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Mayo Endoscopic Score (MES) as a reference for the histological active disease of ulcerative colitis



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ABSTRACT

Background: The degree of inflammation dramatically affects the morbidity of ulcerative colitis. Local and systemic inflammation features are modalities to determine disease severity and evaluation. Furthermore, local inflammation can be seen from endoscopic and histological examinations. This study aimed to examine the relationship of histological inflammatory profile with endoscopic scoring in ulcerative colitis patients.

Method: A retrospective study was conducted using colonoscopic and histologic data from 68 ulcerative colitis patients. The endoscopic grade was assessed based on the Mayo Endoscopic Score (MES). The histological grade was analyzed using a microscope by assessing acute and chronic inflammatory cells and the presence of ulceration and crypt changes based on the Nancy Score Index and Geboes Score Index. Furthermore, the analysis test used Spearman and Mann-Whitney.

Results: There is a significant positive relationship between endoscopic and histology scoring. The Nancy Score Index and MES combination yields 95% CI: 0.000-0.043, $p=0.000$, Correlation coefficient (r)=0.810, and odds ratio (OR)=3.272. Meanwhile, the combination of the Geboes Score Index with MES yields 95% CI: 0.000-0.043; $p=0.000$; $r=0.727$; and OR=1.347. In each histological scoring, there was a significant difference between the Nancy Score Index and Geboes Score Index to ($r = 0.018$; $p<0.05$).

Conclusion: There is a significant relationship between histological and endoscopic scoring. Therefore, an endoscopic examination can be a reference for histologically active disease.

Keywords: Geboes Score Index, Mayo Endoscopic Score, Nancy Score Index, ulcerative colitis.

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INTRODUCTION

Ulcerative colitis is an inflammation of the intestine or lamina propria and is more common than Crohn's disease. It is common in industrialized countries such as North America and Western Europe, with all cases reported from 1.2 to 20.3 per 100,000 people/year. Meanwhile, the prevalence of ulcerative colitis is 7.6 to 246 cases per 100,000 people, and the diagnosis cannot be confirmed with a single diagnostic study.^{1,2} Therefore, it is based on the interpretation of clinical manifestations, laboratory, radiological and endoscopic tests, and histology.³

In ulcerative colitis, there is epithelial damage due to the continuous inflammatory process and the involvement of pathogenic bacteria capable of damaging the mucin layer. The body's first line of defense is the Intestinal Epithelium (IEC) and columnar cell layer, which contains enterocytes, Goblet cells that produce MUC2, Paneth cells, enteroendocrine cells, and M cells. Chemokines are part of cytokines that act as chemo-attractants

causing leukocytes to be deposited in areas of mucosal inflammation.⁴ The infiltration into the mucosa is seen in histological samples and can describe disease activity.

Endoscopic visualization can see the extent of inflammation spreading from the colon to the rectum. The endoscopic findings range from low activity, with coarse granular mucosa, reduced vascular markings, and mild erythema, to severe activity characterized by ulceration and spontaneous bleeding.^{3,4} The inflammatory activity level in the form of inactive or Low MES (0-I) and active or High MES (II-III) is classified based on the endoscopic appearance using the Mayo Endoscopic Score (MES).⁵ Furthermore, endoscopic assessment of mucosal healing can be used as a measure of disease activity.⁶ Histological improvement may be associated with clinical outcomes, including reduced cancer risk and recurrence rates, which refer to histologic remission as a therapeutic goal in ulcerative colitis.⁷ Many indices used to assess the histological activity of patients show

1 good reproducibility and agreement with endoscopic scoring systems.⁸ Therefore, it is essential to determine the relationship between endoscopic and histological findings to assess disease activity in ulcerative colitis.

METHODS

Patient and study design

We conducted a retrospective data analysis with a total sampling from January 2017 to March 2022. Sixty-eight samples with criteria have two examinations of colonoscopic and histologic data performed in Ulin General Hospital. It is the form of electronic data from colonoscopy results and histological samples of patients with ulcerative colitis. This study used a cross sectional study.

