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A Study of Endoscopic Assessment of Disease Severity using Narrow Band Imaging in Patients of Ulcerative Colitis

Authors
Dr Rajendra Uikey[1], Dr Naresh Kumar Patel[2], Dr Umesh Kumar Chandra[3], Dr Atul Shende[4]

[1,2,3]MD Medicine, Senior Resident, Department of Medicine, MGM Medical College, Indore, MP, India.
[4]MD, DM Gastroenterology and Hepatology, Associate Professor, Department of Medicine, MGM Medical College, Indore, MP, India.
*Corresponding Author
Dr Atul Shende
MD, DM Gastroenterology and Hepatology, Associate Professor, Department of Medicine, MGM Medical College, Indore, MP, India, 452001

Abstract
Background: *For diagnosis of Ulcerative Colitis (UC), proper clinical history, laboratory test, and colonoscopy [both conventional and Narrow Band Imaging (NBI)] are needed. Present study aims to find out disease severity of UC patients with the help of NBI study and its comparison with white light colonoscopy.*
Methods: *This observational study was conducted in 50 consecutive UC patients, who were attending Department of Medicine, MY Hospital, Indore, India. Study was approved by Ethical Committee.*
Results: *Out of 50 patients of UC, according to Baron Score, mild, moderate, and severe disease was found in 8(16%), 29(58%), and 13(26%) patients respectively. As per UCDAI Score out of 50 patients, mild, moderate, and severe disease was found in 17(34%), 25(50%) and 8(16%) patients respectively. Out of these patients of UC, mild, moderate, and severe disease was found in 5(10%), 18(36%), and 27(54%) patients respectively. In our study, we found a statistically significant association of disease activity when compared white light colonoscopy Baron Score with NBI study (p value- 0.000001), and UCDAI with NBI study (P value- 0.000001).*
Conclusions: *We recommended that all patients of UC should be subjected to NBI study for baseline assessment of disease severity. NBI can be a useful armamentarium in surveillance of complications of ulcerative colitis.*
Keywords: *Baron score, Colonoscopy, Narrow Band Imaging, Ulcerative colitis.*

Introduction

Ulcerative Colitis (UC) is a chronic inflammatory disease of the Gastrointestinal tract that usually involves the rectum and extends proximally to involve whole or part of the colon. About 40-50% of patients have disease limited to the rectum and recto-sigmoid, 30 - 40% has disease extending beyond the sigmoid but not involving the entire colon, and 20% has pancolitis.

Patients with UC can present with numbers of symptoms and amongst them most common are diarrhea, bleeding per rectum, tenesmus, passage of mucus, urgency, and pain over abdomen. Sometimes patients present in more serious condition and have complaints of fever and weight loss. The symptoms of ulcerative colitis differ according to the extent of disease[1]. Diagnosis of ulcerative colitis need proper clinical history, laboratory, colonoscopy both conventional and Narrow Band Imaging (NBI).

NBI is a newer optical technology that can clearly visualize the micro vascular structure of the organ surfaces[2,3]. Spectral filters of the NBI highlights the characteristics of the mucosa and vascular patterns of the colon with better definition when compared to the standard endoscopic examination. Two systems are currently available to use endoscopy with NBI. The sequential magnifying system with high resolution endoscope which enables optical magnification up to 80 times and the charged coupled device system of the high definition device ,which has digital zoom with magnifying potential from 1.2 to 1.5 times. This image magnification associated to the NBI improves diagnostic accuracy resulting from the detailed assessment of the pattern of capillary mucosa vessels. NBI improve the visibility of blood vessels and mucosal structures, it exploits certain properties of light, consists of a numbers of wavelengths. Only a small section of the whole light spectrum is visible, once an object is illuminated some of the colors are absorbed, and others are reflected. White light usually comprises the full spectrum of visible light, so when using white light endoscopy, large number of wave lengths is emitted from the endoscope. In contrast, NBI light passes through a special narrow band filter before hitting the tissue, this filter only allows light frequencies that match the absorption spectrum of hemoglobin contained in blood to pass. Therefore, narrow band light only consists of two wavelengths namely, 415 nm blue light and 540 nm green lights. NBI light is absorbed by vessels but reflected by mucosa. NBI light penetrates deeper within the mucosal layer and enhances the visualization and assessment of micro vessel architecture and improve the detection and characterization of deeper vasculature of suspected lesion, in addition, the visualization of the capillary system is less blurred or distorted by scattering as compared to white light endoscopy.

