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ORIGINAL RESEARCH—CLINICAL

Prevalence of Active Pouch Symptoms and Patient Perception of Symptom Control and Quality of Life in an Outpatient Practice

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BACKGROUND AND AIMS: Pouchitis is an inflammatory condition affecting the ileal pouch in patients' status after ileal pouch anal anastomosis (IPAA). This affects a significant portion of IPAA patients. Our aim was to study the prevalence of active pouch symptoms among currently treated outpatients with endoscopic pouchitis and understand patients' perspective of disease control and quality of life. **METHODS:** We cross-sectionally reviewed the medical charts of patients who had undergone pouchoscopy at NYU Langone Health from 2010 to 2022 and recorded demographic, clinical, and endoscopic data. Based on the most recent data in the medical record, we defined active pouch symptoms as 2 or more current clinical symptoms and "endoscopic pouchitis" as "moderate" or "severe" by pouchoscopy. We also administered surveys in March 2023 to 296 patients with an IPAA to understand symptom control, quality of life, and interest in fecal microbiota transplant. **RESULTS:** We identified 282 unique patients. The median age of patients was 46 (interquartile range 33–59), with 54.3% males. Of these, 37.2% of patients currently had active pouch symptoms, 36.9% had endoscopic pouchitis, and 14.9% met the criteria for both. Of the 296 surveys sent to patients with IPAA, 74 (25%) responded. The median age of respondents was 49.5 (interquartile range 34–62). 59.5% were male. Average treatment satisfaction score (scale of 0–10) was 6.4 and quality of life score was 5.8. A majority (64.9%) expressed interest in fecal microbiota transplant. **CONCLUSION:** Outpatients with active pouch symptoms or endoscopic pouchitis have high prevalence of active disease and report ongoing symptoms. The results underscore the inadequacy of current treatments and highlight the need for additional therapeutic options.

Keywords: Pouchitis; IPAA; Fecal Microbiota Transplant

Introduction

Total proctocolectomy is a definitive treatment for patients with ulcerative colitis and select patients with Crohn's disease (CD) colitis who have failed medical management or developed colorectal neoplasia.[1,2] After colectomy, ileal pouch anal anastomosis (IPAA) is the preferred operation to avoid permanent ileostomy and associated diminished quality of life. Patients with inflammatory bowel disease (IBD) who undergo an IPAA have variable clinical outcomes and complications including pouchitis, fistulas, strictures, and CD of the pouch.[3,4] Pouchitis, an inflammatory disorder that affects the surgically created reservoir, is characterized by increased stool frequency and urgency, rectal bleeding, and occasional systemic symptoms.[5] These symptoms can significantly impair the quality of life. The lifetime incidence of pouchitis is reported to vary between 10% and 60%, with up to 80% of IPAA patients experiencing pouchitis symptoms in their lifetime.[6] Furthermore, there is a wide spectrum of pouchitis based on severity of symptoms, duration of symptoms, response to antibiotics, frequency of pouchitis episodes, and endoscopic features.[7]

The etiology of pouchitis is not well-understood, but it is hypothesized that an altered pouch microbiome may play a key role in the pathogenesis.[8,9] Current treatments for pouchitis include antibiotics and immunosuppressive medications, but the condition often recurs.[10] Pouchitis represents a spectrum of disease from acute pouchitis to chronic antibiotic-dependent pouchitis (CADP) to chronic antibiotic refractory pouchitis. Acute pouchitis is defined as <4 weeks in duration, whereas chronic pouchitis is >4 weeks in duration. CADP is defined as 3 or more flares per year.[10] Chronic antibiotic refractory pouchitis occurs in patients who do not have symptomatic improvement even after 4 weeks of antibiotics. Treatment of acute pouchitis typically entails a 2–4 week course of metronidazole or ciprofloxacin.[10] There is a critical need for more effective therapies for pouchitis. Given the role of the gut microbiome in pouchitis and response to antimicrobials, another potential treatment option is fecal microbiota transplant (FMT), which aims to

Abbreviations used in this paper: **CADP, chronic antibiotic-dependent pouchitis; ER, emergency room; FMT, fecal microbiota transplant; GI, gastroenterology; IBD, inflammatory bowel disease; IPAA, ileal pouch anal anastomosis; IQR, interquartile range; PDAI, Pouchitis disease activity index.**

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mitigate pouchitis by restoring the microbiome.[9,11] Several small studies have evaluated the use of FMT in treating pouchitis. A systematic review of 4 such studies concluded that FMT is safe but largely not efficacious in the treatment of pouchitis; however, significant heterogeneity was noted.[12] In contrast, a larger systematic review of 9 studies, found that nearly one-third of patients experienced a clinical response to FMT.[11] In our study, we characterize the disease burden of active pouch symptoms to better understand the disease course and impact on the quality of life. Additionally, we assess patient interest in FMT. The results of this study will demonstrate the need for future trials evaluating the role of FMT and related microbial therapeutics in active pouch symptoms management.

