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Faecal Myeloperoxidase as a Biomarker of Endoscopic Activity in Ulcerative Colitis

MOHAMED A. AWADEIN, M.D.*; AYA AKIL EZZAT, M.B.B.Ch.*; HESHAM S. ABDEL FATTAH, M.D.*; HANAN G. EL-BAZ, M.D.** and BASMA S. KHEREBA, M.D.***

The Department of Internal Medicine, Faculty of Medicine, Misr University for Science & Technology, Clinical Pathology & Immunology, Theodor Bilharz Institute (TBRI)** and Clinical Pathology & Immunology, MUST University****

Abstract

Background: Inflammatory bowel disease (IBD), including Crohn's disease (CD) and Ulcerative Colitis (UC), is a chronic gastrointestinal condition affecting over 6.8 million people globally. It is linked to relapse and remission, necessitating regular monitoring for disease activity.

Aim of Study: To evaluate Faecal Myeloperoxidase (fMPO) as a potential marker of activity in patients confirmed to have UC compared to C-reactive protein (CRP) and faecal Calprotectin (fCAL), which are the standard laboratory markers to initially diagnose activity in quiescent UC.

Patients and Methods: This cross-sectional study was conductedon 39 patients, divided into 3 groups with ulcerative colitis attending The Memorial Souad Kafafi University Hospital, Misr University for Science and Technology. Group 1: Newly diagnosed patients (15 patients). Group 2: Patients on No-biological therapy (11 patients). Group 3: Patients of biological therapy (13 patients).

Results: The study demonstrated a significant positive correlation between fCAL and Mayo score, but no correlation was found between Mayo score and fMPO. However, a significant positive relation was found between fCAL and disease activity groups, with a difference between mild and moderate disease activity groups. The area under curve for fCAL was excellent in distinguishing between moderate and mild disease groups, with a sensitivity of 85.7% and specificity of 87.5%.

Conclusion: The study demonstrated that fMPO is effective in stratifying UC patients' activity, while fCAL showed the best diagnostic ability. Combining markers could improve diagnostics.

Key Words: Faecal Myeloperoxidase – MPO – A Biomarker – Endoscopic Activity – Ulcerative Colitis.

Correspondence to: Dr. Mohamed A. Awadein,
The Department of Internal Medicine, Faculty of Medicine,
Misr University for Science & Technology

Introduction

ULCERATIVE colitis (UC) is an inflammatory bowel disease characterized by mucosal inflammation that involves the rectum and extends towards the colon. It is considered a lifelong disease characterized by recurrent remissions and unpredictable exacerbations, with a considerable number of patients unable to maintain a continuous state of remission **[1].**

The prevalence of UC is 5.50–24.30 cases per 100,000 population **[2].**

In western countries, the incidence of UC in North America is 8.8–23.14%, and the incidence in Eastern Europe is 1.7–57.9%. Recently, with the transformation of newly industrialized countries in Asia, Africa and South America to modern society, the global incidence of UC is increasing, and it has become a worldwide disease, with prevalence of 0.68–2.17% in Southeast Asia and 3.29–19.02% in Africa **[3].**

Pathophysiology of UC is not completely understood, where multiple factors contribute to it. Gut microbiota shows declined diversity and a change in metabolic profile, which is indicated by a decrease in short-chain fatty acids. The mucosal layer in UC is characterized by a decreased synthesis of the colon mucin, mucin 2. These changes lead to a barrier breach, facilitating the approach of the microbiota to the epithelial barrier. Disruption of intestinal epithelium occurs due to apoptotic foci and an altered expression of tight junction proteins, permitting more microbiota to cross the barrier, activating macrophages and antigen-presenting cells (APCs) and resulting in the expression of chemokines that finally attract neutrophils **[4].**

In most cases the first symptoms are bloody stools. Symptoms may also include urgency to defecate, excessive mucus excretion, increased frequency of bowel movements, abdominal discomfort (pain, cramping), fatigue, dehydration, and malnutrition. Axial or peripheral arthropathy, scleritis, and erythema nodosum are considered the most common extra intestinal manifestations **[5].**

Diagnosis of UC is a combination of clinical and lab investigations including various biomarkers, such as fCAL, faecal lactoferrin, or CRP as well as bowel ultra-sonography and colonoscopy. A downside of colonoscopy is its invasiveness for patients, and is needed in the form of serial assessments, expensive, and not without risks to the patient **[6].**

During the continuous progression of UC, the over activation of neutrophils is the chief cause behind continued aggravation of the inflammatory response. In the colonic mucosa specimens of UC patients, there is a large number of infiltrations of neutrophils. After the activation of neutrophils at the site of inflammation, they can release a variety of substances related to chronic inflammation. These substances not only aggravate inflammation but also promote the continuous progression of inflammation **[7].**

MPO`s specificity, simplicity, non-invasiveness, and likely inexpensive nature, may serve as an important tool for evaluating patients with UC. But further large population studies need to be done to validate MPO's diagnostic and prognostic value **[8].**

In the latest largest cohort study of patients with IBD investigating fMPO to date, it was shown that fMPO protein is an effective biomarker of disease activity when compared with ileocolonoscopy, and that it has similar precision in predicting moderate-to-severely active UC as fCAL, and predicts a more complicated course **[6].**

The aim of This study was to evaluate fMPO as a potential marker to detect endoscopic activity in patients confirmed to have UC compared to CRP and fCAL, which are the standard laboratory markers to initially diagnose activity in quiescent UC.

Sensitivity and specificity of fMPO vs CRP and fCAL will be performed in all stages of UC.

Patients and Methods

Patients:

This cross-sectional analytic study was conducted on 39 UC patients in activity at the Memorial Souad Kafafi University Hospital, Misr University for Science and Technology during the period from May 2023 to February 2024. The duration of the study was 10 months.

