year, 26% at 5 years, and 31% at 10 years, with reoperation rates of 0.8%, 2.7%, 6.7% and 7.5%, respectively. Early SBO, occurring within 30 days of pouch formation or ileostomy closure, accounted for 44% of obstructive episodes. Most cases resolved using conservative measures, and only 5% required laparotomy. Early SBO did not predispose to late SBO. There were 197 episodes of late SBO in 149 patients; 36% of patients required laparotomy. In a large proportion, small bowel was adherent to the pelvis or a previous stoma site. The risk of late SBO alone was 6% at 1 year, 14% at 5 years, and 19% at 10 years. One fourth of patients experienced >1 episode. Five percent of the total population required reoperation for late SBO, 20% of patients who underwent laparotomy and adhesionolysis developed further episodes of SBO, and in 5% a further laparotomy was necessary. Factors predisposing to late SBO were revisional pouch surgery (hazard ratio 2.1) and formation of a defunctioning stoma (hazard ratio 1.5). Ischemic bowel was found in 4/80 patients at relaparotomy, thus, a nonoperative strategy is likely to be safe where signs of ischemia do not exist.

Reports from the Cleveland,[7] Mayo,[105] and Lahey[106] Clinics, with follow-up of 2 to 3 years, document SBO rates of 25%, 17%, and 20%, respectively, with operative intervention necessary in 7% of cases.

Several strategies have been devised to prevent adhesion formation. The efficacy of dextran solutions remains unproven[107] and concerns persist regarding safety. A multicenter randomized controlled trial of the sodium hyaluronate bioresorbable barrier preparation Seprafilm (Genzyme, Cambridge, Mass), revealed reduced adhesions to the midline scar following IPAA in cases in which this product was used.[108] Unfortunately, the incidence of SBO remained unchanged. If applied next to an anastomosis, Seprafilm may impair healing,[109] a finding that in our view would preclude its use within the pelvis of pouch patients, where adhesions commonly give rise to episodes of SBO.

SBO related to ileostomy formation may follow torsion of the loop, lateral space obstruction, and an inadequate trephine. The latter usually requires digital dilation under general anesthetic; however, in the remaining cases it may be desirable to aim for stoma closure if a contrast enema demonstrates healing of the pouch and intraabdominal sepsis has been reasonably excluded.

Pelvic Sepsis

Fever in a patient recovering from an IPAA operation should arouse suspicion of pelvic sepsis. This remains a relatively common acute complication, and failure to react in a timely fashion is likely to compromise pouch function. Septic complications result from anastomotic dehiscence or an infected pelvic hematoma. Digital examination may reveal an anastomotic defect or localized tenderness overlying an indurated or fluctuant mass. CT or MRI should demonstrate its extent. Treatment may be tailored to the size and nature of the problem. For instance, nonoperative measures were used to treat 24/131 (18%) cases in a series from Heidelberg, with 2/24 (8%) eventually losing the pouch.[110] Data from the Mayo Clinic indicate that 11/73 (15%) abscesses were considered "early" and treated with antibiotics alone.[111] All but 3 cases resolved without the need for subsequent operation. An additional 16/73 (22%) were aspirated under radiologic guidance, with 3 requiring surgical intervention.

The rate of pouch-related sepsis was 15.6% at 1 year and 24.2% at 3 years in 494 consecutive patients with UC from Heidelberg.[112] A stapled J pouch with mucosectomy and hand-sewn anastomosis was used. Interestingly, no patients were subsequently diagnosed with Crohn's disease. Fistulae accounted for 76% of septic events (56% pouch-anal anastomotic, 13% pouch vaginal, 7% proximal pouch), with anastomotic separation (16%) and para-pouch abscesses (8%) constituting the remainder.[110] In contrast, 73/1508 (4.8%) of patients from the Mayo Clinic had their recovery complicated by

a pelvic collection, with pouch fistulae recorded in only 3.[111] In this series, a technique of hand-sewn ileal J pouch-anal anastomosis was favored. The Cleveland Clinic evaluated 1965 IPAA procedures performed for UC (60.7%), IndC (27.9%), Crohn's disease (3.8%), and familial adenomatous polyposis coli (0.7%) to conclude that fistula formation occurred in 151 (7%), anastomotic separation in 104 (5%), and pelvic abscess in 109 (5%).[33]