Methods

Study Design

In the retrospective arm of this study, we cross-sectionally queried the electronic medical record at NYU Langone Health, New York, to identify patients who had undergone an IPAA with subsequent pouchoscopy and had a gastroenterology clinic visit between December 2010 and October 2022. Inclusion criteria for the study included adults with a diagnosis of IBD status after IPAA with gastroenterology follow-up through January 2022. In the cross-sectional arm of the study, we identified current IPAA patients and emailed them an anonymous survey evaluating satisfaction with the pouch and interest in FMT as a treatment option. A reminder email was sent 2 weeks later.

Data Collection

For the retrospective portion of the study, data were extracted from the patient medical records. Clinical data were retrieved from the most recent gastroenterology (GI) visit including demographics (age, sex, body mass index, race, ethnicity), IBD diagnosis date, pouch creation date, history of pouch revision, pouch failure (defined as conversion to ostomy), IBD medications, most recent pouchoscopy date and results, and current symptoms (diarrhea, increased stool frequency, increased stool urgency, night time stool leakage, abdominal pain, fever, bloating, rectal bleeding). Number of pouchitis episodes, GI visits, antibiotic courses prescribed by the GI physician for pouchitis, and emergency room (ER) visits/hospitalizations for pouchitis were examined over the 12 months preceding the most recent GI visit. Using a modified pouchitis disease activity index (PDAI) clinical subscore, we defined "active pouch symptoms" as 2 or more clinical symptoms (listed above) at the patient's last GI appointment. "Endoscopic pouchitis" was defined as "moderate" or "severe" pouchitis on the patient's most recent pouchoscopy report as noted by the endoscopist.

Statistical Analysis

Descriptive statistics were presented as median and interquartile ranges (IQRs) for continuous variables and frequencies (%) for categorical variables. Averages were used for treatment satisfaction and quality of life scales. Univariate comparisons among endoscopic and clinical active pouch symptoms were performed separately using Wilcoxon Rank-sum tests for continuous variables and Chi-Squared or Fisher's exact tests for categorical variables. Multivariable logistic regression was conducted to evaluate predictors of both endoscopic and active pouch symptoms, adjusting for potential confounders. All variables showing statistical significance in the univariate analyses were included in the multivariable models. The level of statistical significance was set at $P < .05$. Unadjusted and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) were reported. All statistical analyses were performed using Stata/BE 17.0 (StataCorp, College Station, TX, USA).

Results

Retrospective Patient Population

We identified 282 individuals who met the inclusion criteria. The median age of patients was 46 (IQR 33–59) and the sample comprised 54.3% males. The median number of years since IBD diagnosis was 18 years (IQR 11–28). The median number of years since IPAA surgery was 7 years (IQR 4–15) with 16.7% of patients diagnosed with chronic pouchitis and 18.1% requiring pouch revision. Within the previous 12 months from the most recent evaluation, 28% of patients experienced an episode of active pouch symptoms, 29.8% had 1 GI clinic visit, 33% had 2 or more GI clinic visits, and 12.8% had at least 1 IBD-related ER visit or hospitalization. Within the previous 12 months from the most recent evaluation, 22.3% received at least 1 course of antibiotics for pouchitis treatment and 28.0% of patients were treated with biologics or small molecules [infliximab (9, 3.2%), certolizumab (1, 0.4%), adalimumab (8, 2.8%), ustekinumab (40, 14.2%), vedolizumab (13, 4.6%), risankizumab (1, 0.4%), ozanimod (1, 0.4%), tofacitinib (5, 1.8%), and upadacitinib (1, 0.4%)]. In addition, 2.8% patients were treated with mesalamine, 0.35% with mercaptopurine, and 7.45% with corticosteroids (Table 1).