Inclusion criteria:

Age: Between 18 and 70 years old, both sexes and patients diagnosed with UC.

Method:

All included patients were subjected to the following:

First visit: Complete history taking: Personal history: Age, sex, smoking status, diabetes mellitus, hypertension, dyslipidaemia, family history of UC, chronic kidney disease, peripheral vascular disease and cerebrovascular disease. Also, patients were asked about active or previous infection with SARS-CoV-2(COVID-19) virus.

Complaint & its duration.

Present history: Analysis of the current patient complaint.

Past Medical history.

Past Surgical history: History of previous operations.

Drug history and sensitivity.

Clinical assessment: Detailed symptomatology for each case was taken to evaluate the severity of the case according to Mayo score / Disease Activity Index (DAI) for Ulcerative Colitis. Laboratory Investigations: CRP, PT, PTT, INR and Stool analysis, fecal Calprotectin and Fecal Myeloperoxidase.

Kits used in the study:

(IDK MPO ELISA) For the in vitro determination of myeloperoxidase (MPO) in stool and urine, immunodiagnostic AG, steuerwald-Allee 8a, 64625 Bensheim, Germany.

Bowel preparation for colonoscopy:

Patients underwent bowel preparation 1 day prior to a colonoscopy and biopsy. The patient was kept on oral clear fluids then start fasting 12 hours prior to the procedure. In addition to Laxative sachets (Movi prep sachets) added to 1.5 liters of water to be drunk over 3 hours twice, one day prior to the colonoscopy. For patients that cannot tolerate a 24-hours cleanse, they were instructed to proceed with a clear liquid diet for up to three days before the procedure with a gentle laxative regimen to help facilitate a clean colon.

Second visit: Patients underwent colonoscopy and biopsies were taken.

Third visit: Histopathology as per Montreal Classification.

Statistical analysis:

Data analysis was performed by SPSS software, version 25 (SPSS Inc., PASW statistics for windows version 25. Chicago: SPSS Inc.). Qualitative data

were described using number and percent. Quantitative data were described using median (interquartile range) for non-normally distributed data and mean ± Standard deviation for normally distributed data after testing normality using Kolmogrov-Smirnov test. Significance of the obtained results was judged at the (≤0.05) level.

Monte Carlo test was used to compare qualitative data between groups as appropriate.

One Way ANOVA test, Kruskal Wallis test were used to compare more than 2 independent groups with Post Hoc Tukey test to detect pair-wise comparison.

The Spearman's rank-order correlation is used to determine the strength and direction of a linear relationship between two non-normally distributed continuous variables and/or ordinal variables.

Receiver operating characteristics curve (ROC curve) was used to calculate validity (sensitivity & specificity) of continuous variables with calculation of best cut off point. Predictive values and accuracy are assessed using cross tabulation.

Results

Table (1) and Fig. (1) illustrate statistically significant difference between studied groups as regard fCAL level (p=0.04). Median fCAL was higher among group 1 followed by group 3 and group 2 (881.2, 340 & 300, respectively). Pairwise comparison shows statistically significant difference between group 1 &2 (p=0.014).

Table (1): Comparison of fCAL between Studied Groups.

	Group 1 N=15	Group 2 N=11	Group 3 N=13	Test of significance	Within group significance
fCAL	881.2 (350-2200)	300 (94.70-400)	340 (221-1694.5)	KW=6.24	$p1$=0.014* $p2$=0.258 $p3$=0.164
Mean ± SD	1087.55±810.37	361.34±343.51	811.69±830.54	p=0.04*	

KW: Kruskal Wallis test.
*Statistically significant.
p1: Difference between groups 1&2.
p2: Difference between groups 1&3.
p3: Difference between groups 2&3.
Data described as median (interquartile range).

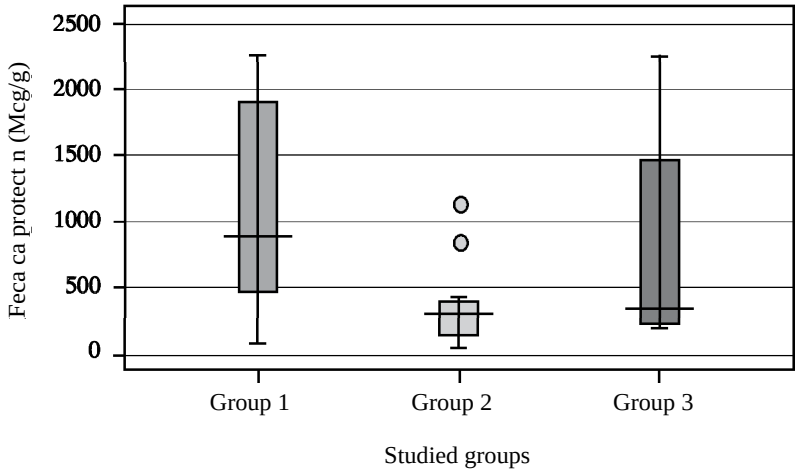

Fig. (1): Box & Whisker plot showing fCAL among studied groups.

Table (2) and Fig. (2) show no statistically significant difference between studied groups as regard quantitative and qualitative fMPO. Median quantitative fMPO was higher among group 2 followed by group 3 and the least for group1 (4450, 4400 and 2150, respectively). Qualitative assessment of MPO demonstrates that positive expression is as following 53.3%, 63.6% & 61.5%, for groups 1, 2 & 3, respectively.

Table (2): Comparison of fMPO between Studied Groups.