During an examination under anesthesia, the vagina should be inspected for evidence of fistulation, especially if the IPAA was stapled. The anus is inspected with an Eisenhammer retractor. Anastomotic breakdown can usually be directly visualized. The underlying area is probed to determine the extent of any associated abscess cavity and suction applied to clear the contents. Larger defects may be amenable to digital examination followed by placement of a catheter for drainage and irrigation. In the presence of a presacral collection and no obvious anastomotic defect, one is usually created in its posterior aspect. Regular reexamination under anesthetic may be required to be confident that the cavity remains clean. A sinogram performed via the catheter may indicate when the cavity has collapsed. Although we favor this approach for the majority of mild to moderate pouch-related sepsis, other series appear to use this course of action less frequently. Case mix may account for this. In the Mayo series of isolated para-pouch abscesses per-anal drainage was used in 6/73 (8%) cases,[111] whereas for Heuschen et al, the figure was 33/131 (33%).[110]

Relaparotomy is reserved for cases in which CT-guided drainage or minor surgery has failed to control sepsis and also for patients who deteriorate quickly with signs of generalized peritonitis. In the Mayo Clinic series, 40/73 patients (55%) were primarily treated by laparotomy; 14 pouches were excised immediately, 2 as a result of ischemia, and the remainder for severe sepsis.[111] Laparotomy was ultimately required in 74/131 cases (56%) from Heidelberg.[110] Major leaks require a proximal diverting loop ileostomy to be formed if one is not already in place. Consideration should be given to exteriorizing of the pouch if complete anastomotic disruption has occurred. With gross ischemia, one should aim to resect and exteriorize the ileum.

Rates of pelvic sepsis are much higher for patients with UC undergoing IPAA than for those with FAP who are subject to the same operation.[112,113] Risk factors for the development of pelvic sepsis have been evaluated in a number of institutional series with varying results. High-dose corticosteroid usage (systemic equivalent of >40 mg/day prednisolone) predisposed to sepsis in patients undergoing panproctocolectomy and IPAA.[112] Similar conclusions were drawn by Cohen et al from a review of 483 patients,[114] whereas Ziv et al found no association between prolonged high-dose corticosteroids (>20 mg) before operation and the rate of acute septic complications.[115] Whether steroids impair healing of the anastomosis, decrease the ability to combat infection, or simply mark a subgroup of patients that are in poor clinical condition remains unknown. Our approach is to avoid IPAA formation and instead perform subtotal colectomy in patients who are acutely unwell and receiving high-dose corticosteroids.

What is the prognosis of patients following an episode of pelvic sepsis? The Mayo series indicated that 4/73 patients developed a chronic fistula.[111] One pouch vaginal fistula was successfully repaired, but 3 pouch perineal fistulas each required a long-term ileostomy. Functional outcome was worse following pelvic sepsis. Major incontinence occurred in 16% of patients who had experienced sepsis compared with 7% who had not. More patients in this subset relied on constipating medication (72% versus 47%) and pads (41% versus 18%), although stool frequency remained unchanged at 5/day. Quality-of-life measurements were also adversely affected. Within 2 years of pelvic sepsis, pouch failure accounted for 18/73 (27%) patients compared with a baseline rate of 5.9%. It is encouraging that the incidence of pouch-related sepsis declined markedly during the 15-year time frame of this study.

The pouch failure rate for patients after septic complications in the Heidelberg cohort was 29%.[110] Major causes of failure were persistent pouch fistula (36%), poor function secondary to a compromised anal sphincter (18%), outlet obstruction (13%), pelvic fibrosis (10%), pouchitis (10%), and unwillingness on patients' parts to undergo ileostomy closure (13%). In a series of 628 patients treated mostly for UC at the Lahey Clinic, pelvic sepsis was diagnosed with a frequency of 6.5% and associated positively with increased stool frequency and inability to discriminate the passage of stool from gas.[116] No difference in incontinence or medication or pad usage was found.

