

Correlation Between Endoscopic and Histopathological Diagnosis in Inflammatory Bowel Disease – A Two-Year Study at a Tertiary Care Center

Pushpa Mahadevan¹, Rithu Sebastian², Remya R^{3,*}

¹Department of Pathology, VPS Lakeshore Hospital and research center, Kochi, Kerala, India

²Department of Medical Gastroenterology, VPS Lakeshore Hospital and research center, Kochi, Kerala, India

³VPS Lakeshore Hospital and research center, Kochi, Kerala, India

*Correspondence: remyaran849@gmail.com

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Abstract

Background: A combined retrospective and prospective correlative evaluation of endoscopic and histopathologic scores, based on data collected between April 2018 and April 2020 at VPS Lakeshore Hospital and Research Center, Nettoor, Kochi.

Methods: 65 diagnosed cases of Ulcerative Colitis and 10 cases of Crohn Disease were selected. Biopsies were evaluated blindly, without going through clinical or endoscopic details. Histological activity was assessed using Gupta Index (scale 0 to 3) and Global Histologic Activity Score (scale < 2 to > 8) for Ulcerative Colitis and Crohn Disease, respectively. These were then correlated with Endoscopic activity assessed by Mayo Score (scale 0 to 3) for Ulcerative Colitis and Simple Endoscopic Score (scale: < 2 to > 8) for Crohn Disease. Statistical significance was assessed.

Result: In this study, a statistically significant correlation was observed between the scales of endoscopy and histology scores of UC (p value 0.00). The best correlation was seen for Mayo Score 3. The sensitivity (93%), specificity (100%), PPV (100%) and NPV (60.0%) reveals that the MAYO score is accurately matching with GUPTA index in 94% cases. Correlation was not found to be statistically significant between SES Score and GHAS Score in Crohn Disease (p value 0.117 – Chi square test for association between the scores). However, the sensitivity, specificity, PPV and NRV are 71%, 100%, 100% and 60.0% (diagnostic performance assessment), respectively. Here again, p value of 0.167 using McNemar's test indicates an insignificant value due to low sample size. The overall accuracy indicates that the SES score is accurately matching with GHAS score in 80% cases.

Conclusion: A statistically significant correlation was observed between the scales of endoscopy and histology scores of UC, with 100% correlation in cases with Endoscopic Mayo score 3. However, several patients with mild or normal endoscopic findings exhibited histological evidence of inflammation. Therefore, histological assessment in Ulcerative Colitis is essential in diagnosing and for evaluating treatment outcomes and determining follow up strategies. Correlation between endoscopic and histological measures was not statistically significant in Crohn Disease, which may be due to lower number of cases. However, the overall accuracy indicates, SES Score is accurately matching with GHAS score in majority (80%) of the cases.

Keywords: Ulcerative Colitis; Crohn Disease; Simple Endoscopic Score; Global Histologic Activity Score; Mayo score; Gupta Index; Endoscopy; Histopathology; Score correlation

Introduction

Inflammatory bowel disease is a chronic relapsing and remitting inflammatory disorder of the gastrointestinal tract. Ulcerative colitis (UC) and Crohn's disease (CD) are the two most common forms.

Diagnosis relies heavily on pathologic interpretation of biopsy [1, 2], characterized by the extent and the distribution of mucosal architectural abnormality, lamina propria cellularity and the cell types present.

Mucosal healing is considered the therapeutic goal in IBD and endoscopy is considered the primary endpoint in assessing mucosal healing. However, studies have shown that histological activity do persist even in endoscopically inactive cases, responsible for the early relapse.

Many features do frequently overlap between ulcerative colitis and crohn's disease. Evaluation is performed by the pathologist with the hope that a specific diagnosis can be rendered once appropriate clinical, endoscopic and laboratory information is obtained.

Perhaps the most important aspect of evaluating colorectal biopsy specimens is to determine normal from abnormal, which can be difficult because of the presence of bowel preparation and biopsy procedure artifacts characterized by surface epithelial degeneration, edema, hemorrhage and congestion, aggregation of inflammatory cells, pseudo lipomatosis, mucin depletion, and even cryptitis.