At the most recent GI clinic visit, patients reported the following symptoms: diarrhea (45.4%), increased stool frequency (27.7%), increased stool urgency (18.1%), nighttime stool leakage (7.8%), abdominal pain (15.6%), fever (0.4%), and blood in stool (3.9%). There was an average of a 9-month time gap between a patient's most recent GI clinic visit and last pouchoscopy. By our criteria, 37.2% of patients were found to have active pouch symptoms. Per their last pouchoscopy result, 32.3% of patients were in remission, 30.9% had mild, 21.3% had moderate, and 15.6% had severe pouchitis. By our criteria, 36.9% of patients were identified as having endoscopic pouchitis. 14.9% of patients met the criteria for both active pouch symptoms and pouchitis on endoscopy (Table 1).

Factors associated with endoscopic pouchitis. On univariate analysis, patients with endoscopic pouchitis were more likely to have a history of pouch failure (10.6% vs 3.4, $P = .014$), multiple clinic visits for IBD/pouchitis in the last year (45.2% vs 25.8%, $P = .003$), received an antibiotic course in the last year (29.8% vs 18.0,

Table 1. Population Baseline Characteristics (N = 282)

Variables	N (%)
Total	282 (100.00%)
Covariates	
Demographic characteristics	
Age	
Median (IQR)	46 (33–59)
Sex	
Male	153 (54.26)
Female	129 (45.74)
Race	
White	221 (78.37)
Black	12 (4.26)
Asian	14 (4.96)
Unknown	35 (12.41)
Ethnicity	
Not Hispanic	51 (18.09)
Hispanic	4 (1.42)
Unknown	227 (80.50)
BMI	
Median (IQR)	24.3 (21.4–27.4)
Missing (N (%))	1 (0.35)
Clinical pouchitis related variables	
History of pouch failure	
No	265 (93.97)
Yes	17 (6.03)
Number of years with pouch	
Median (IQR)	7 (4–15)
Missing (N (%))	21 (7.45)
History of pouch revisions	
No	231 (81.91)
Yes	51 (18.09)
Episodes of pouchitis last year	
No	203 (71.99)
Yes	79 (28.01)
Number of clinic visit for IBD/Pouchitis last year	
None	105 (37.23)
One	84 (29.79)
Two or more	93 (32.98)
Number of years with IBD	
Median (IQR)	18 (11–28)
Missing (N (%))	43 (15.25)
Antibiotic course last year	
No	219 (77.66)
Yes	63 (22.34)
History of chronic pouchitis	
No	235 (83.33)
Yes	47 (16.67)
Hospital/ER visit for IBD or pouchitis in last year	
No	246 (87.23)
Yes	36 (12.77)
Current medication use	
Biologics	
No	203 (71.99)
Yes	79 (28.01)
Individual Biologics	
Infliximab	
No	273 (96.81)
Yes	9 (3.19)
Adalimumab	
No	274 (97.16)
Yes	8 (2.84)
Golimumab	
No	282 (100.00)
Yes	0 (0.00)
Certolizumab	
No	281 (99.65)
Yes	1 (0.35)
Risankizumab	
No	281 (99.65)
Yes	1 (0.35)
Ustekinumab	
No	242 (85.82)
Yes	40 (14.18)
Vedolizumab	
No	269 (95.39)
Yes	13 (4.61)
Upadacitinib	
No	281 (99.65)
Yes	1 (0.35)
Tofacitinib	
No	277 (98.23)
Yes	5 (1.77)
Ozanimod	
No	281 (99.65)
Yes	1 (0.35)
Other Meds	
Sulfasalazine	
No	282 (100.00)
Yes	0 (0.00)
Mesalamine	
No	274 (97.16)
Yes	8 (2.84)
Azathioprine	
No	282 (100.00)
Yes	0 (0.00)
Cyclosporine	
No	282 (100.00)
Yes	0 (0.00)
Allopurinol	
No	282 (100.00)
Yes	0 (0.00)
Colestipol	
No	282 (100.00)
Yes	0 (0.00)
Immunomodulators	
No	281 (99.65)
Yes	1 (0.35)
Steroids	
No	261 (92.55)
Yes	21 (7.45)
Pouchoscopy results	
Most recent pouchoscopy results	
In remission or inactive	91 (32.27)
Mild	87 (30.85)
Moderate	60 (21.28)
Severe	44 (15.60)
Endoscopic pouchitis (moderate or severe pouchoscopy)	
No	178 (63.12)
Yes	104 (36.88)
Pouchitis symptoms at last GI visit	
Diarrhea	
No	154 (54.61)
Yes	128 (45.39)

Table 1. Continued

Variables	N (%)
Increased stool frequency	
No	204 (72.34)
Yes	78 (27.66)
Increased stool urgency	
No	231 (81.91)
Yes	51 (18.09)
Increased night-time stool leakage	
No	260 (92.20)
Yes	22 (7.80)
Abdominal pain	
No	238 (84.40)
Yes	44 (15.60)
Fever	
No	281 (99.65)
Yes	1 (0.35)
Blood in stool	
No	271 (96.10)
Yes	11 (3.90)
Clinical pouchitis (≥2 clinical pouchitis symptoms)	
No	177 (62.77)
Yes	105 (37.23)

BMI, body mass index.