Various studies have been conducted to find the disease severity in ulcerative colitis patients with NBI. Present study aims to find out the severity of disease in ulcerative colitis with the help of NBI study. Finally, we tried to conclude whether UC patients should be routinely screened for disease severity with the help of NBI study or not by our.

Materials and Methods

Study Design: This prospective observational study included 50 patients of UC presenting to the outpatient department or were inpatient from March 2017 to February 2019 of Department of Medicine, Maharaja Yashwantrao Hospital, Indore, MP, India. The study protocol was approved by the Departmental Scientific Committee and Institutional Ethics Committee before the start of the study.

Inclusion Criteria: All patients of UC of any age group who provide informed consent for participation.

Exclusion Criteria

1) Patients not giving consent.
2) Patients having GIT tuberculosis, malignancy or any other GIT disorders.

The nature of study was explained to all participants and a written informed consent obtained from them. Each participant was subjected to detailed history taking with special emphasis on previous history of any GIT disorder. Symptoms of ulcerative colitis like diarrhea including frequency of stool, rectal bleeding, tenesmus, passage of mucus, and crampy abdominal pain were asked.

NBI Colonoscopic Examination– Patients prepared for colonoscopy by ingesting 2-3L of polyethylene glycol electrolyte solution. All

examinations were performed using magnifying colonoscopies with two light sources, one for the standard optical broadband filter and other for the NBI system. During the procedure, whenever a lesion was detected by standard colonoscopy, analyses of capillary vessel patterns with NBI was done. Conventional White Light colonoscopy findings depicts in the form of UCDAI score and BARON score than compare with NBI Colonoscopy findings. UC Disease Activity Index [UCDAI], and Baron Score was used to assess the disease severity.

Ulcerative Colitis Disease Activity Index

It includes stool frequency, rectal bleeding, mucosal appearance, and physician rating of disease activity.

1) Stool Frequency

Normal	0
1-2 stool /day > normal	1
3-4 stool /day > normal	2
>4stool /day > normal	3

2) Rectal Bleeding

None	0
Streaks of blood	1
Obvious blood	2
Mostly blood	3

3) Mucosal appearance

Normal	0
Mild Friability	1
Moderate Friability	2
Exudation, spontaneous bleeding	3

4) Physicians rating of disease activity

Normal	0
Mild	1
Moderate	2
Severe	3

Based on UCDAI Score [Total Score 0-12] disease activity is graded as follows:

Grade	Score
Remission	0-2
Mild	3-6
Moderate	7-10
Severe	>10

BARON SCORE: An Endoscopic Scoring system for ulcerative colitis

Normal	Normal mucosa, inactive disease
Mild	Erythema, decreased vascular pattern
Moderate	Marked erythema, loss of vascular pattern, mucosal friability
Severe	Spontaneous bleeding, ulceration

The following investigations done in all UC patients:

- Complete Blood Counts (CBC) - It was done using the System XP-300 automated cell count analyzer,
- Conventional white light colonoscopy,
- NBI colonoscopy with the help of OLYMPUS -170 Series.

Statistical Analyses

All data were collected, organized in a tabulated form, and statistically analyzed. The analysis was carried out using SPSS (Statistical Package for Social Science) version 24 for windows (Software and Services, North California, USA). A 'p value' less than 0.05 were considered to be significant.

Results

A total 50 patients, who fulfilled the eligibility criteria, were included in the study. In our study, total 50 patients of UC were evaluated, out of which 23(46%) were females and 27(54%) were males. Most of the patients belong to the age group of 21 to 40 years [25/50(50%) patients]. The age ranged was from 9 to 70 years with a mean age of 41.86 ± 15.12 years.

As shown in table 1, out of 50 patients of UC, according to Baron Score, mild, moderate, and severe disease was found in 8(16%), 29(58%) and 13(26%) patients respectively. As per UCDAI score, out of these patients mild, moderate, and severe disease was found in 17(34%), 25(50%) and 8(16%) patients respectively. According to NBI mild, moderate, and severe disease was found in 5(10%), 18(36%), and 27(54%) patients respectively.

