Mucosal Healing in Clinical Practice: A Single-Center Pediatric IBD Experience

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Background: Mucosal healing (MH) is associated with improved clinical outcomes in patients with Crohn's disease (CD) and ulcerative colitis (UC). MH as a target for treatment has been suggested, although there is little pediatric data. The goal of this study was to evaluate MH in clinical practice in pediatric patients with inflammatory bowel disease in clinical remission.

Methods: A retrospective review of electronic health record data was performed on all patients with CD or UC who underwent at least 2 colonoscopies from 2010 through 2016. Only patients in clinical remission undergoing a scope for MH were included in our study. The incidence of MH and histologic healing (HH) was analyzed, along with cumulative rates of MH in each group. MH was defined by both physician assessment of MH and an endoscopic score of zero for CD and UC.

Results: A total of 76 patients with CD and 28 patients with UC underwent at least one MH scope while in clinical remission. Of the 76 patients with CD, 51 patients (67%) demonstrated MH by physician assessment, 34 patients (45%) demonstrated MH by a simple endoscopic score for CD of zero, and 35 patients (46%) demonstrated HH. Of the 28 patients with UC, 20 patients (71%) demonstrated MH by physician assessment, 10 patients (36%) demonstrated MH by a Mayo score of zero, and 10 patients (36%) demonstrated HH. Nineteen patients underwent a second MH scope and 11 (58%) demonstrated MH by physician assessment, 7 patients (37%) demonstrated MH by simple endoscopic score for CD or Mayo scores of zero, and 5 patients (26%) demonstrated HH. Of those patients with active disease, 21 of 25 patients with CD underwent escalation of therapy, whereas 8 of 8 patients with UC underwent escalation of therapy. Cumulative rates of MH when defined by physician assessment were 79% (60 of 76 patients) in CD and 79% (22 of 28 patients) in UC.

Conclusions: MH is feasible in pediatric CD and UC, and rates of cumulative MH in pediatric patients are similar to previously published adult data. In children with inflammatory bowel disease in clinical remission, approximately one-third demonstrate active disease at endoscopy.

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Key Words: pediatric, inflammatory bowel disease, Crohn's disease, ulcerative colitis, mucosal healing

WHAT IS KNOWN/WHAT IS NEW

1. What is known
   1. Mucosal healing (MH) is associated with improved long-term outcome
   2. MH is only present in half of adult patients with inflammatory bowel disease (IBD) in clinical remission
3. What is new
   1. MH using the most strict definition of endoscopic scores of 0 was present in 42% of children with IBD in clinical remission at first evaluation
   2. MH as defined by the physician which included very mild disease was demonstrated in 68% of children with IBD in clinical remission at first evaluation
   3. With treatment changes, a cumulative paComplete MH with endoscopy scores of 0 was more likely to occur with biological treatment in CD

Crohn's disease (CD) and ulcerative colitis (UC) are chronic inflammatory diseases of the gastrointestinal tract. The typical disease progression is characterized by intervals of active flares and quiescent remission states.[1] In either disorder, the natural history of persistent inflammation can lead to complications. Complications in CD can be strictures, fistulae, and abscesses, whereas in UC complications can include colorectal cancer. Treatment is aimed to achieve and maintain disease remission, which is associated with an improved health-related quality of life.

Recent evidence has shown that treatment based on symptom control does not alter the natural course of IBD.[2,3] However, achieving MH has demonstrated improved long-term outcome and a significant reduction in complications. MH is associated with sustained clinical remission, steroid-free remission, reduced rates of relapse, and reduced rates of hospitalization

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and surgery.[4–13] Meanwhile, MH was demonstrated to be feasible in clinical practice with cumulative MH probability of up to 70% in CD and UC.[14,15] Furthermore, MH has also been shown to be a cost-effective treatment approach in clinical practice.[16]

Because of these data, MH has been suggested as a target for treatment. Yet, in pediatric IBD, there is little data regarding the feasibility or probability of attaining MH. This study evaluates MH experience in clinical practice for children with IBD who are in clinical remission. Our primary goal was to determine the feasibility of MH as a target and the probability of MH when in clinical remission.

METHODS

Study Population

This study was approved by the Emory Institutional Review Board.