$P = .021$), a history of chronic pouchitis (28.9% vs 9.6%, $P < .001$), hospital/ER visits for IBD in the last year (18.3% vs 9.6%, $P = .034$), and received biologic or small-molecule drugs (40.4% vs 20.8%, $P < .001$; Table 2).

On multivariable analysis, having a history of pouch failure (OR = 3.39, 95% CI = 1.22–9.46), multiple clinic visits in the last year (OR = 2.68, 95% CI = 1.48–4.83), an antibiotic course in the last year (OR = 1.94, 95% CI = 1.10–3.42), a history of chronic pouchitis (OR = 3.84, 95% CI = 1.99–7.40), a hospital or ER visit in the last year (OR = 2.12, 95% CI = 1.05–4.28), and being on biologics (OR = 2.58, 95% CI = 1.51–4.40) was significantly associated with an increased odds of endoscopic pouchitis (Table 3). After adjustment of covariates, endoscopic pouchitis was significantly associated with having a history of pouch failure (OR = 3.79, 95% CI = 1.23–11.66) and a history of chronic pouchitis (OR = 3.83, 95% CI = 1.88–7.82) (Table 3).

Factors associated with active pouch symptoms. Patients with active pouch symptoms were more likely to have had one (36.2% vs 26.0%, $P = .031$) or multiple (36.2% vs 31.1%, $P = .031$) clinic visits for IBD/pouchitis in the last year and received an antibiotic course in the last year (30.5% vs 17.5%, $P = .012$; Table 4). Patients with active pouch symptoms were less likely to have a history of pouch failure (0.95% vs 9.04%, $P = .004$).

On multivariable analysis, having episodes of pouchitis in the last year (OR = 3.15, 95% CI = 1.84–5.40), 1 clinic visit in the last year (OR = 2.16, 95% CI = 1.18–3.97), and an antibiotic course in the last year (OR = 2.06, 95% CI = 1.17–3.64), was significantly associated with an increased odds of active pouch symptoms (Table 5). Having pouch failure with subsequent pouch revision was significantly associated with a decreased odds of active pouch symptoms (OR = 0.10, 95% CI = 0.01–0.74). After adjustment of covariates, there was a significant positive association between active pouch symptoms and having episodes of pouchitis in the last year (OR = 3.06, 95% CI = 1.45–6.45). Meanwhile, having a history of pouch failure was negatively associated with active pouch symptoms (OR = 0.12, 95% CI = 0.02–0.93) (Table 5).

Cross-Sectional Survey Patient Population

We identified 302 IPAA patients, 6 of which were unreachable by email due to having no functioning email or being deceased. A total of 296 surveys were sent out with 74 (25%) responses. The median age of respondents was 49.5 (IQR 34–62) and 59.5% were male. Ninety-one-point 9 percent of respondents were White, 2.7% were Black, 0% were Asian, and 5.4% identified as "other." Two-point 7 percent of patients were Hispanic. A substantial number of patients reported ongoing symptoms such as increased stool frequency (56.8%), urgency (43.2%), night-time leakage (44.6%), abdominal pain (23.0%), bloating (31.0%), and blood in stool (16.2%). No patients reported fever and 17.6% of patients reported no symptoms. Many patients (28.4%) reported taking daily antibiotics. Average treatment satisfaction score (on a scale of 0–10) was 6.4, pouch satisfaction score was 6.7, and quality of life score was 5.8. Most patients (64.9%) expressed interest in FMT, 28.4% stated they may be interested in FMT but would need further information, and only 6.8% of patients were not interested in FMT (Table 6).