Endoscopic and histologic assessment

The Mayo Endoscopic Score is an endoscopy index to assess inflammation on the surface of the colon. This assessment has a subscore of 0 = Normal, Score 1 = Mild (mild erythema or decreased vascular pattern), score 2 = Moderate (erythema, absence of vascular pattern fragility and erosion), score 3 = Severe (spontaneous bleeding and ulceration). This assessment is divided into subgroups Low MES = score 0-1 and High MES = score 2-3. Histology assessment uses 2 scores, the Nancy Score Index and the Geboes Score Index. Histological assessment based on the infiltration of lymphocytes and neutrophils, involvement of crypts, ulceration, and granulation. Each subscore is in the table of patient characteristics.

Statistics and analysis

Variables were stated as mean and standard deviation (SD). Statistical tests carried out data analysis to correlate the Mayo scoring index with the Nancy Score and the Geboes scoring index. Statistical analysis was conducted using an unpaired non-parametric in the form of Spearman's test with a significance level of 95%, using the Statistical Package for the Social Sciences (SPSS) version 25 software.

RESULTS

Based on the analysis, 68 patients met the inclusion and exclusion criteria, most

Table 1. Patients' characteristics.

Variable	n (%)
Gender	
Male	36 (52.9)
Female	32 (47.1)
Age (years) (mean±SD)	44.94±7.22
< 40	22 (32.4)
≥ 40	46 (67.6)
Diagnosis on colonoscopy	
Abdominal pain	3 (4.4)
Hematochezia	31 (31.6)
Constipation	12 (17.6)
Colitis	22 (32.3)
Mayo Endoscopic Score (mean ± SD)	1.48±0.68
Low MES (0-1)	39 (57.3)
High MES (2-3)	29 (42.7)
Geboes Score Index (mean ± SD)	2.38±0.83
Active (>3.1)	40 (58.8)
Inactive (<3.1)	28 (41.2)
Nancy Score Index (mean ± SD)	2.79±1.02
Normal-Mild (0-2)	42 (61.8)
Moderate (3)	18 (26.5)
Severe (4)	8 (11.7)

Table 2. Relationship of MES with Nancy and Geboes Score Index.

Histology Scoring	95%CI		p	r	OR
	Min	Max			
Nancy Score Index	0.000	0.043	0.000	0.810	3.272
Geboes Score Index	0.000	0.043	0.000	0.727	1.347

1 **Table 3. Histological activity (Geboes Score Index) based on Endoscopical Activity.**

Histological Activity	Mayo Endoscopic Score (MES)			
	0 (Normal)	1 (Mild)	2 (Moderate)	3 (Severe)
Geboes Score < 3.1	1	25	3	0
Geboes Score > 3.1	0	13	20	6
	N = 39 (Low MES)		N = 29 (High MES)	

Table 4. Histological activity (Nancy Score Index) based on Endoscopical Activity.

Histological activity (Nancy Score Index)	Mayo Endoscopic Score (MES)			
	0 (Normal)	1 (Mild)	2 (Moderate)	3 (Severe)
Grade 0-II	1	36	5	0
Grade III	0	2	16	0
Grade IV	0	0	2	6
	n=39 (Low MES)		n= 29 (High MES)	

male (52.9%) with a mean age of 44.94 years old and most in the ≥ 40 years old group (67.6%). The majority of diagnoses of colonoscopy was hematochezia (31.6%). The mean Mayo Endoscopic Score (MES) was 1.48±0.68, and the majority of the subject classified in low MES (57.3%). The mean Geboes Score Index was 2.38±0.83,

with most subjects classified as active (58.5%). The mean of the Nancy Score Index was 2.79±1.02, and most subjects were classified as normal-mild (61.8%), as shown in Table 1.

The analysis results showed that MES has a significant relationship with the Nancy Score (p<0.05, r = 0.810, OR