The aim of this study is to provide a solid basis for the histopathological diagnosis of UC and CD on endoscopy guided biopsy samples, focusing on the histological criteria for diagnosis. Since lesions may be focal, multiple sections from each tissue sample should be examined. The differences between endoscopy and histology are smaller for active disease but may be larger for inactive disease and hence histopathological examination is important [3].

Materials and Methods

Study setting – This study is a correlative endoscopic and histopathological study, data collected at VPS Lakeshore Hospital and Research center, Nettoor, Kochi, which is a tertiary care referral center.

Study duration – April 2018 to April 2020.

Study design – A retrospective and prospective study.

Study sample – The retrospective part of the study includes histologically proven cases of inflammatory bowel diseases investigated with endoscopic biopsy, with the slides available between April 2018 and June 2019.

The prospective part of the study includes cases of inflammatory bowel diseases investigated with endoscopic biopsy and the slides available between June 2019 and April 2020.

Inclusion criteria: Cases of IBD, reporting to VPS Lakeshore Hospital, Kochi, in whom endoscopic biopsies are done, with endoscopic scores available during the period from April 2018 to April 2020.

Exclusion criteria: Patients suspicious to have IBD on endoscopy, but in whom histopathological examination are not done. Patients found to have IBD on histopathology, but in whom endoscopy reports are not available.

Data collection

During the study period, 75 endoscopy guided mucosal biopsy samples from lower gastrointestinal tract were received for histopathological examination. A range of histopathological diagnosis was offered on all satisfactory mucosal biopsies. A correlative endoscopic and histopathological study was done.

The reports were recorded in a master chart.

For statistical purposes, the lesions are categorized into: Ulcerative colitis – Mild, Moderate, Severe; Crohn disease - Mild, Moderate, Severe.

A correlative study between endoscopy and histopathology was done.

Sample size Calculation Formula for calculating sample size The provided formula, $n = (Z_{1-\alpha/2}^2 Sn)1/D^2p$, is a variation for calculating sample size for comparing two group means.

$$n = (Z_{1-\alpha/2}^2 Sn)1/d^2p$$

where, α – level of significance

Sn –sensitivity of the test

d –desired precision

p –prevalence of the disease

$$n = 1.96^2 * 0.74(1 - 0.74)(1/0.15^2)$$

$$0.443$$

$$= 32.85$$

$$0.443$$

$$= 74.15$$

Results

A total of 75 patients diagnosed with inflammatory bowel disease were included in the study. The endoscopic disease activity was assessed using the Mayo endoscopic score for Ulcerative colitis and Simple endoscopic score for Crohn disease, while the histopathologic activity was evaluated using the Gupta index for Ulcerative Colitis and Global histologic activity index for Crohn disease. A statistically significant correlation was observed between the scales of endoscopy and histology scores of IBD, with 100% correlation in cases with Severe Activity. However, several patients with less severe (inactive / mild / moderate) endoscopic findings exhibited higher degree of histological activity. Therefore, histological assessment is essential in diagnosing and for evaluating treatment outcomes and determining follow up strategies.

In Ulcerative Colitis there was statistically significant correlation between Mayo Score and Gupta Index, with a *p*-value of 0.000. Also, evaluation of accuracy revealed that the scores were matching in 94% of cases. Correlation between endoscopic and histological measures was however not statistically significant in Crohn Disease, which may be due to small sample size of CD (limitation of this study). But the overall accuracy indicates, SES Score is accurately matching with GHAS score in majority (80%) of the cases. When stratified by disease type, both UC and CD showed similar positive correlations between endoscopic and histologic scores. The higher the endoscopic activity, more severe the histologic inflammation.