MPO in stool	Group 1 N=15	Group 2 N=11	Group 3 N=13	Test of significance
Quantitative (ng/g)	2150 (650-12050)	4450 (750-11000)	4400 (1275-13025)	KW=0.607 *p*=0.738
Mean ± SD	6443.33±7027.16	7236.36±8913.72	7788.46±8686.99	
Qualitative:				
–ve	7 (46.7)	4 (36.4)	5 (38.5)	MC=0.331
+ve	8 (53.3)	7 (63.6)	8 (61.5)	*p*=0.847

KW: Kruskal Wallis test. *p*1: Difference between groups 1&2. Data described as median (interquartile range).
MC: Monte Carlo test. *p*2: Difference between groups 1&3. Number (percentage).
*Statistically significant. *p*3: Difference between groups 2&3.

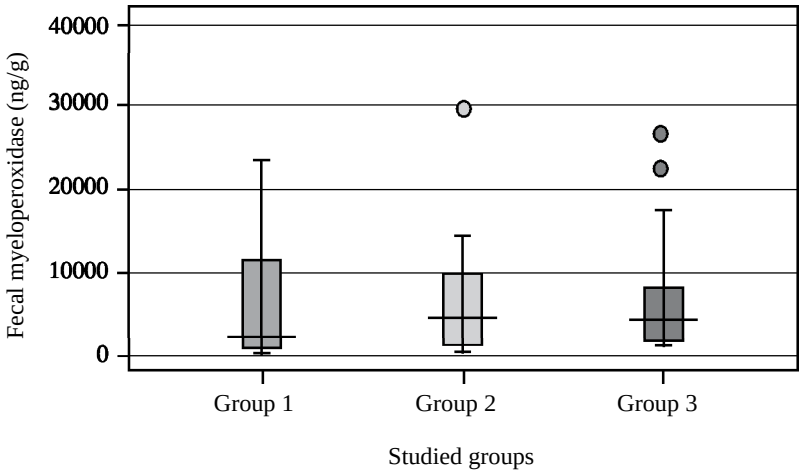

Fig. (2): Box & Whisker plot "fMPO among studied groups".

Table (3) and Figs. (3,4) illustrate that area under curve for fMPO (ng/g) was poor in differentiating between moderate versus mild disease with the best detected cut off point from the curve is ≥1250 yielding sensitivity 66.7% and specificity 37.5%.

Area under curve for fCAL (mcg/g) was excellent in differentiating between moderate versus mild disease with the best detected cut off point from the curve is ≥275 yielding sensitivity 85.7% and specificity 87.5%.

Area under curve for CRP was good in differentiating between moderate versus mild disease with the best detected cut off point from the curve is ≤17.5 yielding sensitivity 71.4% and specificity 62.5%.

Table (3): Validity of fMPO, fCAL, CRP in differentiating moderate versus mild disease activity among studied groups.

	AUC (95% CI)	*p*-value	Cut off point	Sensitivity %	Specificity %
fMPO (ng/g)	0.542 (0.309-0.774)	0.733	≥1250	66.7	37.5
fCAL (mcg/g)	0.902 (0.792-1.0)	0.001*	≥275	85.7	87.5
CRP (mg/l)	0.726 (0.512-0.941)	0.064	≤17.5	71.4	62.5

AUC: Area Under Curve.

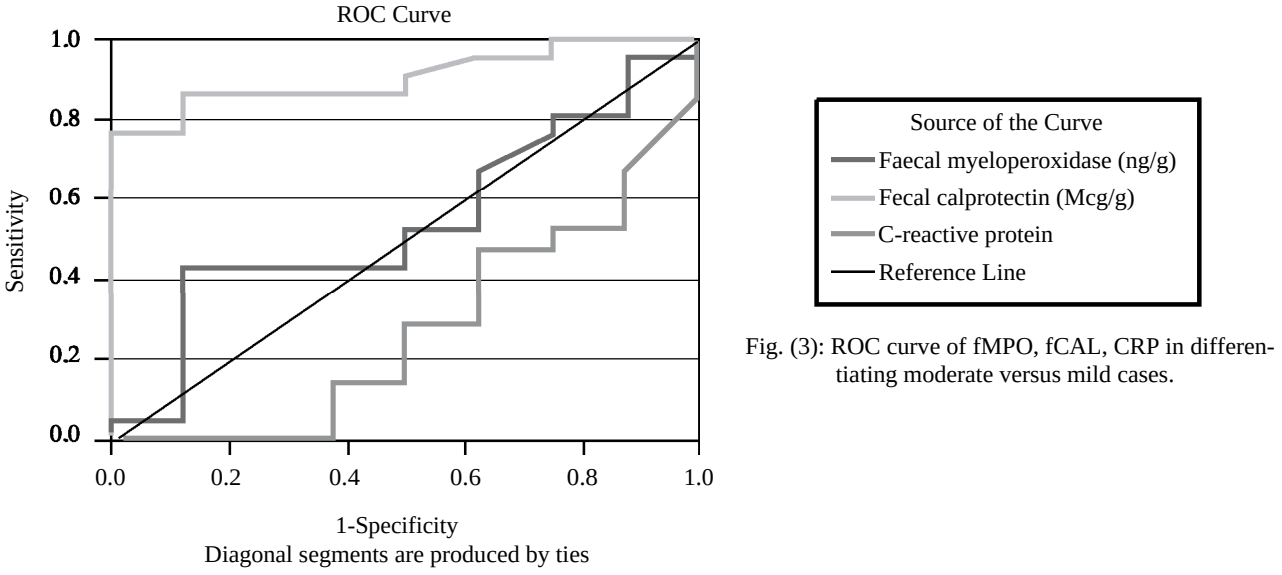

Fig. (3): ROC curve of fMPO, fCAL, CRP in differentiating moderate versus mild cases.