The Population Discovery data mart and Clarity databases, based at Children's Healthcare of Atlanta, were queried from 2010 to 2016. The *International Classification of Diseases (ICD-9)*, ninth revision, diagnosis codes and Current Procedural Terminology codes were used to identify all patients with IBD and those who had endoscopic procedure, respectively. Extracted data were sorted to include only those patients with IBD who had more than one endoscopy done with different procedure dates. Manual full electronic health record chart review was conducted on all patients who were diagnosed with CD or UC with more than 1 colonoscopy. Furthermore, only those endoscopically confirmed patients with CD and UC who had at least one more scope performed intentionally to evaluate for MH were included, and those who had endoscopy for GI symptoms were excluded. GI symptoms were defined as diarrhea, abnormal bowel movements, blood in stool, and pain. Also, patients who had bowel resection and for whom scopes were performed for symptoms or other reasons such as rectal dilation or evaluation of pouchitis were excluded (Fig. 1). All patients were classified based on Physician Global Assessment as patients in clinical remission or quiescent disease.

The following demographic and clinical characteristics were extracted from each patient's electronic medical record: sex, birth date, age at diagnosis, race, year of diagnosis, year of MH scope, age at MH scope, and duration of disease currently and at the time of MH scope. The *ICD-9* code–based search diagnosis was validated by chart review. The pediatric modification of the Montreal classification for IBD, or the Paris classification, was used to describe each patient's disease at diagnosis.[17] For patients with CD, Paris classification of the disease location, behavior, and perianal involvement at diagnosis was described, along with Paris classification of disease location at diagnosis of patients with UC. In addition, medications at the time of endoscopy along with changes to medications after endoscopy were recorded.

Endoscopic reports and attached color photographs of each scope were reviewed to assess endoscopic disease activity. Endoscopic MH was defined by physician assessment of endoscopic findings. In patients with CD, the simplified endoscopic

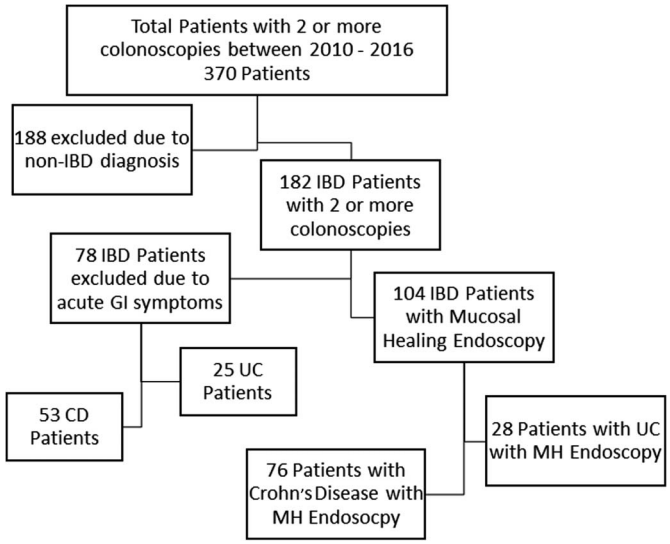

FIGURE 1. Study population.

activity score for Crohn's Disease (SES-CD) was used to evaluate endoscopic disease.[18] The categories were SES-CD of 0, <5, and >5. In patients with UC, the Mayo scoring system was used to classify endoscopic disease activity. Patients underwent Mayo scoring or SES-CD scoring by the pediatric gastroenterologist performing the endoscopy, and scoring was performed at the time of endoscopy as is standard in our IBD population.

MH was primarily defined by physician assessment of MH, either stated on the endoscopy report or subsequent clinic visits. A second, more robust definition of MH was also evaluated in which the Mayo and SES-CD scoring systems were used, and only scores of zero were considered MH. Histologic healing (HH) was defined as the absence of active inflammation in all biopsies obtained. Pathology reports specified between active and inactive inflammation. Active inflammation indicated the presence of neutrophils, microabscesses, and/or crypt abscesses on histology. Inactive inflammation indicated that there was architectural distortion as a result of previous inflammation; however, no neutrophils were present to indicate ongoing, or active, inflammation. Therefore, inactive findings were considered to be in MH because there was no active inflammation.