Table 1: Ulcerative colitis (Table 1)

MAYO Score	GUPTA Index				Total	<i>p</i> -value
	Inactive	Mild	Moderate	Severe		
Inactive	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1	0.000
Mild	0 (0%)	5 (56%)	0 (0%)	4 (44%)	9	
Moderate	0 (0%)	0 (0%)	12 (33%)	24 (67%)	36	
Severe	0 (0%)	0 (0%)	0 (0%)	19 (100%)	19	
Total	0 (0%)	6 (9%)	12 (18%)	47 (72%)	65	

Table 2: Ulcerative colitis (Table 2)

MAYO Score	GUPTA Index		Total	Sensitivity	Specificity	PPV	NPV	Accuracy	<i>p</i> -value
	Severe	Less Severe							
Severe	55	0	55	93%	100%	100%	60%	94%	0.000
Less Severe	4	6	10						
Total	59	6	65						

Table 3: Crohn disease (Table 3)

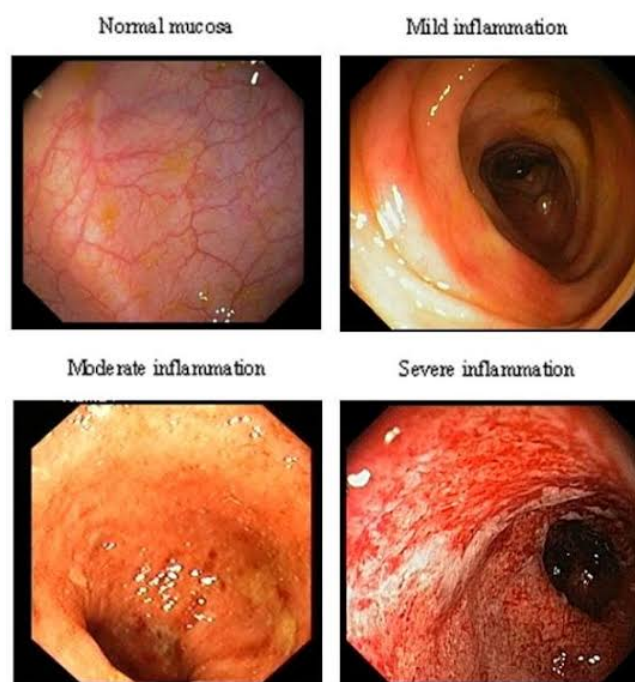
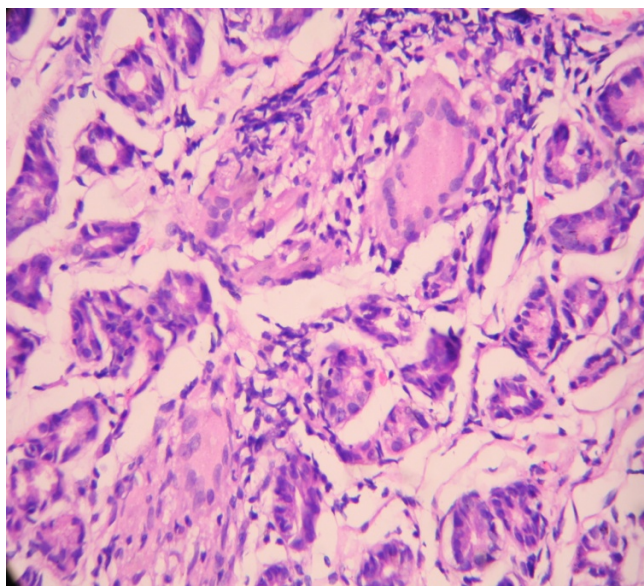
SES Score	GHAS Score				Total	<i>p</i> -value
	Inactive	Mild	Moderate	Severe		
Inactive	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1	0.117
Mild	0 (0%)	2 (50%)	2 (50%)	0 (0%)	4	
Moderate	0 (0%)	0 (0%)	2 (67%)	1 (33%)	3	
Severe	0 (0%)	0 (0%)	0 (0%)	2 (100%)	2	
Total	0 (0%)	3 (30%)	4 (40%)	3 (30%)	10	

Discussion

Our study aimed to evaluate the correlation between endoscopic and histological scoring systems in patients with inflammatory bowel disease. The results demonstrate a significant correlation between endoscopic findings and histologic activity, although the degree of correlation varied depending on the severity.