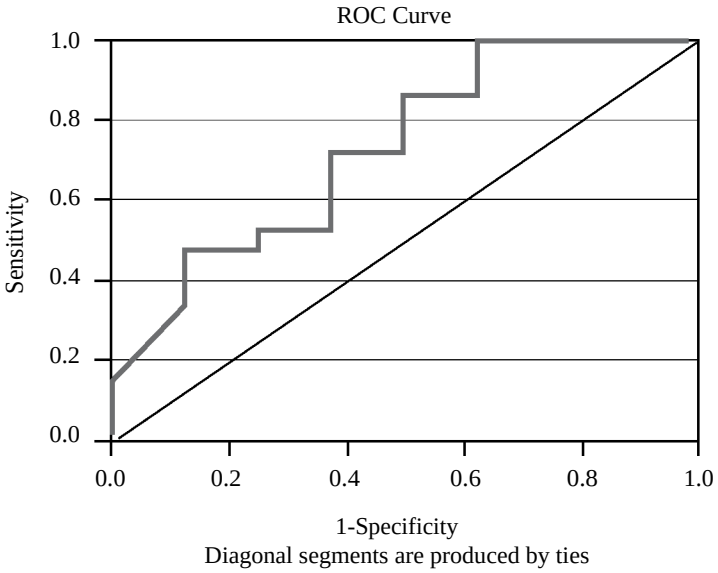

Fig. (4): ROC curve of CRP in differentiating moderate versus mild cases.

Table (4) and Figs. (5,6) illustrate that area under curve for fMPO (ng/g) was poor in differentiating between severe versus mild disease with the best detected cut off point from the curve is ≥1650 yielding sensitivity 70% and specificity 37.5%.

Area under curve for fCAL (mcg/g) was excellent in differentiating between severe versus mild disease with the best detected cut off point from the curve is ≥254.5 yielding sensitivity 90% and specificity 87.5%.

Area under curve for CRP was good in differentiating between severe versus mild disease with the best detected cut off point from the curve is ≤25.5 yielding sensitivity 71.4% and specificity 62.5%.

Table (4): Validity of fMPO, fCAL, CRP in differentiating mild & severe disease activity.

	AUC (95% CI)	*p*-value	Cut off point	Sensitivity %	Specificity %
fMPO (ng/g)	0.575 (0.299-0.851)	0.594	≥1650	70	37.5
fCAL (mcg/g)	0.888 (0.700-1.0)	0.006*	≥254.5	90.0	87.5
CRP (mg/l)	0.575 (0.296-0.854)	0.143	≤25.5	71.4	62.5

AUC: Area Under Curve.

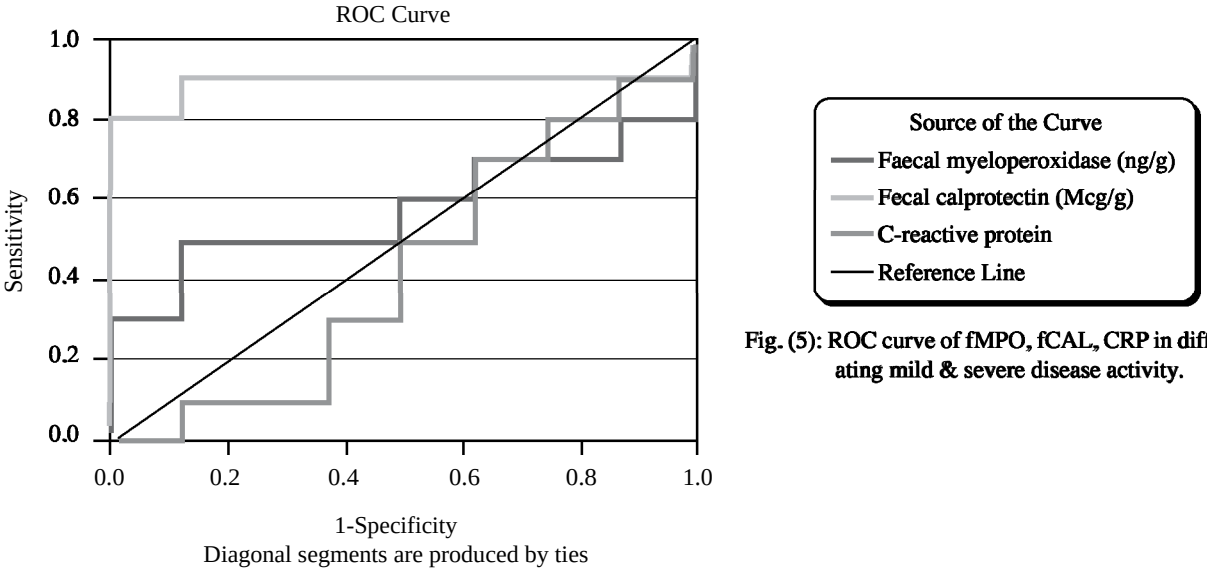

Fig. (5): ROC curve of fMPO, fCAL, CRP in differentiating mild & severe disease activity.

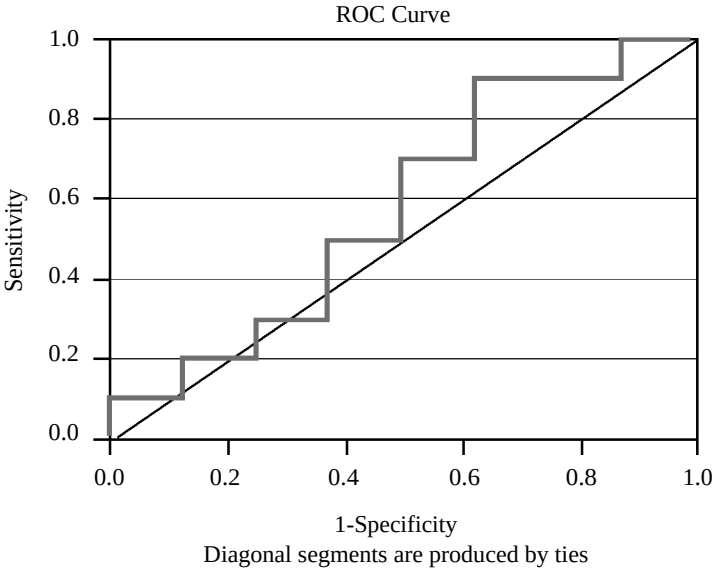

Fig. (6): ROC curve of CRP in differentiating mild & severe disease activity.