Statistical Analysis

Quantitative variables were portrayed with mean, median, and interquartile range (interquartile range, 25%–75%). Categorical variables were shown as number (n) and percentage of the cohort. Also assessed with each scope was MH versus HH. Wilcoxon rank-sum tests were used to compare quantitative variables between groups when applicable. Chi-square tests were used to compare counts of categorical variables between (or among) groups when applicable. To examine the agreement between the endoscopic scores and histopathology results, we calculated percent agreement between the 2 methods. In addition, we computed kappa statistics with associated 95% confidence intervals (CIs).

Statistical analysis was performed using SAS 9.4 (SAS Institute, Cary, NC).

RESULTS

Mucosal Healing

A total of 76 patients with CD and 28 patients with UC met inclusion criteria by having an endoscopy performed while in clinical remission and with the intention of assessing for MH. Second MH scopes were performed in 13 of the 76 patients with CD and 6 of the 28 patients with UC for a total of 104 patients and 123 total MH endoscopies. The population characteristics are listed in Table 1.

All endoscopies in this study reported MH defined by both physician assessment and endoscopic scores (SES-CD and Mayo in CD and UC, respectively) because both may be of use in clinical practice. Of the 76 patients with CD, 51 (67%) demonstrated MH based on physician assessment and 34 patients (45%) had a SES-CD score of 0. All 34 patients with an SES-CD score of 0 also demonstrated MH on physician assessment (Fig. 2). Of the remaining 17 patients with CD with physician-assessed MH, all had SES-CD scores less than 5, and their endoscopic findings were put into clinical context to determine physician-assessed MH. SES-CD was between 0 and 5 in 21 patients (28%) and greater than 5 in 21 patients (28%). Therefore, there were 4 of 21 patients with SES-CD score <5 who were not reported to be in physician-assessed MH.

Of the 28 patients with UC, 20 (71%) demonstrated MH based on physician assessment, whereas only 10 patients (36%) had a Mayo score of 0. All 10 UC patients with Mayo 0 were also reported to have physician-assessed MH. The other 10 patients who were deemed to be in MH from physician assessment had a Mayo score of 1. Further review of these 10 endoscopies revealed that mild Mayo 1 disease was present in only one segment of bowel, excluding the possibility of being classified as MH based on the strict scoring definition. Of the 8 patients with UC without MH based on physician assessment, 3 patients (11%) were scored Mayo 2 and 5 patients (18%) were scored Mayo 3. Therefore, among patients with UC, all those with scores of Mayo 0 or 1 were reported as physician-assessed MH.

In patients with CD, more than 30% are found to have upper GI tract disease. Within our study population, there were 52 of 76 patients with CD (68%) who had an esophagogastroduodenoscopy (EGD) performed at the same time as their first MH colonoscopy. Of these 52 patients, 38 (73%) had a normal EGD. Of the 14 EGDs that demonstrated disease, 10 demonstrated gastric erythema alone and pathology confirmed a chronic gastritis in all patients. The remaining 4 EGDs demonstrated both gastric erythema and duodenal erythema/ulcers. Pathology for these patients confirmed gastritis and chronic duodenitis. All 4 of these patients demonstrated active disease on colonoscopy with an SES-CD score greater than 5.

A total of 13 patients with CD and 6 patients with UC underwent a second MH scope. Of those with CD, 9 (69%) demonstrated MH based on physician assessment and 5 (39%) demonstrated an SES-CD score of 0. All 5 patient with SES-CD 0 were reported to be in physician-assessed MH. The remaining 4 patients who were in MH based on physician assessment were reported to have SES-CD scores between 0 and 5. The 4 patients with CD with SES-CD >5 were the same patients who were not in physician-assessed MH. Of those with UC, 2 (33%) demonstrated MH based on physician assessment and both had a Mayo score of 0. There were no patients with UC who had Mayo 1 or Mayo 3 scores on their second MH scope. The 4 patients with Mayo 2 were the same 4 patients who did not have physician-assessed MH.