Evacuation Problems

Anastomotic stricture may complicate leakage, tension, or ischemia at the IPAA.[117] It is estimated to occur with a frequency of 4% to 18%.[7,58,116,118,119] Anastomotic strictures were diagnosed in 42/982 (4%) patients treated at the Mayo Clinic.[120] In 62%, this diagnosis followed ileostomy closure. Routine pouchogram before stoma closure is now standard practice. Presenting symptoms included straining (36%), diarrhea (50%), and anal (12%) or abdominal pain (12%). A single examination under anesthesia with application of Hegar's dilators successfully treated 40% of cases; in the remainder, either repeated dilatation was necessary or further complications ensued. Ultimately, 6/42 (14%) cases required pouch excision for stenosis,[3] fistulization,[2] or poor function.[1] One patient remained defunctioned at 40 months, whereas another was lost to follow-up. Of the 34 remaining patients, 11 were dependent on periodic dilatation, and 23/34 were deemed to have good or satisfactory pouch function.

In our experience, it is often possible to attempt dilatation at the time of pouchoscopy. Stapled anastomosis may

increase stricture formation, but such strictures are usually weblike and easily treated. Most strictures will respond to the use of Hegar's dilators and in some instances it may prove beneficial if the patient continues to use the dilator for several weeks at home. In a few patients this approach may fail, especially if the stricture is particularly long or tight. In such cases, further biopsies are taken to exclude Crohn's disease. Once all sepsis has been eradicated and the tissues have recovered, surgical revision by per-anal pouch advancement may be considered.[121] This technique can also be used to close fistula tracks situated at the level of the stricture. Partial dehiscence of the new suture line can occur and is managed conservatively if possible with minimal debridement and drainage of any underlying cavity using a small catheter. Long strictures may require relaparotomy with pelvic mobilization before per-anal anastomosis.

Efferent limb obstruction was a common cause of outlet obstruction following S pouch construction. Intestine connecting the pouch to the anus was prone to kinking when left too long. Current pouch designs anastomose directly to the anal canal, so this complication is now seldom seen. Salvage surgery involves mobilization of the pouch from above with revision of the efferent limb so that it measures no more than 1 cm.[122]

Reoperation for Pouch Vaginal Fistulae

Fistulae arising between the IPAA and vagina occur relatively rarely, with an estimated incidence estimated at 3% to 16%.[49,123–126] In 68 patients from St. Marks, pouch vaginal fistulation originated from the IPAA (76%), the pouch (13%), or from a cryptoglandular/other source (10%).[127] Operative trauma, surgical technique, postoperative pelvic sepsis, and undiagnosed Crohn's disease were implicated. Fistulae present either immediately postoperatively or several months later, with evidence to suggest that outcome is better in the former. Associated early complications included pelvic sepsis (29%), anastomotic separation (24%), anastomotic stricture (24%), small bowel obstruction (25%), hemorrhage (3%), and pouchitis (18%). Unsuspected Crohn's disease should be actively sought because rates of healing are worse (25% versus 48%) and pouch failure more common (33% versus 14%).[126] Indeed, no long-term healing was achieved in 12% of patients diagnosed with Crohn's disease in the St. Marks's study.[127]

Transanal ileal advancement flap, transabdominal advancement of the ileoanal anastomosis, transvaginal/transanal repair of the defect, long-term seton placement, and pouch excision are techniques that have been used to treat pouch-vaginal fistulae. In a series of 60 cases reported from the Cleveland Clinic, more than half of the fistulae were deemed to arise from below the anastomosis with a further 28% at that level.[126] Per-anal ileal advancement was used in 39 patients.[121] Seton drainage preceded closure in a few cases. Primary healing occurred in 17 (43%) cases. Closure was obtained in 4 more after a second procedure. Careful hemostasis and a tension-free join were deemed essential to success, and the pouch should be mobile from the outset. Redo IPAA was necessary in 16 patients, either as a primary procedure for high pouch fistulas or in cases in which transanal repair had failed or was deemed unsuitable because of tethering. Healing was achieved in 10/16 cases. Primary healing rates were better for early fistulas formed within 6 months of operation. This is not surprising given that 40% of subjects were later diagnosed with Crohn's disease. Fecal diversion was not considered obligatory for ileal advancement; only 65% of patients were defunctioned, including those whose stomas had not been reversed in the first place.