Table (5) and Fig. (7) illustrate that area under curve for fMPO (ng/g) was poor in differentiating between severe versus moderate disease with the best detected cut off point from the curve is ≥2025 yielding sensitivity 70% and specificity 47.6%.

Area under curve for fCAL (mcg/g) was excellent in differentiating between severe versus moderate disease with the best detected cut off point from the curve is ≥916.6 yielding sensitivity 80% and specificity 81%.

Area under curve for CRP was fair in differentiating between severe versus moderate disease with the best detected cut off point from the curve is ≥8.5 yielding sensitivity 70% and specificity 52.4%.

Table (5): Validity of fMPO, fCal, CRP in differentiating moderate & severe disease activity.

	AUC (95% CI)	*p*-value	Cut off point	Sensitivity %	Specificity %
fMPO (ng/g)	0.552 (0.305-0.799)	0.642	≥2025	70	47.6
fCAL (mcg/g)	0.717 (0.488-0.945)	0.06	≥916.6	80.0	81.0
CRP (mg/l)	0.660 (0.454-0.865)	0.157	≥8.5	70.0	52.4

AUC: Area Under Curve.

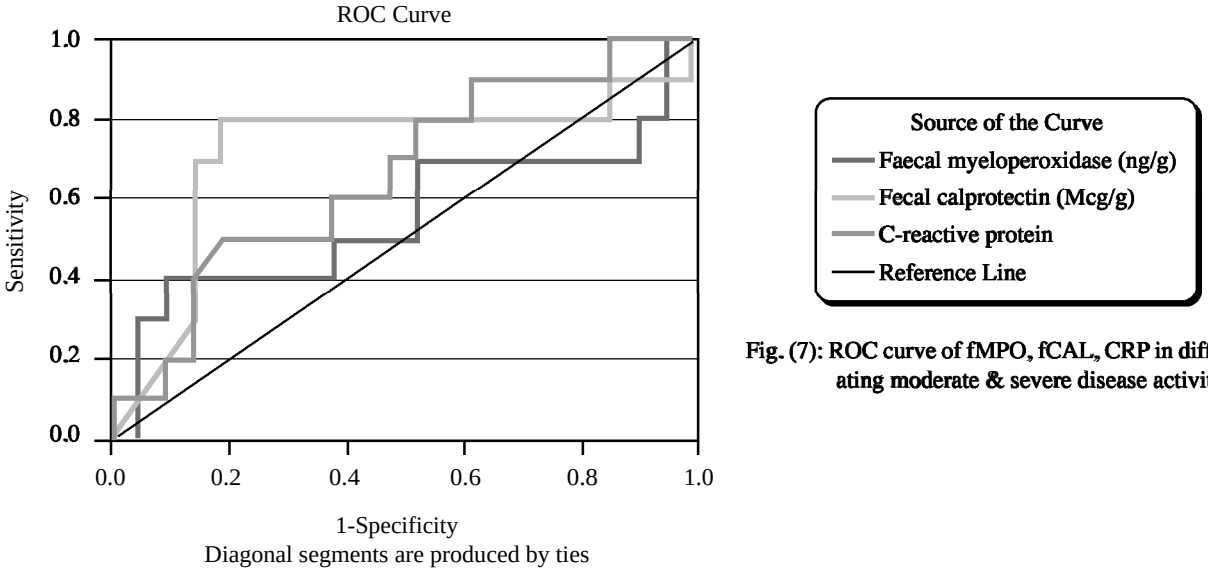

Fig. (7): ROC curve of fMPO, fCAL, CRP in differentiating moderate & severe disease activity.

Discussion

Ulcerative colitis is an inflammatory bowel disease characterized by mucosal inflammation that involves the rectum and extends towards the colon. It is considered a lifelong disease characterized by recurrent remissions and unpredictable exacerbations, with a considerable number of patients unable to maintain a continuous state of remission Kim et al. *[1]*.

Therefore, our aim was to evaluate fMPO as a potential marker to detect activity in patients confirmed to have UC compared to CRP and fCAL, which are the standard laboratory markers to initially diagnose activity in quiescent UC.

This cross-sectional study was conductedon 39 patients with UC attending Memorial Souad Kafafi University Hospital, Misr University for Science and Technology, during the period from May 2023 to February 2024. The duration of the study was 10 months.

According to treatment modality, patients were allocated into 3 groups, group 1 included 15 newly diagnosed cases,group 2 included 11 cases on non-biological treatment and group 3 included 13 cases on biological treatment.

The current study showed no significant difference between the groups of newly diagnosed cases, on non-biological treatment and on biological treatment, as regard the presence of pus cells or RBCS in stool.

Afify et al. *[9]* showed that in patients with UC and CD, after 1 year of treatment by either infliximab or adalimumab, a significant drop in number of RBC'S and pus cell in stool and fCAL concentration was found, while there was a significant increase in Hb concentration.

Regarding CBC, the current study showed no statistically significant differences between studied groups as regard WBC count, hemoglobin level, platelet count, lymphocytes, neutrophils count, eosinophils, monocytes, CRP, ESR, PT, PTT and INR.