Table 1: Distribution of subjects according to BARON score

Grade	Number (%) According to BARON Scoring	Number (%) According to UCDAI Scoring	Number (%) According to NBI
Mild	8(16%)	17(34%)	5(10%)
Moderate	29(58%)	25(50%)	18(36%)
Severe	13(26%)	8(16%)	27(54%)

As shown in table 2 and 3, there was a statistically significant association of disease activity when compared White Light Colonoscopy BARON Score with NBI study (p value =0.000001), and UCDAI with NBI study (p value= 0.000001).

Table 2: Comparison between Conventional White Light Colonoscopy Baron Score Vs NBI

Grade		NBI			Total
		Mild	Moderate	Severe	
Baron Score	Mild	3	5	0	8
	Moderate	2	10	17	29
	Severe	0	3	10	13
Total		5	18	27	50

Table 3: Showing Inter–rater agreement between White Light Colonoscopy BARON SCORE Vs NBI

Symmetric Measures					
Measure of Agreement	Kappa	Value	Asymptotic Standard Error	Approx. T	Approx. Sig.
		0.688	0.041	15.807	0.000
No. of Valid Cases	50				
Chi Square Test					
		Value	DF	Asymptotic Significance (2-sided)	
Pearson Chi-Square		328.866	9	0.000001	
Likelihood Ratio		268.946	9	0.000001	
No. of Valid Cases		50			

As shown in table 4 and 5, White Light Colonoscopy, BARON Score showed substantial agreement with NBI [kappa value(k) of White Light Endoscopy, Baron Score Vs. NBI – 0.68] and UCDAI Score also showed substantial agreement with NBI [kappa value(k)of White Light Endoscopy, UCDAI Score Vs. NBI -0.66].

Table 4: Comparison between Conventional White Light Colonoscopy UCDAI SCORE Vs NBI

Grade		NBI			Total
		Mild	Moderate	Severe	
UCDAI Score	Mild	5	10	2	17
	Moderate	0	8	17	25
	Severe	0	0	8	8
Total		5	18	27	50

Table 5: Showing Inter–rater agreement between White Light Colonoscopy UCDAI Score Vs NBI

Symmetric Measures					
Measure of Agreement	Kappa	Value	Asymptotic Standard Error	Approx. T	Approx. Sig.
		0.667	0.040	16.228	0.000
No. of Valid Cases		50			
Chi Square Test					
		Value	DF	Asymptotic Significance (2-sided)	
Pearson Chi-Square		375.570	9	0.000001	
Likelihood Ratio		280.972	9	0.000001	
No. of Valid Cases		50			

Kappa Agreement < 0 less than chance agreement, 0.01–0.20 Slight agreement, 0.21– 0.40 Fair agreements, 0.41–0.60 Moderate agreement, 0.61–0.80 Substantial agreement, and 0.81–0.99 almost perfect agreement.

Discussion

NBI enables distinct observation of the pit pattern as well as intramucosal vascular network without chromoscopy. Granular mucosa without spontaneous bleeding is suggested to be a favorable candidate for the scrutiny of NBI colonoscopy. Under NBI colonoscopy, round crypts or villous mucosal surface are depicted in the granular mucosa of active UC. Mucosal vascular pattern in the inactive mucosa is shown as a honeycomb like structure or irregular, tortuous structure under magnifying NBI observation. Furthermore such NBI findings show close correlations with histological finding including crypt distortion, goblet cell depletion. Therefore, NBI Colonoscopy might be of value for the precise assessment of histological severity in mildly active and inactive UC[4].

In our study we found that NBI detected higher rate of severity of disease in UC patients when compared with Baron Score (p value =0.000001) and UCDAI Score (p value =0.000001). It has been suggested that NBI colonoscopy can be reliable for assessing severity in UC patients. In this study mucosal pattern was assessed whereas study done by Yasuharu maeda et al[5] have evaluated, the colorectal microvasculature with NBI, demonstrating a good correlation (r = 0.871, p <0.01) with histological diagnosis. In our study we compared white light colonoscopy findings using Baron Score and UCDAI Score with NBI findings. We confirmed that NBI findings have diagnostic ability to differentiate active and inactive UC and severity when compared with white light colonoscopy findings in the form of Baron Score and UCDAI Score. Our study also demonstrated that NBI is useful to assess disease severity in UC patients.

Conclusions

We recommended that all patients of ulcerative colitis should be subjected to Narrow Band Imaging study for baseline assessment of disease severity to appropriately start treatment in these patients. NBI can be a useful armamentarium in surveillance of early detection of complications of ulcerative colitis.

References

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