Per-anal access to fistulae arising within the anal canal may be difficult, especially when an anastomosis has been placed at the anorectal junction. For this reason transvaginal repair has gained popularity.[123] This technique may avoid damage to the anal sphincters. It involves direct exposure of the internal anal opening through the posterior wall of the vagina, with mobilization of the pouch and primary closure of the defect followed by restitution of the vaginal wall and formation of a defunctioning stoma.[128] Successful closure was reported in 11/14 cases, although 5 patients required up to 3 operations; median follow-up was 18 months. Where fistulation is demonstrated to stem from previously unrecognized Crohn's disease, the antitumor necrosis factor monoclonal antibody infliximab may be effective in closing the defect, although recurrence remains a problem.[129,130]

Mucosal Adaptation and Pouchitis

Prolonged fecal exposure can induce adaptive changes within the ileal pouch mucosa. Villous atrophy, a chronic inflammatory cell infiltrate, and colonic phenotypic change occur in up to 80% of pouches.[131] The dependent portion of the pouch is most notably affected.[132] Pouchitis is a relapsing, acute-on-chronic inflammatory condition presenting with diarrhea that may be bloody, urgency, abdominal bloating, pain, or fever. Endoscopic appearances are similar to those of UC with erythema, granularity, faded vascular markings secondary to mucosal edema, and contact bleeding seen initially. Later, punctate hemorrhages, mucous secretion, purulent discharge, and superficial ulceration occur. Histologically, signs of acute inflammation (polymorphonuclear leukocyte infiltration) with superficial ulceration, superimposed onto a background of chronic inflammatory changes, are typical.[133,134] Current evidence points to recurrence of UC in areas of colonic metaplasia as a potential cause of this condition, although alternate hypotheses abound. Anaerobic bacterial overgrowth of the ileal pouch may occur. It is on this premise that antimicrobial treatment is based, although to date no definitive evidence exists.

Differential diagnoses include undiagnosed Crohn's disease, especially in the presence of prominent ulceration, pre-pouch ileitis or fistula formation. "Cuffitis" describes

recurrence of UC in the columnar cuff that is preserved during stapled IPAA. Alternatively, specific bacterial or viral infections, para-pouch pelvic sepsis, a low volume reservoir, outlet obstruction, and incomplete emptying can result in a similar clinical picture. In these instances stool examination, MRI, and isotope or contrast pouchogram may help to elucidate the nature of malfunction. A noninflammatory condition akin to irritable bowel syndrome, termed irritable pouch syndrome, is proposed to account for patients with severe symptoms of pouch dysfunction, in the absence of gross endoscopic or histological changes.[135] The etiology of pouch dysfunction in a cohort 123 consecutive "symptomatic" patients, was pouchitis (34%), irritable pouch syndrome (28%), unrecognized Crohn's disease (15%), and cuffitis (22%), of whom 6% had concomitant pouchitis.[70] Fecal lactoferrin, an iron-binding protein released by activated polymorphonuclear leukocytes, was used to differentiate patients with an inflammatory condition requiring endoscopic evaluation from those with irritable pouch syndrome who were treated symptomatically with antidiarrheal, anticholinergic, or antidepressant medication.[136]

Two tools have been created to standardize diagnosis and reportage of pouchitis. The pouch disease activity index and the pouch activity score each provide a numerical score based on clinical, endoscopic, and histological findings.[137,138] Neither index is currently deemed as accurate as the physician's assessment, but they are useful for reporting the results of clinical trials.[139]