Afify et al. *[9]* showed that in patients with UC and CD, after 1 year of treatment by either infliximab or adalimumab, a significant drop in platelets count, and ESR, CRP, was found, while there was a significant increase in Hb concentration.

Pairwise comparison of our studied groups demonstrated that the only statistically significant difference between groups with mild and severe activities as regard eosinophils.

The lack of significant association between disease activity and CBC, particularly inflammatory markers, in the current study may be due to the limited sample size, and the response of non-biological treatment in group 2 and biological treatment in group 3.

However, Elkholy et al. *[10]* revealed that in patients with UC, anemia, thrombocytosis, leukocytosis and CRP were significantly higher in active patients especially moderate and severe grade than inactive.

This is consistent with Elnagdy et al. *[11]* who also found that active UC patients showed significantly greater WBC, absolute neutrophilic count, absolute monocytic count, and elevated levels of CRP, and ESR than inactive UC patients and controls.

Furthermore, Zhang et al. *[12]* showed that severe UC patients had lower hemoglobin, albumin, and total protein levels than mild-to-moderate UC patients.

The current study showed a statistically significant difference between studied groups as regard fCAL level. Median fCAL was higher among Mayo newly diagnosed group followed by biological treatment group and non- biological treatment group.

Pairwise comparison showed statistically significant difference between newly diagnosed and non-biological treatment groups.

In this study the decrease in fCAL level in non-biological treatment group may be due to the higher response to non-biological treatment compared to biological treatment.

The results showed higher pus cells or RBCS in stool in newly diagnosed cases, indicating higher disease activity.

The lower pus cells or RBCS in stool in patients on treatments supporting the positive effect of both biologic and non-biologic treatments.

fCAL is an effective biomarker of IBD activity and has also previously been shown to be a predictor of disease relapse and response to treatment Heida et al. *[13]*; Kostas et al. *[14]*; Swaminathan et al. *[6]*.

As literature showed that there was significant association between UC disease activity and fCAL level as it was increased with disease activity Turner et al. *[15]*; Swaminathan et al. *[6]*; Mańkowska-Wierzbicka et al. *[16]*; Elkholy et al. *[10]*.

In this study, the comparison of Mayo score between the groups on different treatment modalities, showed that there was no statistically significant difference between studied groups as regard median Mayo score.

Disease severity by Mayo score in our study was higher among newly diagnosed group, followed by non-biological treatment group and biological treatment group.

Severe disease was detected among 33.3%, 30.8% and 9.1% of newly diagnosed group, biological treatment group and non-biological treatment group, respectively. These results supported the higher response to non-biological treatment compared to biological treatment without statistical significance. This result needs to be confirmed with large randomized studies.

The current study also showed that no statistically significant difference between studied groups as regard quantitative and qualitative fMPO. Median quantitative fMPO was higher among non-biological treatment group followed by biological treatment group and the least for newly diagnosed group.

Qualitative assessment of MPO demonstrates that positive expression is as following 53.3%, 63.6% & 61.5%, for newly diagnosed, non-biological treatment and biological treatment groups. These results need to be confirmed with larger randomized studies.

fMPO was significantly correlated with disease activity in UC Swaminathan et al. *[6]*, Swaminathan et al. *[17]*.

Swaminathan et al. *[17]* stated that the neutrophil-derived fecal biomarkers studied in this cohort were fCal and fMPO. There were no significant differences in the diagnostic precision of either marker in predicting a complicated IBD course at 24 months of follow-up.

A previous study highlighted that fMPO is equivalent to fCal at detecting moderate to severe endoscopic disease activity in IBD, and the majority of fMPO detected is physiologically active.

These results suggest the potential for fMPO to be a sensitive marker to prognosticate the longitudinal disease course; however, these findings require validation in external cohorts Swaminathan et al. *[17]*.

The current study showed that there was no statistically significant difference between the groups on different treatment modalities as regard Montreal classification.

However, a study stated that Montreal Classification for IBD classifies severity of CD and UC Sehgal et al. *[18]*.

The current study showed that there was statistically significant positive correlation between fCAL and Mayo score among biologic treatment group.

No statistically significant correlation was detected between Mayo score and fMPO neither total nor within each group.

The lack of significance in other groups was due to the limited sample size, and difference in treatment response.

In agreement with the current study Mańkowska-Wierzbicka et al. *[16]* assessed the usefulness of selected laboratory markers in UC patients. Whereas, fCAL was found to be correlated closely with the Mayo endoscopic score, and might be used to evaluate the severity of UC in the clinical setting.As well, Swaminathan et al. *[6]* found significant association between UC disease activity and fCAL level as it was increased with disease activity.

Moreover, Turner et al. *[15]* revealed thatfCAL was used as biomarker of disease activity for all patients. As well, Elkholy et al. *[10]* showed that fCAL was significantly lower in remission than activity.

The current study found no statistically significant correlation between Montreal score and fCAL and also no statistically significant correlation was detected between Montreal score and Mayo score neither total nor within each group.

In agreement with the current study Spekhorst et al., *[19]* revealed that Montreal score have no correlation with Mayo score in patients with UC.

However, in contrast to the current study Mahdipour et al. *[20]* showed that fCAL was significantly different in terms of disease severity based on both Mayo score and Montreal classification in UC. Also, Zittan et al. *[21]* showed that in UC, fCAL was correlated with the Mayo clinical score and was highly correlated with the total Mayo score.

The current study demonstrated no statistically significant correlation between fMPO and the following: CRP, disease activity, fCAL and RBCS in stool neither total nor within each group.

In agreement with the current study Masoodi et al., *[22]* showed that there was no significant association between fMPO and activity of UC.