The cumulative MH probability was 79% in CD and 79% in UC when based on physician assessment and 51% in CD and

TABLE 1. Patient Characteristics

Patient Characteristic	CD	UC	*P*
N	76 (73.1%)	28 (26.9%)	
Sex, n (%)			
Male	46 (60.5)	14 (50.0)	0.335
Female	30 (39.5)	14 (50.0)	
Race, n (%)			
Caucasian	43 (56.6)	17 (60.7)	0.004
AA	29 (38.2)	4 (14.3)	
Other	4 (5.2)	7 (25.0)	
Median age at diagnosis in years (IQR)	13.6 (10.9–15.8)	13.4 (9.7–15.6)	0.728
Median duration of disease in years (IQR)	4.1 (2.9–6.3)	4.0 (3.1–5.3)	0.927
Median time to first MH scope in years (IQR)	2.0 (1.0–3.6)	2.3 (1.2–3.4)	0.431
Paris age classification			
A1a	16 (21.1%)	8 (28.6%)	0.708
A1b	53 (69.7%)	18 (64.3%)	
A2	7 (9.2%)	2 (7.1%)	
Paris CD location			
L1	15 (19.75)		N/A
L2	6 (7.9%)		N/A
L3	55 (72.4%)		N/A
Paris CD behavior			
B1	49 (64.5%)		N/A
B2	19 (25.0%)		N/A
B3	4 (5.3%)		N/A
B2B3	4 (5.3%)		N/A
Perianal disease			
Yes	15 (19.7%)		N/A
No	61 (80.3%)		N/A
UC disease location			
E1		0 (0%)	N/A
E2		7 (25.0%)	N/A
E3		3 (10.7%)	N/A
E4		18 (64.3%)	N/A

N/A, not applicable.

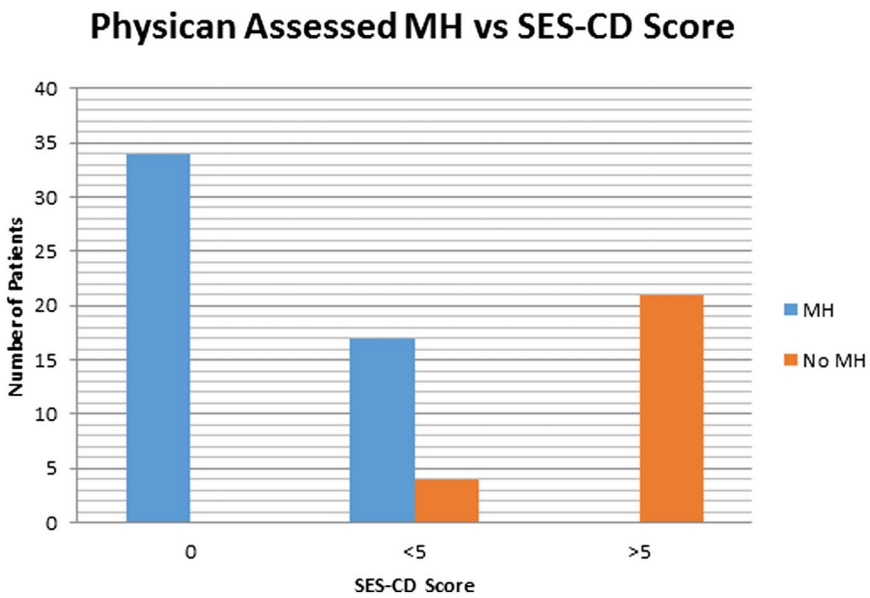

FIGURE 2. Physician-assessed MH versus SES-CD score.

43% in UC when based on SES-CD and Mayo scoring systems, respectively. (Tables 2 and 3)

Histologic Healing

Of the 76 patients with CD, 35 (46%) demonstrated HH with no pathologic abnormality or inactive findings. The remaining 41 (54%) patients were noted to have active disease on histopathology. Of the 28 patients with UC, there were 10 (36%) patients with no pathologic abnormality or inactive findings. The remaining 18 (64%) patients were noted to have active disease on pathology. Thirteen patients with CD underwent second endoscopy and 4 (31%) demonstrated HH, whereas 6 patients with UC underwent second endoscopy and 1 (17%) demonstrated HH. The cumulative HH rate in CD was 51% and 39% in UC (Table 2).

For patients with CD, we examined the agreement between the endoscopic scoring system and the histopathology results for evidence of MH. The methods showed moderate agreement (Kappa: 0.44; 95% CI [0.24–0.65]). MH was indicated by both methods in 24 patients and active disease was indicated by both in 21 patients. This resulted in 72.4% agreement (55/76 patients) between the 2 methods. There were 11 patients that histological evaluation suggesting MH but endoscopic scoring indicated active disease. There were 10 patients with MH based on endoscopic scoring but histopathology suggested active disease.