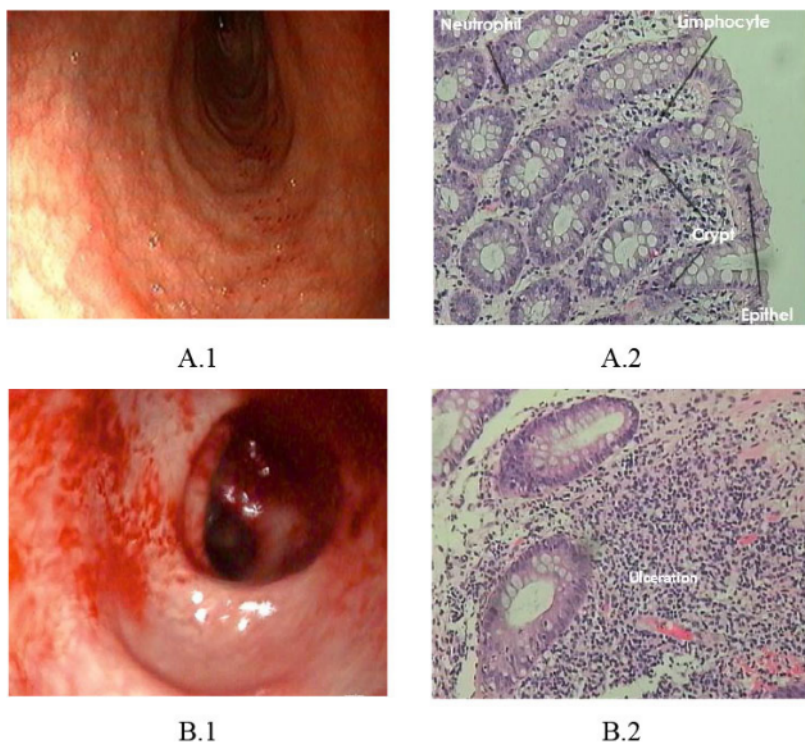


Figure 1. (A.1) Colonoscopic appearance with MES grade I; (A.2) Neutrophils in the lamina propria and crypts, there are lymphocytes; (B.1) There is spontaneous ulceration and bleeding; and (B.2) Significant ulceration with granulation.

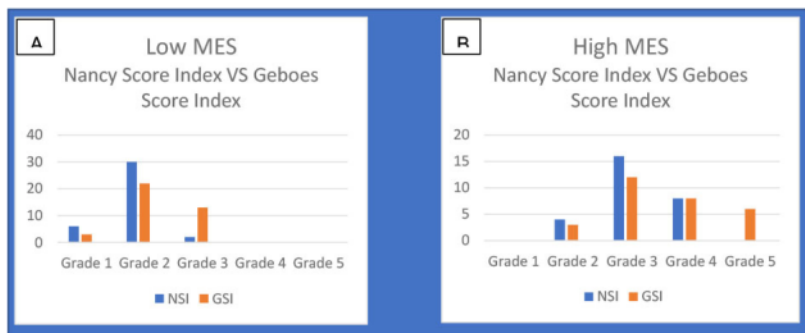


Figure 2. Graph of histological activity based on endoscopic activity. (A) Low MES (grade 0-I) and (B) High MES (grade II-III).

3.272) and Geboes Score Index ($p < 0.05$, $r = 0.727$, OR 1.347), as shown in Table 2. In Low MES (grade 0-I), 39 samples showed inactive inflammation, namely the Nancy and Geboes Score Index of 37, and (Inactive < 3.1) 26 samples at 94% and 70.2%. In High MES, 29 samples showed active inflammation, namely the Nancy and Geboes Score Index of 24, and (active > 3.1) 26 samples at 82.7% and

89.0%. Based on the relationship table, it was found that there was a significant positive relationship between endoscopic scoring and histology scoring with a 95% confidence interval, i.e., an increase in the MES score was significantly associated with an increase in the Nancy Score Index score by 3.272 times (OR), while in the MES with the Geboes Score Index by 1.347 times (OR). Therefore, most Low MES

give an equivalent description with a mild histological grade or inactive disease on endoscopic scoring.

DISCUSSION

Mucosal healing with a subscore of 0-1 based on endoscopic assessment using MES is a predictive value recommended in clinical practice. Histological remission was also reviewed and considered essential to evaluate disease severity in ulcerative colitis patients.⁸⁻¹⁰ The healing is a therapeutic target in Inflammatory Bowel Disease (IBD), which is associated with a reduced number of hospitalized patients, incidence of colorectal cancer, and risk of surgery.^{7,11}

There was a significant relationship between endoscopic and histology scoring. Colonoscopy with Low MES in 39 samples or inactive inflammation showed equivalence with histological examination of the Nancy and Geboes Score Index. This condition provides a macroscopic description with a decrease in the vascular pattern of the colonic mucosa. Furthermore, it reflects infiltration into the lamina propria by chronic inflammatory cells in the form of lymphocytes and a few neutrophils assessed histologically. The Low MES sample had crypt involvement infiltrated by neutrophils at the histological level based on the Geboes Score Index in 13 samples (19.1%). After four months of illness, the neutrophil cell infiltration and architectural changes in the crypts are signs of chronicity in IBD. However, no clinical assessment was carried out, including the onset of the disease.¹²⁻¹⁵