However, in contrast to the current study, Swaminathan et al. *[6]* and Swaminathan et al. *[17]* revealed that fMPO was significantly correlated with disease activity in UC.

While in disagreement with the current study Nowak et al. *[23]* reported that there was a significant correlation of MPO levels with disease activity and fCAL.

Our study showed that there was no statistically significant relation between either disease activity and age, or disease activity and sex.

In accordance with our results, Swaminathan et al. *[6]* to investigate whether fMPO correlated with endoscopic disease activity in patients with IBD. Additional aims included assessment of the performance of fMPO in comparison with CRP and fCAL in predicting endoscopic disease activity in IBD, and the utility of fMPO in predicting a more complicated IBD course over 1 year. They found that the associations between faecal biomarkers and endoscopic disease activity were similar between males and females. The correlation between fCAL and fMPO was also similar between males and females.

Moreover, Monstad et al. *[24]* who aimed to evaluate the course and prognosis of UC during the first 20 years after diagnosis, and to identify early prognostic risk factors. They reported that there were no statistically significant differences in patients' perception of their disease activity with regard to gender and age.

Regarding the relation between disease activity and fMPO, the current study showed that there was no statistically significant relation between disease activity and quantitative and qualitative fMPO.

In agreement with the current study Masoodi et al. *[22]* showed that there was no significant association between fMPO and endoscopic extent and histological scores of activities and chronicity.

In contrast to the current study, Swaminathan et al., *[6]* and Swaminathan et al., *[17]* found significant association between fMPO and disease activity in UC.

Also, Saiki et al. *[25]* showed that fMPO levels in active UC patients increased significantly and correlated with laboratory parameters and endoscopic grade of inflammation. A paired analysis showed a decrease in MPO levels after the resolution of disease exacerbation.

These results suggest that fMPO is a simple, non-invasive and relevant marker of disease activity. fMPO levels can detect intestinal healing after treatment in a non-invasive manner. This can be reassuring to the treating physician and high levels can predict relapse in a given patient.

The current study showed that there was a statistically significant relation between Montreal score and disease activity. Pairwise comparison between mild and severe activity shows statistically significant difference and between moderate and severe.

In concordance with the current study Sehgal et al., *[18]* showed that there was a significant association between Montreal score and disease activity in UC. However, Spekhorst et al. *[19]* revealed that Montreal score have no correlation with Mayo score in patients with UC.

The current study showed that there was a statistically significant relation between fCAL and disease activity. Pairwise comparison between mild and moderate disease activity shows statistically significant difference.

In agreement with the current study Mańkowska-Wierzbicka et al. *[15]* showed that fCAL was found to be correlated closely with the Mayo endoscopic score, and might be used to evaluate the severity of UC in the clinical setting.

As well, Swaminathan et al., *[6]* found significant association between UC disease activity and fCAL level as it was increased with disease activity.

Also, Turner et al., *[16]* revealed that fCAL was used as biomarkers of disease activity for all patients. As well, Elkholy et al., *[10]* showed that fCAL was significantly lower in remission than activity.

Regarding the validity of fMPO in differentiating different disease activity, the current study

showed that the area under curve for fMPO (ng/g) was poor in differentiating between moderate versus mild disease with the best detected cut off point from the curve is >-1250 yielding sensitivity 66.7% and specificity 37.5%.

Similarly, the area under curve for fMPO (ng/g) was poor in differentiating between severe versus mild disease with the best detected cut off point from the curve is >-1650 yielding sensitivity 70% and specificity 37.5%.

As well, area under curve for fMPO (ng/g) was poor in differentiating between severe versus moderate disease with the best detected cut off point from the curve is >-2025 yielding sensitivity 70% and specificity 47.6%.

In agreement with the current study Swaminathan et al. *[6]* showed that fMPO can significantly differentiate UC patients with different disease activities UC. fMPO has the ability in predicting endoscopic activity at cutoff point of4.64 mcg/g and AUC of 0.85. Predicting moderate-severe endoscopic activity at cutoff point of4.64 mcg/g and AUC of 0.85.

Also, Masoodi et al. *[21]* showed that fMPO is an effective biomarker for assessing disease activity and response to therapy in patients with UC.

As well, Hansberry et al. *[8]* in a meta-analysis established the utility of fMPO as a biomarker for IBD, there was significantly higher levels of MPO in patients with active IBD compared to patients without IBD as well as patients with inactive IBD. MPO is also expressed in higher concentrations in patients with more severe forms of IBD.

Regarding the validity of fCAL in differentiating different disease activity, the current study showed that the area under curve for fCAL (mcg/g) was excellent in differentiating between moderate versus mild disease with the best detected cut off point from the curve is >-275 yielding sensitivity 85.7% and specificity 87.5%.

Moreover, area under curve for fCAL (mcg/g) was excellent in differentiating between severe versus mild disease with the best detected cut off point from the curve is >-254.5 yielding sensitivity 90% and specificity 87.5%.

Area under curve for fCAL (mcg/g) was excellent in differentiating between severe versus moderate disease with the best detected cut off point from the curve is >-916.6 yielding sensitivity 80% and specificity 81%.

Moreover, at cut off value >243 mcg/mg fCAL it could distinguish severe activity from mild to moderate activity, the sensitivity, specificity, PPV (Positive predictive value), NPV (Negative predictive value) and accuracy were (60.87, 63.64, 63.6, 60.9 and 58.1% respectively).

In line with the current study, Elkholy et al. *[10]* showed that fCAL; at cut off value >100µg/mg it could distinguish between activity and remission with sensitivity, specificity, PPV, NPV and accuracy were (88.89, 86.67, 87.0, 88.6 and 93.9% respectively).

