Association of Decreased Perfusion of the Ileoanal Pouch Mucosa With Early Postoperative Pouchitis and Local Septic Complications

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Background: After ileoanal pouch operation, 5% to 40% of patients with ulcerative colitis and 2% to 8% of patients with familial adenomatous polyposis develop pouchitis. Seven percent to 32% of all patients have local septic complications. Pouch ischemia is discussed as a pathophysiologic factor. Tonometry is a minimally invasive method for estimating intramucosal pH (pHi), with a decreased pHi showing intramucosal acidosis characteristic of hypoperfusion.

Hypothesis: Decreased perfusion of the ileoanal pouch measured by pHi is associated with local septic complications and the development of pouchitis.

Design: Prospective cohort study.

Setting: Surgical department of a university hospital.

Patients and Methods: The pHi in the ileoanal pouch of 98 patients was measured directly after the pouch procedure and correlated to the clinical course. Endoscopic examination of the pouch with biopsy and blinded histologic assessment, including calculation of a histologic pouchitis score, were routinely performed 3 months postoperatively.

Main Outcome Measures: Development of pouchitis and local septic complications in correlation to pHi.

Results: A decreased pHi was statistically significantly associated with the development of pouchitis and the rate of local septic complications. All 3 patients with anastomotic stenosis had a pHi less than 7.00. The diagnosis of ulcerative colitis just failed in statistical significance as a risk factor for pouchitis. An increased body mass index just failed as a statistically significant risk factor for complications but was a risk factor for the development of acute pouchitis.

Conclusion: Pouch hypoperfusion is a risk factor for the development of pouchitis and local septic complications.

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Restorative proctocolectomy is now generally regarded as the first choice of elective surgical treatment for patients with familial adenomatous polyposis and most patients with ulcerative colitis.1 The general morbidity of the ileoanal pouch operation has steadily decreased in recent years. However, local septic complications and pouchitis are still the most common causes of pouch failure; between 1.5% and 11% of patients ultimately lose their pouch predominantly because of these complications.2,4

Pouchitis is an ill-defined clinical entity that occurs after ileoanal anastomosis with pouch creation. Its cause, diagnosis, and treatment are still poorly understood. Patients present with a variable degree of crampy abdominal pain, watery diarrhea, rectal bleeding, incontinence, fever, and general malaise. Because of the lack of stringent and generally accepted criteria for the diagnosis of pouchitis, the incidence in the literature varies between 2% and 40%.3,6 Patients operated on for ulcerative colitis develop pouchitis significantly more often (5%-40%) than patients with familial adenomatous polyposis (2%-8%), although the cause remains unclear.

Pouchitis is frequently characterized by endoscopic stigmas of mucosal inflammation, ie, diffuse erythema, edema, friability of the mucosa, and sometimes erosions and ulcerations.7,8 Histologic changes in pouches may occur in patients with or without clinical symptoms; standardized, specific histologic criteria for the diagnosis of pouchitis have not yet been described.9 Most authors distinguish between acute and chronic pouchitis, the former being characterized by neu-
**PATIENTS AND METHODS**

**PATIENTS**

From November 1, 1995, to September 30, 1997, 98 patients received an ileoanal pouch after proctocolectomy for either ulcerative colitis (n=65) or familial adenomatous polyposis (n=33). Fifty male and 48 female patients were operated on; median age at operation was 37 years, with the youngest patient being 10 years of age, and the oldest, 71 years. Median body mass index (BMI; calculated as weight in kilograms divided by the square of height in meters) was 23.2 (Table 1); 18 patients were obese (BMI <27.0). The pouch was constructed as a J-pouch as previously described, and continence was reconstructed through an ileoanal side-to-end anastomosis (Figure). Fifty-eight patients were operated on without a protective loop ileostomy, and 40 received a protective ileostomy either because of preoperative risk factors such as long-term corticosteroid therapy for acute ulcerative colitis or because of operative technical reasons (eg, anastomosis under tension). Ileostomy closure was generally performed 3 to 4 months after the pouch procedure.