For patients with UC, agreement between histological results and endoscopic scoring was much higher (kappa = 0.84; 95% CI [0.64–1.00]). MH was indicated by both methods in 9 patients, and active disease was indicated by both in 17 patients. This resulted in 92.9% agreement (26/28 patients) between the 2

TABLE 2. MH and HH

MH based on physician assessment	CD (n = 76)	UC (n = 28)	*P*
First MH scope (CD n = 76; UC n = 28)	51 (67.1%)	20 (71.4%)	0.674
Second MH scope (CD n = 13, UC n = 6)	9 (69.2%)	2 (33.3%)	0.319
Cumulative patients in MH (CD = 76, UC = 28)	60 (78.9%)	22 (78.6%)	0.967
MH based on endoscopic indices			
First MH scope (CD n = 76; UC n = 28)	34 (44.7%)	10 (35.7%)	0.409
Second MH scope (CD n = 13, UC n = 6)	5 (38.5%)	2 (33.3%)	1
Cumulative patients in MH (CD = 76, UC = 28)	39 (51.3%)	12 (42.9%)	0.444
HH			
First MH scope (CD n = 76; UC n = 28)	35 (46.1%)	10 (35.7%)	0.345
Second MH scope (CD n = 13, UC n = 6)	4 (30.8%)	1 (16.7%)	1
Cumulative patients in HH (CD = 76, UC = 28)	39 (51.3%)	11 (39.3%)	0.276

TABLE 3. Endoscopic Scoring for MH Scopes

CD	First MH Scope (n = 76)	Second MH Scope (n = 13)	Cumulative MH (n = 76)
SES-CD = 0	34 (45%)	5 (38%)	39 (51%)
SES-CD <5	21 (28%)	4 (31%)	20 (26%)
SES-CD >5	21 (28%)	4 (31%)	17 (22%)
UC	**First MH Scope (n = 28)**	**Second MH Scope (n = 6)**	**Cumulative MH (n = 28)**
Mayo 0	10 (36%)	2 (33%)	12 (43%)
Mayo 1	10 (36%)	0 (0%)	8 (29%)
Mayo 2	3 (11%)	4 (67%)	7 (25%)
Mayo 3	5 (18%)	0 (0%)	1 (4%)

methods. There was 1 patient that histological evaluation suggesting MH but endoscopic scoring indicated active disease. Similarly, there was 1 patient with MH based on endoscopic scoring but histopathology suggested active disease.

Medications

Medications at first MH endoscopy are reported in Table 4 stratified by MH and HH findings. All patients in our population, who were on biological medications, were on monotherapy. In CD, there was a significant association between medication and likelihood of MH when endoscopic indices were used to define MH ($P = 0.037$). Patients with CD in MH were more likely to be on biological medications than those who were not on biological medications (Table 4). Odds of MH given you were on a biologic were 3.1 times higher compared with those not on a biologic (OR = 3.1; 95% CI [1.1–8.9]; $P = 0.03$).

Changes to medications after endoscopy were recorded and are reported in Table 5. In CD, there were 25 patients without MH and 21 patients (84%) underwent an escalation of therapy. The 4 patients who were not in MH and did not have escalation of therapy had significant improvement in their endoscopic findings and thus continued their current medications. In patients with UC, there were 8 patients without MH, and all 8 patients underwent escalation of therapy (Table 5).

Of those on biological medications, 21 of 62 patients (34%) had therapeutic drug monitoring with biological levels performed within 3 months of their MH scope. None of these patients demonstrated antibodies to their biological medication. Of the 21 patients with levels checked, 15 were in MH and 6 were not in MH. The median level of biological medication in MH was 15.9 μg/mL (range 2.9–50 and interquartile range 12.4–22.25), and the median level of biological medication in non-MH patients was 12.65 μg/mL (range 1.0–14.3 and interquartile range 7.83–13.05). There was no statistically significant association between biological level and likelihood of being in MH. Of those 6 who were not in MH and biological levels were obtained, there was either a dose increase based on low levels or an extra medication, such as 6-mercaptopurine or methotrexate, was added if the biological level was in good range. One patient with UC who was in MH was found to have a high infliximab level, and so the dose was decreased as a result.