The 29 samples with High MES gave a clinical description of clear erythema; some had ulceration with bleeding. In the histological picture, the Nancy and Geboes Score Index (grade III-IV) of 24 (82.7%) and (active > 3.1) 26 samples (89.0%) showed a distortion of the crypts followed by massive neutrophil infiltration and ulceration of the colonic mucosa. However, there was no sampling point in the colon for histological examination. This study is consistent with Kim DB et al. in that most of the mucosal samples with High MES showed histologically active inflammation with a Geboes Score Index > 3.1 . In 94% of samples, normal endoscopic

mucosa showed a **Geboes Score Index** <3.1.⁸

A **previous study** found that from 378 sampling sites in the large intestine of 54 patients with ulcerative colitis, 88.1% with MES of 0 showed a histologic score of 1.^{8,12} Therefore, chronic ulcerative colitis is inactive and confirms that the endoscopic score is consistent with the histological score. These results agree with Shah J et al., which correlated MES with GI, RHI, and NI. Based on **Table 1**, 57.3% of patients (1.48 + 0.68) had a Low MES score, while the Geboes and Nancy Score Index found the inactive disease in 58.8% (2.38 + 0.83), and 61.8% (2.79 + 1.02).⁷ Endoscopic examination with High MES can effectively predict ulcerative colitis associated with dysplasia and colorectal cancer.⁵ Ulcerative colitis-associated dysplasia impacts the poor prognosis of patients. In High MES with active disease conditions accompanied by severe intestinal inflammation, there is a risk of repeated recurrences.^{5,9} Xu W et al., comparing clinical outcomes between patients, showed that the remission phase (p=0.024) was more common with Low MES. Meanwhile, those with High MES tend to have an active disease (p=0.033), serious complications (p < 0.001), and undergo surgery (p < 0.001).⁵

A combination of clinical, serological, endoscopic, and histological examinations is required in patients with ulcerative colitis to accurately assess and evaluate the ongoing inflammatory process. This is because each examination has its strengths and weaknesses.⁸ Assessment of disease activity in determining the severity and extent of inflammation is very important for planning treatment strategies. Endoscopy is a modality for assessing mucosal activity and disease extension in the luminal gastrointestinal tract, and the correlation with histology scoring can be used in clinical practice.^{9,16,17}

Concerning the strength of this study, the inflammatory profile can be analyzed endoscopically and histologically. There is a significant positive relationship between endoscopic and histological inflammatory profiles. Therefore, endoscopic assessment can reflect the histological features of inflammation to determine disease severity and evaluate therapy. The limitations of

this study were retrospective; there was no follow-up with patients who could provide an overview of disease progression and evaluation of treatment. This study only uses two parameters which are endoscopic and histological. In ulcerative colitis, the number of parameters used is directly proportional to the accuracy in assessing the inflammatory profile and disease severity, such as epidemiological and clinical factors, the examination of fecal calprotectin, and the neutrophil-lymphocyte ratio.¹⁸ Future studies are expected to assess the relationship between these parameters. Therefore, the profile of inflammation and disease severity of ulcerative colitis can be determined.

CONCLUSION

There is a significant relationship between histological and endoscopic scoring. Therefore, an endoscopic examination can be a reference for histologically active disease.

ETHICAL CONSIDERATION

This study has been approved by the Research Ethics Committee of the Faculty of Medicine, University of Lambung Mangkurat Banjarmasin, under No. 137/KEPK-FK ULM/MEC/V/2022.

CONFLICT OF INTEREST

The authors declared that no competing financial interests or personal relationships tend to influence the work reported in this study.

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AUTHOR CONTRIBUTIONS

AAW is responsible for conceptualization, methodology, validation and formal analysis. HBV is responsible for data curation, writing – original and administration. DDS is responsible for software, validation, formal analysis and resources, and HS is responsible for writing – review and editing, administration and resources. HDP is responsible for the

supervision, writing – review & editing, and KMS is responsible for writing – reviewing & editing resources.

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