**TONOMETRY**

The pHi was measured according to the method originally described by Boda and Muranyi, later modified by Bergofsky, and ultimately introduced into clinical practice by Fiddian-Green et al. The tonometer is a semipermeable silicone balloon catheter (TRIP; Tonometrics Inc, Worcester, Mass) that is introduced into the lumen of the gut, then filled with 2.5 mL of isotonic sodium chloride solution (0.9%), and allows the free diffusion of carbon dioxide. After an adequate equilibration time of 60 minutes, the PCO2 in the isotonic sodium chloride solution and the standard bicarbonate in an arterial blood sample are measured simultaneously and the pH is calculated according to the following modified Henderson-Hasselbalch equation:

\[ \text{pHi} = 6.1 + \log_{10}\left(\frac{\Delta[HCO_3^-]}{0.03 \times pCO_2 \times F}\right) \]

where F is a time-dependent correction factor.

**PATIENT STUDY**

A sterile tonometric catheter was introduced into the pouch by the operating surgeon, the balloon positioned about 3 to 5 cm above the ileoanal anastomosis (Figure). This was done at the end of the operation when the easy-flow drains are routinely introduced and therefore did not lead to additional invasiveness for the patient. The PCO2 in the balloon was then measured in the recovery room during a period of 60 minutes, and the arterial blood probe was obtained through an arterial catheter, which is routinely placed by the anesthesiologists in this type of operation. Isotonic sodium chloride solution and blood were analyzed with standard pH and blood gas analyzers. The tonometer was removed immediately afterward. During pHi measurement, macrohemodynamic variables (heart rate and blood pressure) were monitored to exclude systemic reasons for pouch hypoperfusion.

**FOLLOW-UP**

All patients who underwent ileoanal pouch procedures in this study were routinely followed up in our gastrointestinal (ulcerative colitis) or familial adenomatous polyposis outpatient clinic, and all complications were monitored.

Table 1. Patient Characteristics and pHi

<table>
<thead>
<tr>
<th></th>
<th>All Patients (N = 98)</th>
<th>Patients With Postoperative Histologic Examination (n = 76)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex, No. M/F</td>
<td>50/48</td>
<td>39/37</td>
</tr>
<tr>
<td>Median age (range), y</td>
<td>37 (10-71)</td>
<td>38 (10-71)</td>
</tr>
<tr>
<td>Diagnosis, No.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ulcerative colitis</td>
<td>65</td>
<td>52</td>
</tr>
<tr>
<td>FAP</td>
<td>33</td>
<td>24</td>
</tr>
<tr>
<td>Primary ileostomy</td>
<td>40</td>
<td>33</td>
</tr>
<tr>
<td>Median BMI (range), kg/m²</td>
<td>23.2 (11.6-33.8)</td>
<td>24 (11.6-33.8)</td>
</tr>
<tr>
<td>pH, mean (SD)</td>
<td>7.27 (0.11)</td>
<td>7.28 (0.10)</td>
</tr>
</tbody>
</table>

*pHi indicates intramucosal pH; FAP, familial adenomatous polyposis; and BMI, body mass index.

Invasive methods such as laser Doppler flowmetry, needle oximetry, and angiography have been used to measure the vascularization of ileoanal or colonic pouches, but no larger prospective study has yet investigated the association of pouch hypoperfusion with clinical outcome. Tonometry is a noninvasive method first described by Bergofsky to determine the intramucosal pH (pHi).

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Endoscopic examinations of the pouches were performed 3 months after the operation, at which time biopsies for histologic evaluation were routinely performed. All patients who had received primary or secondary ileostomies still had their ileostomy at the time of evaluation. Twenty-one patients without any clinical symptoms of pouchitis and with macroscopically normal pouches on endoscopy did not undergo biopsy for histologic examination. These patients were excluded from the statistical workup focusing on pouchitis but were included in the remaining statistical analysis. Endoscopic macroscopic evaluation of the pouch was graded into 4 groups: no inflammation, mild inflammation (edema, mild erythema, and friability), severe inflammation (severe erythema, edema, erosions, and ulcerations), and chronic inflammation (scarred mucosa, uninflatable pouch, and chronic ulcerations).

Histologic evaluation was routinely performed in the Department of Pathology. All biopsy specimens were then independently reexamined and reviewed by 2 pathologists (A.M. and F.A.) (blinded) who used the criteria of a modified 12-point scoring system as previously described. This allows a numerical grading of severity of both acute and chronic inflammation for each specimen. The following classification into 4 groups was used: no inflammation (0 points), mild inflammation (1–2 points), moderate inflammation (3–6 points), and severe inflammation (7–12 points).