The cumulative probability of pouchitis, determined on the basis of symptoms, endoscopy, and histopathology in 468 IPAA patients was 20% at 1 year, 32% at 5 years, and 40% at 10 years.[140] No pouchitis occurred following operation for FAP (7% of the total). These rates are in accordance with those of other centers. The incidence of pouchitis appears to be independent of surgical technique with respect to pouch construction, use of a defunctioning stoma, or laparoscopic techniques.[45,93,141,142] Patients with primary sclerosing cholangitis are more prone to develop pouchitis, with a cumulative probability of 79% at 10 years.[143] Persistence of extraintestinal manifestations of UC has also been linked to an increased risk of developing pouchitis, and certain patients exhibit a temporal relationship between their pouchitis and extraintestinal symptoms akin to that described for UC, fueling speculation that these 2 inflammatory processes represent variations of the same underlying condition.[144] Perpetuating this theme, smoking is considered to be protective against UC[145] and also reduces the incidence of pouchitis.[146,147]

A genetic marker for pouchitis has been suggested following the discovery of an association between allele 2 of the interleukin-1 receptor antagonist gene (*IL-1ra*) and the development of pouchitis.[148]*IL-1ra* is a competitive antagonist to the IL-1 receptor and therefore potentially anti-inflammatory. Allele 2 leads to reduced levels of *IL-1ra*, and this change is hypothesized to mediate inflammation within the pouch.

The efficacy of preoperative serum perinuclear antineutrophil cytoplasmic antibody (pANCA) as a predictor of postoperative pouchitis was evaluated in 95 patients.[149] Preoperatively 60% were pANCA positive, of whom 42% developed pouchitis. Only 20% of those who were pANCA negative did likewise ($P = .09$). Subgroup analysis according to pANCA levels revealed no predictive value with respect to acute pouchitis, however, high levels were associated with the development of chronic pouchitis in one half of patients. It is interesting to note that the majority of primary sclerosing cholangitis subjects are pANCA positive.[150] It must, however, be stressed that whereas many investigators have examined whether pANCA measurement predicts for pouchitis, a significant proportion have failed to show any association. A recent study by Reumaux et al illustrates this point.[151]

Long-term pouch function has been studied in patients diagnosed with pouchitis. Hurst et al determined that even a single episode of pouchitis predisposed to worse long-term function.[152] They hypothesized that pouchitis was a chronic condition affecting daily function. Other investigators have concluded that only chronic pouchitis, with an incidence of 5% at 10 years, affects daily function by increasing the frequency of defecation.[153] In large institutional series, the incidence of pouch failure approached 10% at 10 years, with severe pouchitis accounting for 10% of failures.[7,15,30,94,140] Pouchitis is therefore responsible for 1% of all ileal pouches failing, a relatively small figure considering that the majority of patients experience at least 1 episode during their lifetime.

Patients with new symptoms suggestive of pouchitis have a 50% probability of eventually being diagnosed with this condition, and therefore they should be investigated by endoscopy and biopsy. Once the diagnosis is established, it would be reasonable to instigate empirical therapy for relapses, with the caveat that patients who do not promptly settle should return for further endoscopic evaluation. Bacterial infection with *Salmonella*, *Shigella*, *Escherichia coli*, *Campylobacter,* or *Clostridium difficile* and viral infection with cytomegalovirus are recorded as potential causes of pouchitis.