TABLE 4. Medications at Endoscopy

Endoscopy—Physician Assessment	MH	No MH	*P*
CD	n = 51	n = 25	
Mesalamine	3 (5.8%)	5 (20.0%)	0.137
Immunomodulators (6 MP or MTX)	9 (17.6%)	6 (24.0%)	
Biologics (IFX, ADA)	36 (70.6%)	14 (56.1%)	
No medication	3 (5.8%)	0 (0%)	
UC	n = 20	n = 8	
Mesalamine	7 (35.0%)	2 (25.0%)	
Immunomodulators (6 MP or MTX)	5 (25.0%)	2 (25.0%)	0.856
Biologics (IFX, ADA)	8 (40.0%)	4 (50.0%)	

Endoscopy—Scoring Systems	MH (SES-CD = 0, Mayo = 0)	No MH	*P*
CD	n = 34	n = 42	
Mesalamine	3 (8.8%)	5 (11.9%)	0.037
Immunomodulators (6 MP or MTX)	2 (5.9%)	13 (31.0%)	
Biologics (IFX, ADA)	27 (79.4%)	23 (54.8%)	
No medication	2 (5.9%)	1 (2.4%)	
UC	n = 10	n = 18	
Mesalamine	4 (40.0%)	5 (27.8%)	
Immunomodulators (6 MP or MTX)	2 (20.0%)	5 (27.8%)	0.785
Biologics (IFX, ADA)	4 (40.0%)	8 (44.4%)	

Histopathology	HH	Active Disease	*P*
CD	n = 35	n = 41	
Mesalamine	2 (5.7%)	6 (14.6%)	0.465
Immunomodulators (6 MP or MTX)	6 (17.1%)	9 (22.0%)	
Biologics (IFX, ADA)	26 (74.3%)	24 (58.5%)	
No medication	1 (2.9%)	2 (4.9%)	
UC	n = 10	n = 18	
Mesalamine	3 (30.0%)	6 (33.3%)	0.834
Immunomodulators (6 MP or MTX)	2 (20.0%)	5 (27.8%)	
Biologics (IFX, ADA)	5 (50.0%)	7 (38.9%)	

ADA, adalimumab; IFX, infliximab; MP, mercaptopurine; MTX, methotrexate.

DISCUSSION

This study reports a single-center experience in MH as part of clinical practice demonstrating the feasibility of a treat to target

TABLE 5. Treatment Changes After Active Disease Confirmed

	Active Disease	Escalation	Add Another Class	Initiate Anti-TNF	Switch Within Anti-TNF Class	Dose Optimization
Escalation Description						
CD						
Mesalamine	5	5	2	3		
Immunomodulators (6 MP/MTX)	6	5	1	3		1
Biologics (IFX, ADA)	14	11	2		2	7
Escalation Description						
UC						
Mesalamine	2	2		2		
Immunomodulators (6 MP/MTX)	2	2		2		
Biologics (IFX, ADA)	4	4	1		1	2

ADA, adalimumab; IFX, infliximab; MP, mercaptopurine; MTX, methotrexate.

approach with MH as the primary target. Using a physician assessment definition of MH, a cumulative MH probability of 79% among both patients with CD and UC was demonstrated, which is similar to adult studies in clinical practice.[14,15] Using a definition of complete absence of ulcers and endoscopic scores (SES-CD and Mayo) of zero, the cumulative MH probability was 51.3% for CD and 42.9% for UC. This rate is similar to anti-tumor necrosis factor (TNF) clinical trials which demonstrate a MH probability of 24% to 50%.[19–21]

Our study demonstrates that despite being in clinical remission, up to 30% of patients with IBD demonstrated active disease on first endoscopy. We suggest that this group of patients is the most important to identify in clinical practice as despite having no symptoms, they demonstrate mucosal disease, sometimes referred to as silent disease. Identifying this group and altering treatment may improve their long-term outcome. The discrepancy between clinical remission and MH highlights the fact that clinical symptoms or lack of symptoms do not correlate with endoscopic disease. Similar findings have been shown in a review of the SONIC data and data from clinical practice.[14,15,19]

Treatment alterations in patients without symptoms but active endoscopic disease may include the addition of medications, optimizing the dose of biological medications, or switching to a different class of medications. Recent data suggest that a higher level of biological medications may be needed to obtain MH.[20,21] In our study, of 18 patients on biologics with active disease, 9 underwent optimization of their biologic without switching to increase the level, 3 patients switched to another biologic, and 3 patients had an immunomodulatory medication added to the treatment regimen. Our study further demonstrates, although with limited numbers, that changes in medical therapy can increase the cumulative MH rate to nearly 80% which could be even higher with additional changes in those who did not demonstrate MH on a second endoscopy.