Discussion

The goal of this study was to evaluate and characterize the disease burden of patients with pouchitis. As described in previous studies, our study confirms that pouchitis is a common complication in patients after IPAA, carrying a significant disease burden. Based on the most recent GI visit and pouchoscopy, we found a cross-sectional prevalence of 37% having endoscopic pouchitis and 16% having active pouch symptoms. About 28% of patients experienced a pouchitis flare within the previous year. The majority of patients had at least one clinic visit for IBD/pouchitis in the previous year, over a fifth of patients had received a course of antibiotics, and over a fourth of patients received biologic or small molecule therapy. In the survey we administered, we found that many patients reported ongoing symptoms and the majority were interested in alternate therapies such as FMT as a potential treatment option.

The lifetime risk of pouchitis varies considerably throughout the literature. Studies have shown a cumulative incidence in the first 2 years after IPAA of about 50% and data suggest rates of pouchitis increase proportionally to the length of follow-up.[13–15] One reason for the wide range of pouchitis rates is the variation in diagnostic criteria used. Different institutions and studies may use different criteria based on symptoms alone or in combination with

Table 2. Bivariate Statistics Grouped by Presence of Endoscopic Pouchitis at the Most Recent Pouchoscopy, New York City, n = 282

		Presence of endoscopic pouchitis		
	Total	No endoscopic pouchitis	Endoscopic pouchitis	
Variables	N (%)	n (%)	n (%)	*P* value
Total	282 (100.00)	178 (63.12)	104 (36.88)	
Demographic variables				
Age				.206[a]
Median (IQR)	46 (33–59)	47 (35–61)	44 (33–57)	
Sex				.061[b]
Male	153 (54.26)	89 (50.00)	64 (61.54)	
Female	129 (45.74)	89 (50.00)	40 (38.46)	
Race				
White	221 (78.37)	144 (80.90)	77 (74.04)	.100[c]
Black	12 (4.26)	5 (2.81)	7 (6.73)	
Asian	14 (4.96)	11 (6.18)	3 (2.88)	
Unknown	35 (12.41)	18 (10.11)	17 (16.35)	
Ethnicity				.188[c]
Not Hispanic	51 (18.09)	35 (19.66)	16 (15.38)	
Hispanic	4 (1.42)	1 (0.56)	3 (2.88)	
Unknown	227 (80.50)	142 (79.78)	85 (81.73)	
BMI[d]				.727[c]
Median (IQR)	24.3 (21.4–27.4)	24.3 (21.5–27.1)	24.4 (21.3–28.0)	
Clinical pouchitis-related variables				
Number of y with IBD[d]				.906[a]
Median (IQR)	18 (11–28)	18 (10–29)	18 (12–27)	
Number of y with pouch[d]				.355[a]
Median (IQR)	7 (4–15)	7 (4–18)	6 (4–12)	
History of pouch failure				**.014**[b]
No	265 (93.97)	172 (96.63)	93 (89.42)	
Yes	17 (6.03)	6 (3.37)	11 (10.58)	
History of pouch redo				.951[b]
No	231 (81.91)	146 (82.02)	85 (81.73)	
Yes	51 (18.09)	32 (17.98)	19 (18.27)	
History of chronic pouchitis				**<.001**[b]
No	235 (83.33)	161 (90.45)	74 (71.15)	
Yes	47 (16.67)	17 (9.55)	30 (28.85)	
Episodes of pouchitis last year				.059[b]
No	203 (71.99)	135 (75.84)	68 (65.38)	
Yes	79 (28.01)	43 (24.16)	36 (34.62)	
Number of clinic visits for IBD/pouchitis last year				**.003**[b]
None	105 (37.23)	76 (42.70)	29 (27.88)	
One	84 (29.79)	56 (31.46)	28 (26.92)	
Two or more	93 (32.98)	46 (25.84)	47 (45.19)	
Hospital/ER visit for IBD or pouchitis in last year				**.034**[b]
No	246 (87.23)	161 (90.45)	85 (81.73)	
Yes	36 (12.77)	17 (9.55)	19 (18.27)	
Antibiotic course last year				**.021**[b]
No	219 (77.66)	146 (82.02)	73 (70.19)	
Yes	63 (22.34)	32 (17.98)	31 (29.81)	
Current medication use variables				
Biologics				**<.001**[b]
No	203 (71.99)	141 (79.21)	62 (59.62)	
Yes	79 (28.01)	37 (20.79)	42 (40.38)	
Steroids				.289[b]
No	261 (92.55)	167 (93.82)	94 (90.38)	
Yes	21 (7.45)	11 (6.18)	10 (9.62)	

Bolded figures indicate statistical significant ($P < .05$).
[a]Wilcoxon Rank-Sum Test.
[b]Pearson Chi-Squared Test.
[c]Fisher's Exact Test.
[d]Presence of missing values (BMI = 1, Number of Years with Pouch = 21, Number of Years with IBD = 43).