Table 4: Crohn disease (Table 4)

SES Score	GHAS Score		Total	Sensitivity	Specificity	PPV	NPV	Accuracy	p-value
	Severe	Less Severe							
Severe	5	0	5	71%	100%	100%	60%	80%	0.167
Less Severe	2	3	5						
Total	7	3	10						

**Figure 1:** Endoscopy – mucosal ulceration indicates severe activity (Ulcerative colitis).**Figure 2:** H&E, (400×) multiple clusters of neutrophils in lamina propria and/or in epithelium - severe activity (Ulcerative colitis).

Our findings confirm a moderate to strong positive correlation between the scores, especially when severe. Thus, aligning with the previous studies suggesting that mucosal healing generally reflects histological remission but does not always mirror it.

However, a subset of patients who were classified as being in endoscopic remission were observed to have persistent histologic inflammation, thus stressing the importance of biopsy correlation especially when endoscopically less severe.

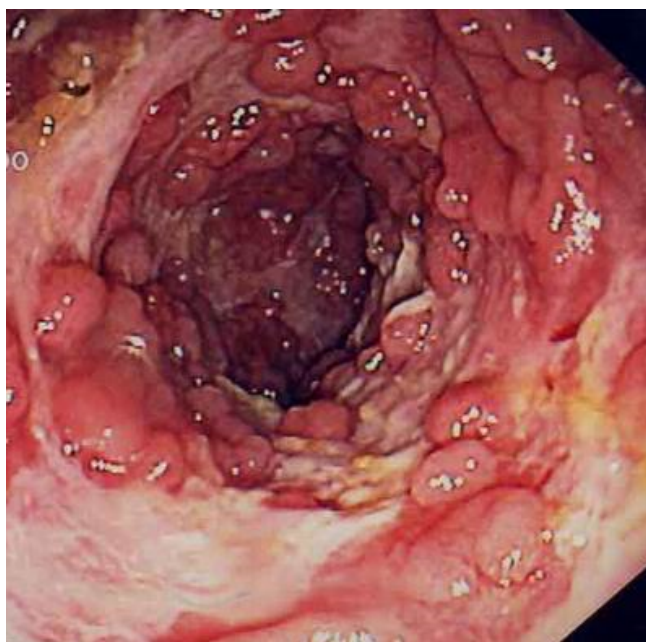


Figure 3: Endoscopy - Cobble stone mucosa in Crohn disease.

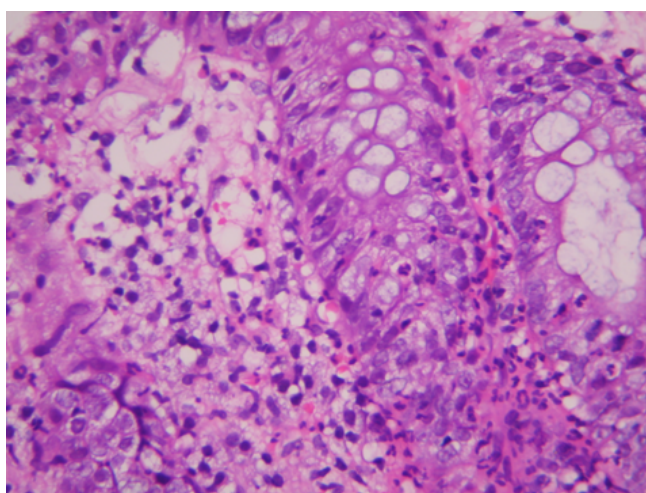


Figure 4: H&E, (400×) Non caseating granuloma in Crohn disease.

*Attempts to correlate endoscopic activity and histological activity in the past have been notable more for disparity than correlation. [4, 5, 6] A plausible reason for this disparity is that there have, until now, been no validated endoscopic or histological indices to compare.