Swaminathan et al. *[6]* showed that fCAL can effectively differentiate UC patients with different disease activities UC. fCAL has the ability in predicting endoscopic activity at cut off point of 137.50 mcg/g and AUC of 0.89. Predicting moderate-severe endoscopic activity at cutoff point of 270.00 mcg/g and AUC of 0.94.

As well, Walsh et al. *[26]* found strong correlation between fCAL and endoscopic or histological activity. Median fCAL thresholds for remission using endoscopic, histological, or combined criteria were 71 mcg/g [range 8–624], 91 mcg/g [range 8–858], and 67 mcg/g [range 8–479], respectively. fCAL threshold above which active disease was confirmed was 187 mcg/g for Ulcerative Colitis Endoscopic Index of Severity (area under the curve [AUC] 0.915), 72 mcg/g for Nancy [AUC 0.824], and 187 mcg/g for combined endoscopic and histological criteria [AUC 0.936].

Moreover, Ahmed et al., *[27]* showed thatserial measurements of fCAL was recommended for patients with UC to assess disease activity, induction and maintenance of remission, response to treatment, and recurrence of activity. fCAL cut off 47.5, sensitivity 84.6%, and specificity 54% in prediction of moderate to severe activity of UC.

Regarding the validity of CRP level in differentiating different disease activity, the current study showed that the area under curve for CRP was good in differentiating between moderate versus mild disease with the best detected cut off point from the curve is ≥17.5 yielding sensitivity 71.4% and specificity 62.5%.

Area under curve for CRP was poor in differentiating between severe versus mild disease with the best detected cut off point from the curve is ≥25.5 yielding sensitivity 71.4% and specificity 62.5%. While area under curve for CRP was fair in differentiating between severe versus moderate disease with the best detected cut off point from the curve is >-8.5 yielding sensitivity 70% and specificity 52.4%.

In line with the current study Swaminathan et al. *[6]* showed that CRP can effectively differentiate UC patients with different disease activities UC. CRP level has the ability in predicting endoscopic activity at cut off point of 3.5mg/L and AUC of 0.73. Predicting moderate-severe endoscopic activity at cutoff point of 10.5mg/L and AUC of 0.81.

Moreover, Ahmed et al. *[27]* showed thatserial measurements of CRP was recommended for pa-

tients with UC to assess disease activity, induction and maintenance of remission, response to treatment, and recurrence of activity. CRP cut off 7, sensitivity 84%, and specificity of 50% in prediction of moderate to severe activity of UC.

The current study demonstrated that only fCAL had significant ability in discriminating UC patients with different disease activities, CRP has fair ability and fMPO has fair ability in differentiating UC patients with different disease activities.

In agreement with the current study, Swaminathan et al. **[6]** showed that fCAL was found to be the best predictor for moderate-to-severely active UC followed by fMPO then CRP. fMPO was effective in predicting moderate-to-severely active UC (AUROC 0.92).

While Ahmed et al. **[27]** established the superiority of fCAL over CRP in prediction of moderate to severe activity of UC.

Conclusion:

The current study demonstrated that Faecal Myeloperoxidase exhibited fair ability in discriminating between patients with UC with different severities.

Faecal Calprotectin showed the best diagnostic ability compared to fMPO and CRP. Combined markers were suggested to enhance the diagnostic ability.

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الميلوبيروكسيديز البرازى كمؤشر حيوى للنشاط بالمنظار فى التهاب القولون التقرحى

مرض التهاب الأمعاء (IBD)، بما فى ذلك مرض كرون (CD) والتهاب القولون التقرحى (UC)، هو حالة مزمنة فى الجهاز الهضمى تؤثر على أكثر من ٦,٨ مليون شخص على مستوى العالم. وهو مرتبط بالانتكاس والشفاء، مما يستلزم مراقبة منتظمة لنشاط المرض.

الهدف من هذة الدراسة: هو تقييم الميلوبيروكسيديز البرازى (fMPO) كمؤشر محتمل للنشاط فى المرضى الذين تم تأكيد إصابتهم بالتهاب القولون التقرحى مقارنة بالبروتين التفاعلى سى (CRP) وكالبروتكتين البرازى (fCAL)، وهما المؤشرات المعملية القياسية لتشخيص النشاط فى التهاب القولون التقرحى الخامل من البدايه.

أجريت هذه الدراسة المقطعية على تسعة وثلاثون مريضًا مقسمين الى ثلاث مجموعات مصابة بالتهاب القولون التقرحى فى مستشفى سعاد كفافى الجامعى، جامعة مصر للعلوم والتكنولوجيا.

المجموعة الاولى: المرضى الذين تم تشخيصهم حديثًا (خمسة عشر مريضًا)، المجموعة الثانية: المرضى الذين لا يتلقون علاجًا بيولوجيًا (احدى عشر مريضاً)، المجموعة الثالثة: مرضى العلاج البيولوجى (ثلاث عشر مريضًا).

أظهرت الدراسة وجود ارتباط إيجابي كبير بين fCAL و تصنيف مايو، ولكن لم يتم العثور على أي ارتباط بين تصنيف مايو وfMPO. ومع ذلك، تم العثور على علاقة إيجابية كبيرة بين fCAL ومجموعات نشاط المرض، مع وجود فرق بين مجموعات نشاط المرض الخفيف والمتوسط. كانت المساحة تحت المنحنى لـ fCAL ممتازة فى التمييز بين مجموعات المرض المعتدل والخفيف، بحساسية ٨٥,٧٪ وخصوصية ٨٧,٥٪، أظهرت الدراسة أن fMPO فعال فى تصنيف نشاط مرضى التهاب القولون التقرحى، بينما أظهر fCAL أفضل قدرة تشخيصية. يمكن أن يؤدى الجمع بين المؤشرين إلى تحسين التشخيص.