Table 3. Multivariate Statistics: Predictors of Endoscopic Pouchitis, n = 282

	Unadjusted model		Adjusted model	
	OR (95% CI)	*P* value	OR (95% CI)	*P* value
History of pouch failure				
No	Ref		Ref	
Yes	3.39 (1.22–9.46)	.020	3.79 (1.23–11.66)	.020
History of chronic pouchitis				
No	Ref		Ref	
Yes	3.84 (1.99–7.40)	<.001	3.83 (1.88–7.82)	<.001
Num of clinic visit for IBD/Pouchitis last year				
None	Ref		Ref	
One	1.31 (0.70–2.44)	.396	1.00 (0.50–2.01)	.990
Two or more	2.68 (1.48–4.83)	.001	1.42 (0.64–3.18)	.388
Hosp/ER visit for IBD or pouchitis in last year				
No	Ref		Ref	
Yes	2.12 (1.05–4.28)	.037	1.42 (0.65–3.13)	.382
Antibiotic course last year				
No	Ref		Ref	
Yes	1.94 (1.10–3.42)	.023	1.86 (0.94–3.69)	.075
Current biologic use				
No	Ref		Ref	
Yes	2.58 (1.51–4.40)	<.001	1.46 (0.76–2.80)	.258

endoscopy and/or histology. One objective assessment is the PDAI score, which is typically recorded prospectively. It is a composite of clinical, endoscopic, and histologic features graded on 6-point scales. A score of ≥7 is the cutoff for diagnosing pouchitis. This score has shown to be useful in assessing pouchitis disease activity. However, no correlation has been shown between the individual components of the PDAI, suggesting that symptoms, endoscopy, and histology

Table 4. Bivariate Statistics Grouped by Presence of Clinical Pouchitis at the Most Recent GI Visit, New York City, n = 282

	Total	Presence of clinical pouchitis		
		No clinical pouchitis	Clinical pouchitis	
Variables	N (%)	n (%)	n (%)	*P* value
Total	282 (100.00)	177 (62.77)	105 (37.23)	
Demographic variables				
Age				.523[a]
Median (IQR)	46 (33–59)	46 (33–59)	47 (35–59)	
Sex				.615[b]
Male	153 (54.26)	94 (53.11)	59 (56.19)	
Female	129 (45.74)	83 (46.89)	46 (43.81)	
Race				.134[c]
White	221 (78.37)	143 (80.79)	78 (74.29)	
Black	12 (4.26)	4 (2.26)	8 (7.62)	
Asian	14 (4.96)	10 (5.65)	4 (3.81)	
Unknown	35 (12.41)	20 (11.30)	15 (14.29)	
Ethnicity				.051[c]
Not Hispanic	51 (18.09)	25 (14.12)	26 (24.76)	
Hispanic	4 (1.42)	2 (1.13)	2 (1.90)	
Unknown	227 (80.50)	150 (84.75)	77 (73.33)	
BMI[d]				.993[a]
Median (IQR)	24.3 (21.4–27.4)	24.3 (21.6–27.4)	24.4 (20.9–27.5)	
Clinical pouchitis-related variables				
Number of years with IBD[d]				.160[a]
Median (IQR)	18 (11–28)	17 (9–27)	19 (13–29)	
Number of years with pouch[d]				.673[a]
Median (IQR)	7 (4–15)	6 (4–14)	7 (4–17)	
History of pouch failure				**.004**[c]
No	265 (93.97)	161 (90.96)	104 (99.05)	
Yes	17 (6.03)	16 (9.04)	1 (0.95)	