Hurst et al concluded that oral metronidazole or ciprofloxacin clinically improved 96% of pouchitis in an institutional series from Chicago.[154] Of 52 subjects studied, 41 were successfully treated using a 7-day course of metronidazole, 250 mg tds, with an additional 8 patients responding to ciprofloxacin, 500 mg bid. Two thirds of patients developed further attacks and 6% became chronic sufferers. The efficacy of metronidazole has been confirmed by 3 small prospective randomized studies.[155–157] One study suggested that ciprofloxacin, 500 mg bid, for 2 weeks was more effective than metronidazole.[157] This drug produced no side effects, whereas metronidazole had induced either an unpleasant taste, vomiting, or transient peripheral neuropathy in 3/9 patients. Maintenance therapy may be effective for patients who promptly relapse following cessation of treatment, and weekly rotation of

antimicrobials may combat resistance to single agents. The probiotic VSL-3 may be taken orally; there is some evidence that relapse rates are decreased. Two randomized trials have shown relapse rates on the order of 10% to 15% at 9 to 12 months with VSL-3 versus 94% to 100% for placebo.[158,159] This therapeutic agent has also been studied in a prophylactic capacity following IPAA operation. At 1 year, 10% of VSL-3 patients had experienced at least 1 episode of pouchitis in contrast to 40% of those receiving placebo.[160] Patients who fail to respond may be offered oral or rectal corticosteroids.[133] Alternatively, oral or topical mesalazine may be used. Consideration should be given to removing the pouch where function is poor as a consequence of chronic pouchitis.

Pouch Dysplasia

It is concerning that patients affected by chronic pouchitis may go on to develop malignancy. Veress et al followed 87 pouches for a median of 6 years to show that 10% were affected by severe pouchitis, with total villous atrophy and colonic phenotypic change.[161] Three cases of low-grade dysplasia were detected, although this figure increased with further surveillance.[162] One high-grade lesion arose in a patient 11 years after S pouch formation. Severe atrophy and low-grade dysplasia had been present for several years. Multiple biopsies taken from the pouch within 6 months of the operation may help categorize patients into the appropriate histological subgroup with targeted follow-up of those deemed at risk.[163] Ileal pouch adenocarcinoma has been described, albeit occasionally and in situations in which the pouch was in situ, although not necessarily in use, for 10 to 20 years.[164,165] Difficulty may exist in deciding whether a tumor arises from the pouch or the columnar cuff.[39] The etiology of these lesions is slightly different. The first probably arises from areas of dysplastic ileal mucosa, whereas the second is likely to be a consequence of persistent islands of rectal mucosa within the rectal cuff.[131,166]

Thompson-Fawcett et al have examined 106 patients deemed at high risk of pouch dysplasia as a result of chronic pouchitis ($n = 34$), pelvic pouch for >12 years ($n = 42$), Kock pouch for >14 years ($n = 29$), and neoplasia within the original colectomy specimen ($n = 11$).[166] Thirty-three patients demonstrated severe villous atrophy, whereas only 1, with a long-standing pouch, had evidence of low-grade dysplasia. The authors concluded that the development of dysplasia was a rare event within 15 to 20 years of pouch surgery. Similarly, 15-year follow-up of the Kock pouch indicates that dysplastic change within the ileal mucosa seldom occurs.[167]

Sexual Dysfunction

Mild impairment of sexual activity was found to occur in 20% of patients before IPAA surgery compared with 16% postoperatively, whereas severe impairment was judged to occur with a frequency of 16% and 3%, respectively.[15] One fourth of pouch patients indicated that their sex lives had improved following the operation, although for 56% there was no change. The incidence of sexual dysfunction at 1 and 12 years in men was 1% versus 2%, whereas in women the figures were much higher at 8% and 11%. Results from Oxford revealed impotence rates in men of 3.8% (6/156 cases), with a median follow-up of 75 months.[168] This complication was limited to patients >50 years old at the time of pouch operation. Erectile function is a parasympathetic response mediated by the erigent nerves, whereas ejaculation is a sympathetic event mediated by the hypogastric nerves. These structures may be damaged during pelvic dissection because they lie behind the parietal facial envelope, close to the mesorectal plane. One may avoid contact with the pelvic nerves using a close rectal dissection. This approach is highly vascularized and for this reason many surgeons prefer to dissect in the more anatomic mesorectal plane. Lindsey et al deduced that close rectal dissection conferred no benefit with regard to either impotence or ejaculatory difficulties when compared with dissection in the mesorectal plane.[168] For patients unfortunate enough to be affected by erectile dysfunction following rectal excision, a randomized controlled trial of sildenafil (Viagra) versus placebo achieved response rates of 79% (11/14 cases) versus 17% (3/18 cases), respectively.[169]