Local septic complications were defined as anastomotic leaks, fistulas, and stenosis.

**STATISTICAL ANALYSIS**

Pouchitis was defined on the basis of endoscopic and histologic findings (each criterion alone and both criteria combined) and was used in the statistical analysis as a dichotomous response variable. Logistic regression analysis was then performed to investigate the significance of the pH i as a prognostic factor in the development of pouchitis and other complications. Age and BMI of the patients at the time of operation, diagnosis (ulcerative colitis or familial adenomatous polyposis), and construction of a protective ileostomy were included in the model as additional risk factors. To clarify the specific role of the underlying diagnosis (familial adenomatous polyposis or ulcerative colitis) and to evaluate the significance of primary ileostomy construction (1-stage vs 2-stage operative technique), stratified analysis regarding the influence of pH i on the risk of developing pouchitis and complications was performed with the use of diagnosis and primary ileostomy as stratification variables. To differentiate between patients with high risk or low risk of developing pouchitis or other postoperative complications, a classification and regression tree was used. The tree is developed by recursive partitioning. Each group is subdivided into 2 subgroups by using the test results from the partition of the sample into different subsamples by dichotomizing a candidate prognostic variable. The value corresponding to the maximum of the test statistics is selected as the cutoff point of the partition. P values were adjusted according to Lausen and Maurer, and approximated 95% confidence intervals were computed on the basis of 500 bootstrap samples. Correlation of endoscopy to the different histologic scores was tested by means of the exact Cochran-Armitage trend test. Results were defined as statistically significant when the respective test statistic had a P value less than or equal to 5% (P ≤ 0.05).

Statistical computations were performed with the software packages S-PLUS, version 3.4 (MathSoft Inc, Cambridge, Mass) and StatXact-4 for Windows (Cytel Software Corp, Cambridge).

in hollow organs, which in turn correlates with the blood supply to the mucosa. During mucosal hypoperfusion, acidosis develops, thereby resulting in a decrease of pH i. The method has been validated in several animal experiments and was proved to produce reliable results.

Gastric tonometry has been widely evaluated as a potential prognostic indicator in cardiac and septic patients. Sigmoid tonometry was shown to be a valuable predictor of outcome in patients undergoing abdominal aortic repair. No data have hitherto been published, to our knowledge, regarding pH i in ileoanal pouches.

On the basis of this widely validated and noninvasive method to measure mucosal perfusion in vivo, we determined pH i in the ileoanal pouch directly after implantation and correlated the results to the clinical outcome (early postoperative endoscopic and histologic evaluation).

**RESULTS**

**CLINICAL RESULTS**

One patient with ulcerative colitis died immediately after the operation on the intensive care ward of congestive heart failure; the autopsy showed preoperatively unknown congestive cardiomyopathy, and the patient was excluded from the statistical workup for pouchitis and local septic complications. Four patients suffered anastomotic leaks at the ileoanal anastomosis. All of these patients had to be reoperated on; a secondary ileostomy was necessary in 3 of them, and the other patient had already primarily received an ileostomy (2-stage operation). Five patients later developed anastomotic fistulas; 2 of these patients ultimately had to have a deviating loop ileostomy to allow healing of the fistulas, and the other 3 patients had already received ileostomies in the primary operation. Three patients developed significant anastomotic stenosis of the ileoanal anastomosis that was successfully treated by dilation. One patient needed a secondary loop ileostomy because of anal incontinence (functional failure). 1 patient received a secondary loop ileostomy because of severe pouchitis that could not be adequately treated conservatively, and 1 patient had to undergo revision postoperatively because of massive pelvic hemorrhage, thereby also receiving a secondary ileostomy. In all, 8 patients had to have secondary deviating loop ileostomies because of complications.