Table 4. Continued

Variables	Total	Presence of clinical pouchitis		
		No clinical pouchitis	Clinical pouchitis	
	N (%)	n (%)	n (%)	*P* value
History of pouch redo				.997[b]
No	231 (81.91)	145 (81.92)	86 (81.90)	
Yes	51 (18.09)	32 (18.08)	19 (18.10)	
History of chronic pouchitis				.137[b]
No	235 (83.33)	152 (85.88)	83 (79.05)	
Yes	47 (16.67)	25 (14.12)	22 (20.95)	
Episodes of pouchitis last year				**<.001**[b]
No	203 (71.99)	143 (80.79)	60 (57.14)	
Yes	79 (28.01)	34 (19.21)	45 (42.86)	
Number of clinic visit for IBD/Pouchitis last year				**.031**[b]
None	105 (37.23)	76 (42.94)	29 (27.62)	
One	84 (29.79)	46 (25.99)	38 (36.19)	
Two or more	93 (32.98)	55 (31.07)	38 (36.19)	
Hospital/ER visit for IBD or pouchitis in last year				.375[b]
No	246 (87.23)	152 (85.88)	94 (89.52)	
Yes	36 (12.77)	25 (14.12)	11 (10.48)	
Antibiotic course last year				**.012**[b]
No	219 (77.66)	146 (82.49)	73 (69.52)	
Yes	63 (22.34)	31 (17.51)	32 (30.48)	
Current medication use variables				
Biologics				.478[b]
No	203 (71.99)	130 (73.45)	73 (69.52)	
Yes	79 (28.01)	47 (26.55)	32 (30.48)	
Steroids				.136[b]
No	261 (92.55)	167 (94.35)	94 (89.52)	
Yes	21 (7.45)	10 (5.65)	11 (10.48)	

Bolded figures indicate statistical significant ($P < .05$).
[a]Wilcoxon Rank-Sum Test.
[b]Pearson Chi-Squared Test.
[c]Fisher's Exact Test.
[d]Presence of missing values (BMI = 1, Number of Years With Pouch = 21, Number of Years with IBD = 43).

are independent variables that should all contribute to the diagnosis of pouchitis.[16,17] Symptoms alone are not reliable to make a diagnosis.[16] In fact, symptoms of pouchitis are nonspecific and often overlap with symptoms of inflammation of the rectal cuff, pouch ischemia, irritable bowel syndrome, anastomotic strictures, and CD.[18]

Table 5. Multivariate Statistics: Predictors of Clinical Pouchitis, n = 282

	Unadjusted model		Adjusted model	
	OR (95% CI)	*P* value	OR (95% CI)	*P* value
History of pouch failure				
No	Ref		Ref	
Yes	**0.10 (0.01–0.74)**	**.025**	**0.12 (0.02–0.93)**	**.043**
Episodes of pouchitis last year				
No	Ref		Ref	
Yes	**3.15 (1.84–5.40)**	**<.001**	**3.06 (1.45–6.45)**	**.003**
Num clinic visit for IBD/Pouchitis last year				
None	Ref		Ref	
One	**2.16 (1.18–3.97)**	**.013**	1.45 (0.76–2.77)	.265
Two or more	1.81 (0.99–3.28)	.050	1.00 (0.48–2.03)	.980
Antibiotic course last year				
No	Ref		Ref	
Yes	**2.06 (1.17–3.64)**	**.012**	0.96 (0.43–2.12)	.917

Bolded figures indicate statistical significance ($P < .05$).

Table 6. Survey Results

Response rate %	25%
Demographics	
%Females	40.54
%Males	59.46
Median age	49.5
IQR age	28, 34–62
% race White	91.89
% race Black	2.7
% race Asian	0
% race other	5.41
Ethnicity	
% Hispanic	2.7
% Non-Hispanic	97.3
Symptoms	
% Pt with increased stool frequency	56.76
% Pt with increased stool urgency	43.24
% Pt with night-time stool leakage	44.59
% Pt with abdominal pain	22.97
% Pt with fever	0
% Pt with bloating	31.08
% Pt with blood in stool	16.22
% Pt with no symptoms	17.57
% Pt currently taking antibiotics	28.38
Satisfaction/QOL scale 0-10	
Treatment satisfaction average	6.36
Treatment satisfaction SD	2.38
Pouch satisfaction average	6.74
Pouch satisfaction SD	2.39
Pouchitis QOL average	5.76
Pouchitis QOL SD	2.74
Interest in FMT	
% Pt interested	64.86
% Pt not interested	6.76
% Pt maybe interested, need more information	28.38

Pt, Patient; QOL, quality of life; SD, standard deviation.