Fecundity and Pregnancy

UC commonly affects young females of reproductive age. Neither the disease itself nor the medical treatments currently available are thought to compromise fertility, although data from patients with predominantly active disease are lacking.[170] Johnson et al examined fertility rates in married or cohabiting females ages 18 to 44 years with a history of UC.[171] Of 153 patients, 59 (38%) who had undergone IPAA were unable to conceive following 1 year of unprotected intercourse compared with 8/60 patients (13%) subject to medical management alone. The authors concluded that whereas a diagnosis of UC did not affect fertility, pouch surgery was associated with a 98% reduction. Surgeons may consider delaying proctectomy until a family has been established, or alternatively antiadhesion products may combat tubal obstruction.

Effect of Vaginal Delivery on Pouch Function

Vaginal delivery is associated with an appreciable rate of occult sphincter injury of ~30%.[172] Concern has arisen that females with an ileal pouch may risk incontinence after vaginal delivery. The Cleveland Clinic has reported that sphincter injury occurs more frequently in those who choose vaginal delivery rather than cesarean section, with rates of 50% and 13%, respectively.[173] Nevertheless, no difference in pouch function was apparent with mean follow-up of 5 years. The Mayo Clinic reported that pouch function was unaffected by childbirth in 85 women; median follow-up of 8 years.[15] Complicated deliveries did not produce a higher proportion of adverse outcomes. For the duration of the pregnancy, stool frequency, incontinence, and pad usage have been shown to

increase.[174] A study of 47 deliveries in 29 women from Toronto revealed that stool frequency and incontinence were worse in the third trimester, with pouch function quickly returning to normal in 83% of cases.[175] Neither multiple births nor birth weight adversely affected subsequent pouch function. Long-term disturbance in pouch function was seen in a small proportion of females (17%), although this interestingly bore no relationship to the method of delivery (cesarean or vaginal). There was a preponderance of cesarean sections within this group of ileal pouch patients (24/49 deliveries). The authors concluded that the mode of delivery should be defined by obstetric criteria alone. It seems reasonable to conclude that whereas vaginal delivery confers no functional disadvantage in the midterm, we remain concerned that sphincter integrity is indeed compromised. Long-term implications remain unmeasured and therefore uncertain.

Pouch Failure

Complication rates for IPAA are quite high—~30% to 40%; fortunately, these problems are usually resolved. Pouch excision or indefinite retention of a defunctioning stoma defines failure. Institutional pouch failure rates have notably fallen during the past 20 years presumably following improvements in patient selection and surgical technique. The rate of failure for 2 separate halves of a 22-year study from St. Marks were 16.5% and 8.3%, respectively.[94] Annual failure rates at the Cleveland Clinic have fallen from 15% to 2% during an 18-year period,[33] with similar trends reported from Toronto.[30] This deficit should reduce over time as failures accrue among more recent cases.

Experience plays a key role in both pouch construction and the treatment of postoperative complications. The Cleveland Clinic group examined how operator experience, determined by previous number of IPAA operations, influenced long-term pouch failure rates using a technique that sought to compensate for mixed case loads.[80] Surgeons were grouped according to experience with 2 seniors who had performed IPAA operations since the mid-1980s and 10 juniors who had completed an average of 67 IPAA cases each. Half of the juniors demonstrated a learning curve of 23 cases for this procedure as determined by their pouch failure rate. The initial learning curve for senior staff had been ~40 cases. Notably, pouch failure following hand-sewn anastomosis was significantly higher for junior staff when compared with their senior colleagues, although both groups performed stapled anastomosis equally well.