Eight of 64 patients with ulcerative colitis histologically showed inflammation of the distal ileum in the operative specimen, commonly described as backwash ileitis; however, only 1 of these patients subsequently developed pouchitis.
STATISTICAL RESULTS: POUCHITIS

Endoscopic Diagnosis of Pouchitis

Eleven patients developed endoscopically diagnosed pouchitis. A decreased pH was significantly associated with pouchitis ($P = .02$). A cutoff point of 7.28 (95% confidence interval [CI], 7.1-7.3) was determined for the pH values ($P = .03$). The estimated odds ratio corresponding to this cutoff point was 9.2 (95% CI, 1.8-47.6). Age and BMI were not significant risk factors for the development of pouchitis, and the diagnosis of ulcerative colitis just failed in statistical significance as a potential risk factor. When the mild form was excluded, only 8 patients were endoscopically diagnosed as having pouchitis. A decreased pH was again significantly associated with pouchitis ($P = .04$).

Histologic Diagnosis of Pouchitis
(Acute, Chronic, and Combined Score)

Thirty-two patients were histologically defined as having pouchitis according to the score for acute inflammation, 37 patients according to the score for chronic inflammation, and 44 patients according to the combined scores (Table 3). The pH, age, and diagnosis were not statistically significantly correlated to the histologic diagnosis of pouchitis (acute, chronic, or combined criteria). The statistical analysis reached the same result when the mild form was excluded. When the mild form of histologically diagnosed pouchitis was excluded.

Combination of Histologic Score and Endoscopy for the Diagnosis of Pouchitis

Endoscopy and the 3 different histologic scores were all significantly correlated to each other (exact trend test$^{44}$: acute score, $P = .001$; chronic score, $P = .001$; combined score, $P < .001$).

Table 2. Scoring System of Histopathologic Changes for Severity of Pouchitis*

<table>
<thead>
<tr>
<th>Histopathologic Findings</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute changes</td>
<td></td>
</tr>
<tr>
<td>Polymorph infiltration</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Mild, subepithelial</td>
<td>1</td>
</tr>
<tr>
<td>Moderate with single crypt abscess</td>
<td>2</td>
</tr>
<tr>
<td>Severe with crypt abscess</td>
<td>3</td>
</tr>
<tr>
<td>Erosions/ulcerations per low-power field</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Few</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>2</td>
</tr>
<tr>
<td>Frequent</td>
<td>3</td>
</tr>
<tr>
<td>Total possible</td>
<td>6</td>
</tr>
<tr>
<td>Chronic</td>
<td></td>
</tr>
<tr>
<td>Chronic inflammatory cell infiltration</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Mild</td>
<td>1</td>
</tr>
<tr>
<td>Moderate</td>
<td>2</td>
</tr>
<tr>
<td>Severe</td>
<td>3</td>
</tr>
<tr>
<td>Villous atrophy</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Minor</td>
<td>1</td>
</tr>
<tr>
<td>Partial</td>
<td>2</td>
</tr>
<tr>
<td>Subtotal or total</td>
<td>3</td>
</tr>
<tr>
<td>Total possible</td>
<td>6</td>
</tr>
<tr>
<td>Total maximum score</td>
<td>12</td>
</tr>
</tbody>
</table>

*Modified according to Sandborn et al$^{36}$ and Shepard et al.$^{37}$

When the mild form of pouchitis was excluded and when the combination of endoscopy and acute histologic score was used as the basis for the diagnosis (17 patients), a decreased pH and an increased BMI were both found to be significantly correlated to pouchitis ($P = .04$ for both). The pH cutoff point was estimated at 7.18 (95% CI, 7.17-7.42, $P = .05$). Stratification regarding fashioning of a primary ileostomy marginally improved the $P$ value for a decreased pH as a significant risk factor to .03.
When the mild form was included and when the same combination was used as the basis for the diagnosis, the underlying diagnosis (ulcerative colitis) and the BMI, but not the pH, were significant risk factors for the development of pouchitis ($P$ = .03 and $P$ = .02, respectively). No other combination showed any correlation between the diagnosis of pouchitis and the investigated variables, regardless of stratification for primary ileostomy.