In our retrospective study, we used 2 independent endpoints—active pouch symptoms and endoscopic pouchitis, both of which fall within reported ranges for pouchitis. Given that the individual components of the PDAI score have been shown to lack correlation, we determined it was best to evaluate active pouch symptoms and endoscopic pouchitis as independent endpoints. Indeed, only about 7% of patients overlapped in the meeting criteria for both active pouch symptoms and endoscopic pouchitis. We used a cutoff of 2 symptoms (diarrhea, increased stool frequency, increased stool urgency, night-time stool leakage, abdominal pain, fever, bloating, and rectal bleeding) to define active pouch symptoms. This is similar to the clinical PDAI subscore which has been used in previous studies to denote clinically apparent pouchitis.[17,19,20]

Although endoscopic or clinical data alone are not sufficient to define pouchitis, we were not able to create one composite score due to the retrospective nature of this chart review study. There was an average of a 9-month gap between a patient's last GI clinic visit and last pouchoscopy. Because of the evolving nature of patient symptoms and endoscopy results, we deemed this time difference too large to make one pouchitis endpoint. Additionally, we did not record data on histology, as this was missing from many patient records. The lack of histology, time gap between endoscopic and clinical data, and inability to compile a formal PDAI score for patients are limitations of this study. The lower percent of patients with active pouch symptoms (16%) compared to those with endoscopic pouchitis (37%) is unexpected. Additionally, we would expect that patients' symptoms may trigger clinic visits and drive up the rate of active pouch symptoms. One possible explanation for the lower number of patients with active pouch symptoms is simply the subjective nature of assessing and documenting clinical symptom compared to the more objective measure of endoscopic findings.

Our results were in line with previous studies that have shown that about 40% of patients with acute pouchitis will only have a single episode that responds to antibiotics, while 60% of patients will develop at least 1 recurrence and 20% will develop chronic pouchitis.[21,22] In addition to antibiotic therapy, immunosuppressive medications can be used to treat chronic pouchitis. Immunosuppressive medications typically begin with mesalamine followed by glucocorticoids and biologic agents or small molecules. In our retrospective study patient population, nearly a third of patients had received immunosuppressive agents, the majority of whom were on biologics. Despite this, many patients continued to have significant symptoms. At their last clinic visit, nearly half of patients reported diarrhea, over a fourth reported increased stool frequency, and nearly a fifth reported increased stool urgency. Additionally, in our cross-sectional study population, over half of patients reported increased stool frequency and just under a half of patients reported night-time leakage and abdominal pain.

In our analyses assessing endoscopic pouchitis, we found predictable outcomes: patients with endoscopic pouchitis were more likely to have a history of chronic pouchitis and pouch failure. There have been conflicting results as to whether older age at the time of IPAA surgery is associated with higher rates of CADP.[23,24] But to our knowledge, no study has previously shown that older age is associated with increased rates of clinical pouchitis. Interestingly, age was not associated with endoscopic pouchitis.

Based on our findings and past research, it is clear that pouchitis is associated with a considerable burden of disease. In our cross-sectional survey population, patients reported an average treatment satisfaction and pouch satisfaction score in the middle range and quality of life score just below 6 on a 10-point scale (10 being most satisfied/highest quality of life). Unsurprisingly, research has indicated that patients suffering from pouchitis tend to utilize health-care services more frequently, indicating a higher degree of disease burden.[25] Despite antibiotics and immunosuppressive drug options, the current treatment options remain insufficient to adequately control many patients' symptoms.

When surveyed, most of our cross-sectional patient sample expressed interest in FMT as a treatment for pouchitis. In fact, only 6.8% of patients were not interested in FMT or learning more about it. A prospective pilot study assessed FMT in 19 patients suffering from chronic pouchitis. They did not find a statistically significant improvement in total PDAI scores, endoscopic or histologic score

after FMT, but there was significant improvement in frequency of bowel movements.[26] Furthermore, a systematic review of FMT in the treatment of chronic pouchitis found that about 32% of patients achieved clinical response and 23% went into remission, though there was significant heterogeneity amongst the studies.[11] We hope our study will underscore the need for better treatment options and disease control in patients suffering from pouchitis. We believe FMT and other microbial therapies represent an opportunity for further research and innovation.

Conclusion

In conclusion, our study has confirmed that pouchitis remains a common complication after IPAA with significant morbidity. Furthermore, despite treatment with antibiotics and/or immunosuppressive therapies, many patients continue to suffer with symptoms. There is significant interest among current IPAA patients for additional treatment options, including FMT. Microbial therapies may offer an exciting new frontier.

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The study was approved by the Institutional Review Board at NYU Grossman School of Medicine.

Data Transparency Statement:
The data and analytical methods will be made available in aggregate form, with appropriate permissions and data use agreements and subject to regulatory approvals.

Reporting Guidelines:
The STROBE guidelines were followed for study conduct and reporting.