Leuven group compared 263 biopsy sets from 131 patients with UC of differing activity, [7] comparing the Mayo Clinic endoscopic sub score (eMCS) with the Geboes [8] and Riley [9] histological indices. It was noted that endoscopically mildly active disease [Mayo 1] was distributed over all different histological grades [37% - grade 0; 21% - grade 1; 28% - grade 2; and 14% - grade 3].

A study published in Journal of Crohn's and Colitis, Volume 12, Issue 10, October 2018, Pages 1151–1157, including 125 patients, with a median age of 37 years [range 16–81 years] at the time of endoscopy; 64/125 [51%] being males.

The correlation coefficient between the Ulcerative Colitis Endoscopic Index of Severity (UCEIS) and Nancy Index (NI) was $r = 0.84$ [95% CI 0.76–0.89, $p < 0.001$]. The correlation and confidence intervals between the UCEIS and Robart's Histopathology Index (RHI) were similar: $p < 0.001$. These correlations are classed as very strong.

The overall correlation between the UCEIS and RHI was numerically greater than between the UCEIS and NI, but the difference was not statistically significant.

The SES-CD at the worst affected area was scored and histological disease activity using Global Histologic Disease Activity Score (GHAS or D'Haens score) and the Naini and Cortina Score (NCS) was scored independently by two pathologists

blinded to the clinical information and endoscopic results. Spearman correlation between the SES-CD, GHAS and NCS were performed.

143 patients, 32 with SES-CD scores 0–2, 57 with 3–6, 37 with 7–15, and 17 with ≥ 16 . Correlation coefficients between SES-CD and GHAS were $r = 0.86$ (95% CI 0.80–0.91, $p < 0.001$) and between SES-CD and NCS $r = 0.85$ (95% CI 0.81–0.88, $p < 0.001$). There was a strong correlation between the two histological indices ($r = 0.70$, 95% CI 0.59–0.78, $p < 0.001$). Mucosal healing without histological disease activity was most correlated with SES-CD score 0 or 1.7 *

Our study explored 75 mucosal biopsy specimens, of diagnosed cases of Inflammatory Bowel Disease who were followed up in VPS Lakeshore Hospital and Research Center, Kochi, India, from April 2018 to June 2020, with endoscopic scores available.

A total of 65 patients of UC, with endoscopic Mayo score (scale: 0–3) and histological Gupta Index (scale: 0–3) were included.

There were 10 patients of Crohn's Disease included in the study. Endoscopic activity assessed by Simple Endoscopic Score (scale: < 2 to > 15) and Histopathological activity assessed by Global Histological Activity Score (scale: < 2 to > 8).

In this study, a strong correlation was obtained between the endoscopic and histological scores in all cases with Severe disease activity. Less severe cases showed a mild degree of disparity. Endoscopy downgraded the activity when compared to histological activity in less severe cases.

A statistically significant correlation was obtained between the scores in UC. The sensitivity (93%), specificity (100%), PPV (100%) and NPV (60.0%) reveals that the MAYO score is accurately matching with GUPTA index in 94% cases.

In CD, the sensitivity, specificity, PPV and NRV are 71%, 100%, 100% and 60.0%, respectively. The overall accuracy indicates that the SES score is accurately matching with GHAS score in 80% cases. However, correlation was not found to be statistically significant between SES Score and GHAS Score (p value 0.117) may be due to small sample size in CD.

Conclusion

A statistically significant correlation was observed between the scales of endoscopy and histology scores of IBD, with 100% correlation in cases with severe activity. However, several patients with less severe (inactive / mild / moderate) endoscopic findings exhibited higher degree of histological activity. In Ulcerative Colitis there was statistically significant correlation between Mayo Score and Gupta Index. Also, evaluation of accuracy revealed that the scores were matching in 94% of cases. Correlation between endoscopic and histological measures was however not statistically significant in Crohn Disease, sample size may limit the generalizability of the study. But the overall accuracy indicates, SES Score is accurately matching with GHAS score in majority (80%) of the cases.

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