The definition of MH can be debated, but in general is considered free of all lesions on endoscopy.[22] In our study, we reported MH from physician assessment which was based on the endoscopy findings, but also took into account the clinical context of each patient if their score was SES-CD <5 or Mayo 1. We also reported MH by applying the strictest definition of MH, those with scores of SES-CD 0 or Mayo 0 for CD or UC, respectively. We chose to evaluate both definitions because both may be useful in clinical practice. In review of the colonoscopies that were rated as MH by the physician, but not by endoscopic indices, all demonstrated very mild mucosal diseases. For CD, this included small and rare aphthous ulcers, and for UC, this included mild Mayo 1 erythema in only one segment of bowel.

This study assessed endoscopic findings and histologic findings. As expected, the rate of HH was significantly lower than the rate of MH, which has been described previously.[23] Patients with IBD with normal appearing mucosa often still have abnormalities histologically, although the importance of HH on long-term outcome is unknown.[24]

There are several limitations to our study. Data were collected retrospectively, although endoscopic indices were performed at the time of endoscopy using Provation software. Very few patients underwent a second MH endoscopy especially if only minimal mucosal disease was present. Long-term outcome is not available, and follow-up data were not available on all patients who underwent a change in medication. In addition, none of the patients in this study were reported to have endoscopic complications. However, our center only tracks acute endoscopic complications, which are those patients who present to the healthcare system within 48 hours of their endoscopy. Our population undergoing MH endoscopy includes significantly more patients with CD compared with UC. Although this does mirror our patient population slightly, there was a higher percentage of our patients with CD who underwent MH

endoscopy. We surmise that this is due to the fact that patients with UC were more likely to be symptomatic as colonic disease often drives symptoms, and we used a strict definition of no symptoms to evaluate only those scopes performed to evaluate for MH in the setting of clinical remission.

A cost analysis was not performed, but it is undeniable that there are costs associated with endoscopy. In addition, although no patients in this study were reported to have an endoscopic complication, there are risks to endoscopy. Even with the costs and risks associated with endoscopy, it seems that there is considerable benefit among those patients who were found to have active disease and need a change in therapy. Those patients in clinical remission but not in MH typically would go undetected, leaving them vulnerable to a disease that carries a significant risk if left untreated.

Data are emerging that early treatment of IBD results in an improved outcome. Early initiation of either immunomodulators or anti-TNF biological medications is associated with an improved outcome and fewer surgeries.[25] Likewise, a subgroup analysis of the CHARM trial demonstrated that early treatment with adalimumab was associated with higher clinical remission rates through 3 years.[26] Similarly, a pediatric study identified that early introduction of anti-TNF medications resulted in improved outcome at 1 year when compared with early introduction of immunomodulators.[27] These studies and others highlight a growing body of evidence that treatment early in disease can result in improved outcome. Projecting this data to MH, obtaining MH early in disease may be an important target that may ultimately alter the natural history of the disease, and that perhaps that early MH rather than early treatment drives improved outcome. Thus, we suggest that obtaining MH early in disease may be an important goal, and thus studies evaluating MH in pediatrics are of utmost importance. This study is one of the first studies evaluating MH in pediatric IBD as an attainable goal and provides real-world data in clinical practice.

In summary, this study reports a cohort of children with IBD who underwent MH endoscopy while in clinical remission as part of clinical practice. Cumulative MH was present in 79% of patients when using physician assessment, and 49% when using strict endoscopic scoring methods and a definition of no lesions. HH was present in 48% of patients. Additional studies in MH in pediatrics are necessary; however, given this data we suggest that MH endoscopy is feasible, and cumulative MH may approach 80% in children with IBD. Endoscopy should be considered in pediatric patients with IBD in clinical remission to identify those without MH who may require medication escalation despite the absence of clinical symptoms.

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