**COMPLICATIONS**

Seventeen patients developed complications as stated above (anastomotic leaks, fistulas, or anastomotic stenosis). A decreased pH was significantly associated with postoperative complications ($P$ = .006); patients without the construction of primary ileostomies at the time of the ileoanal pouch procedure were at higher risk for complications. A cutoff point of 7.10 (95% CI, 7.14-7.33) was determined for the pH levels ($P$ = .12); the odds ratio for this cutoff point was 6.3 (95% CI, 1.7-23.2). Interestingly, all 3 patients with postoperative anastomotic stenosis had pH values below 7.00. When the analysis was stratified for primary ileostomy, the $P$ values for the statistical significance of a reduced pH as a risk factor for all complications increased to .005, and for local septic complications, to .001. Age and BMI were not found to be statistically significant risk factors for the development of complications in general; however, when local septic complications were examined, BMI just failed in statistical significance ($P$ = .06). Patients with ulcerative colitis appeared to have more complications (Table 4); however, the underlying disease could not be proved as a statistically significant risk factor. This may be due to the overall limited number of patients included in the analysis.

<table>
<thead>
<tr>
<th>Combined Histologic Grading</th>
<th>Score</th>
<th>No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>No inflammation</td>
<td>0</td>
<td>32</td>
</tr>
<tr>
<td>Mild inflammation</td>
<td>1-2</td>
<td>23</td>
</tr>
<tr>
<td>Moderate inflammation</td>
<td>3-6</td>
<td>18</td>
</tr>
<tr>
<td>Severe inflammation</td>
<td>7-12</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 3. Combined Acute and Chronic Histopathologic Score in Pouch Biopsy Specimens

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. (%): Ulcerative Colitis</th>
<th>No. (%): FAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications</td>
<td>13/65 (20.0)</td>
<td>4/33 (12.1)</td>
</tr>
<tr>
<td>In patients with primary stoma</td>
<td>5/28 (17.8)</td>
<td>2/12 (16.7)</td>
</tr>
<tr>
<td>In patients without primary stoma</td>
<td>8/37 (21.6)</td>
<td>2/21 (9.5)</td>
</tr>
<tr>
<td>Local septic complications</td>
<td>10/65 (15.4)</td>
<td>3/33 (9.1)</td>
</tr>
<tr>
<td>In patients with primary stoma</td>
<td>4/28 (14.3)</td>
<td>1/21 (4.8)</td>
</tr>
<tr>
<td>In patients without primary stoma</td>
<td>6/37 (16.2)</td>
<td>2/12 (16.7)</td>
</tr>
</tbody>
</table>

Table 4. Complications in Relation to Diagnosis and Presence or Absence of Stoma

The ileoanal pouch operation has become the procedure of choice for patients with familial adenomatous polyposis and for most patients with ulcerative colitis. Major complications potentially resulting in pouch failure are local septic complications and pouchitis.

The cause of pouchitis remains controversial. Ischemia has always been considered as a possible factor among many, but it has never been systematically investigated in a larger patient group. In our study, we measured the pH in 98 ileoanal pouches as an indirect means of determining the perfusion of the pouch. A decreased pH was statistically significantly associated with the development of early postoperative pouchitis and local septic complications, which is a strong argument for hypoperfusion as a pathophysiologic factor. This is supported by previous preliminary studies from Hosie et al., who found a reduced ileal blood flow measured by laser Doppler flowmetry during operation to be significantly correlated to local septic complications and pouchitis. Therefore, the authors suggested an objective intraoperative assessment of ileal blood flow, particularly when a protective loop ileostomy is not used in the operation.

Nonetheless, it is unlikely that ischemia is the primary or only cause of pouchitis, as patients with ulcerative colitis develop pouchitis significantly more often than do patients with familial polyposis. Hypoperfusion possibly triggers pathogenetic mechanisms not yet fully identified, which in turn increase the susceptibility of the pouch to develop pouchitis. This is probably a multifactorial process, where different mechanisms lead to one another. For example, ischemia may lead to a release of oxygen radicals, which can directly damage cell membranes or injure lysosomal membranes, subsequently releasing damaging enzymes and triggering pouchitis. Alternatively, oxygen radicals may activate different mediators, thereby setting off an immune response against mucosal antigens (ie, antineutrophil cytoplasmatic antibody). Ultimately resulting in pouchitis. Allopurinol has been used effectively to treat pouchitis in this context on the basis of being a xanthine oxidase inhibitor, thereby preventing the production of oxygen free radicals in ischemic tissue.

Hypoperfusion could also lead to an impairment of the immune response of the normal mucosa, thereby allowing an overgrowth of certain bacteria, which in turn may cause pouchitis. Decreased blood flow to the pouch may lead to a lack of certain nutritional factors (eg, glutamine), thereby possibly promoting the development of pouchitis. Further research is needed to better understand the relevance of these potential mechanisms.