In general, 2 types of pouch failure have been considered. Early failure arises from complications of the primary procedure or from technical difficulties experienced at this time. Late failure is more likely to reflect poor function of the pouch reservoir. A consistent theme that emerges from the large institutional series is that early pouch failure is closely associated with the occurrence of perioperative pelvic sepsis, whereas that occurring later is often secondary to poor function or after an unexpected diagnosis of Crohn's disease.[15,30,33,94,140] Most failures occur beyond the first year, and a steady rate of attrition occurs up to 10 years. Certain operative practices, such as the S pouch design, may have increased pouch failure rates.

SALVAGE SURGERY

Currently, some 5% to 10% of IPAA procedures fail. The success of redo pouch surgery for UC has improved, with approximately three fourths of patients now retaining a functional pouch in the long term.[176] This figure rises further when considering patients with isolated functional impairment.[177] When considering revision, one should evaluate the sphincters, assess pelvic soft tissue compliance, make a judgment regarding the likely diagnosis (Crohn's disease or UC), and determine the patient's general health and wishes. It is clear that redo IPAA surgery may benefit patients with an excessively long efferent ileal spout[122,177,178] or those with a tortuous stricture.[179] It is perhaps less clear whether revision is as beneficial for those with ongoing septic complications.[120,180] Of 101 pouch revisions performed at the Cleveland Clinic, the original cause of failure was listed as perineal or pouch vaginal fistula (47%), pouch dysfunction including a long efferent limb (36%), chronic anastomotic leak (27%), anastomotic stricture (22%), or unclassified (6%).[181] Pathological evidence of Crohn's disease was noted in 4 patients before revisional surgery and a further 15 following its completion. New pouches were fashioned in 28 patients, with the rest undergoing revision to preserve bowel length. Outcome data were available for 85 patients with pouch survival rates at 5 years of 79% for UC and 53% for Crohn's disease. Continuing sepsis was present in 64% of cases at the time of revision, but this did not prejudice the outcome. Stool frequency was 6.3 ± 2.8 by day and 2.0 ± 1.9 at night. Values were higher where a new pouch had been constructed. Fecal seepage occurred in 50% by day and 69% at night. Complications arising as a result of redo IPAA occurred in 46% of patients. These results indicate that even in the best hands redo IPAA surgery carries an appreciable morbidity rate. Not surprisingly, outcomes are worse both in terms of overall failure and function when compared with first-time surgery; nevertheless, this procedure remains a valid alternative to a defunctioning stoma or pouch excision.

When faced with the proposition of removing an ileoanal pouch one should consider that 62% of 68 cases treated at St. Marks suffered significant morbidity and 1 patient died.[182] Pouch failure was attributed to sepsis (50%), poor function (35%), pouchitis (8%), or an assortment of other causes. Salvage had been attempted in 82% of cases before excision. The single most common complication after pouch excision was nonhealing of the perineal wound, with an incidence of 40% at 6 months and 10% at 12 months. Between 1 and 6 procedures (median 2) were performed per person to

facilitate healing. The risk of readmission at 1 and 5 years was 38% and 58%, respectively, with 20% of patients requiring reoperation for SBO, stoma complications, or hemorrhage. A technique of close pouch dissection was used to avoid impotence. Unfortunately, 7% of males ultimately suffered from this complication.

CONCLUSIONS

The introduction of IPAA has revolutionized treatment of UC. During the past 30 years we have witnessed the convergence of operative technique toward a stapled J pouch design with stapled ileo-anal anastomosis. This is perhaps the fastest and easiest way to create the IPAA. Anastomotic design will hopefully evolve further to minimize postoperative complications, reduce the frequency of bowel movements, and improve continence. One-stage laparoscopic IPAA has already set new standards of cosmesis and may reduce the burden of adhesional SBO. Perennial problems such as evolving Crohn's disease still produce substantial morbidity among a minority of patients. We look forward to the development of genetic markers that identify this subgroup at an early stage so that pouch surgery may be either avoided or prophylactic therapy initiated to improve outcome. Pouchitis is a more common problem for which we hope the determination of the relevant etiological factors may allow prophylaxis. Ileo-anal pouch surgery has quickly become the standard of surgical care for chronic UC and should be considered a major success in the field of gastrointestinal surgery.

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