In this study, only the first 3 months after pouch construction were evaluated; however, several studies have shown that the incidence of pouchitis increases with time. The reason our study focused on the early postoperative phase was the assumption that perioperative hypoperfusion as a risk factor for pouchitis is probably most evident in the early postoperative phase. Later, other factors (as already discussed) may be of greater importance and reduce the possibility of identifying hypoperfusion as a triggering mechanism for pouchitis.
One potential criticism of this study is that clinical symptoms were not used for the diagnosis of pouchitis. However, these are difficult to evaluate in the early postoperative phase, as there is a variable adaptation phase after colectomy, which in turn results in a very heterogeneous clinical picture. We therefore think that the definition of pouchitis on the basis of semiojective endoscopic and histologic parameters, albeit being far from perfect, was the best option in our study design.

This study also demonstrated the problems of exactly defining pouchitis, as endoscopic and histologic evaluations do not necessarily correlate. It is therefore essential to use a standardized histologic scoring system with clearly defined evaluation criteria to allow data from different studies to be compared. A decreased pH in our study was associated with pouchitis when endoscopy or the acute histologic score combined were taken as evaluation criteria, but not when histologic score alone was taken as the basis for evaluation. This dilemma has been demonstrated in several studies, where many patients with ileal pouches histologically developed inflammatory changes without these becoming apparent endoscopically or clinically. Therefore, some authors do not attribute any meaning to these changes.

The diagnosis of ulcerative colitis was a statistically significant risk factor for the development of pouchitis, when the mild form of pouchitis was included and the combined histologic score and endoscopy together were used as evaluation criteria. This is in accordance with the literature, as patients with ulcerative colitis are known to develop pouchitis much more frequently than patients with familial polyposis. Surprisingly, an increased BMI was also a risk factor for the development of acute pouchitis. This may be because patients with ulcerative colitis, as they frequently take corticosteroids for immunosuppression, are generally more obese than patients with familial polyposis. On the other hand, obesity may result in a higher frequency of ischemia, as the mesentery is generally shorter in these patients and therefore more difficult to mobilize adequately for the pouch-anal anastomosis.

Postoperative complications were significantly correlated to decreased pH values in the pouch; however, a statistically nonsignificant cutoff point of 7.16 was determined as critical pH. All 3 patients with marked postoperative anastomotic stenosis had pH values less than 7.00, which is a strong argument for hypoperfusion of the anastomosis as the reason for stenosis in these cases. The patient who died of congestive heart failure also had a pH less than 7.00, which reflected the general hypoperfusion state of all organs because of the underlying disease.

Patients who received an ileal pouch without the construction of a protective ileostomy did not have an increased risk of developing postoperative complications, and the anastomotic leakage rate was no different in the 1-stage compared with the 2-stage group (5.1% vs 2.5%). This supports the concept of a 1-stage procedure in ileal pouch construction in an adequately selected patient population.

Age was of no importance in the development of pouchitis or other complications in our study; several studies have underlined the fact that age alone is not necessarily a significant risk factor for developing complications after extensive abdominal operations. This supports our concept of not routinely excluding older patients with adequate anal sphincter function from the pouch procedure and thereby reducing their quality of life, as an ileostomy generally is the only other operative option.

Obesity measured by the BMI just failed in statistical significance as a risk factor for local septic complications; this was probably because of the limited sample size (only 18 patients were obese as defined by a BMI greater than 27), as obesity has been shown to be a relevant risk factor for local septic complications in colorectal resections.

In conclusion, our study shows that postoperative pH measurement is an adequate method of monitoring pouch perfusion with potential prognostic clinical relevance regarding the development of early postoperative pouchitis and other complications after ileal pouch operation. These data support an ischemic factor in the pathogenesis of pouchitis and local septic complications.

The first 2 authors contributed equally to the preparation of this article.

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REFERENCES


Quotation

Surgery is in large part a handicraft with elaborate technics that may be grouped as Technology . . . if one be honest . . . he cannot fail to see that Surgery is seeded with ad hoc hypotheses, or, in more frank terms, empiricisms and irrational beliefs.

Edward D. Churchill, MD