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Original Research Article

EFFICACY OF ENDOSCOPY AND NARROW BAND IMAGING IN DIAGNOSING HELICOBACTER PYLORI IN CHRONIC GASTRITIS PATIENTS PRESENTING WITH SIGNIFICANT DYSPEPSIA: A PROSPECTIVE OBSERVATIONAL STUDY.

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ABSTRACT

Background: Helicobacter pylori infection is one of the most common cause of chronic gastritis in India and world-wide. There are lots of ongoing research in white light endoscopic and narrow band imaging appearances to diagnose helicobacter pylori infection. In this study we aimed to find out the efficacy of white light endoscopy and narrow band imaging (NBI) in diagnosing H pylori infection.

Material and Methods: A total of 127 patients were included in our study after fulfilling the inclusion and exclusion criteria. Clinical history was taken thoroughly with demographic profile like age, sex, BMI, comorbidities and biochemical parameters. The patients were then subjected to esophagogastroduodenoscopy initially by white light imaging and later by narrow band imaging. Values and findings were recorded after attaining informed consent.

Results: Out of the total 127 patients, 82 were H pylori positive. Of these 78 (61.40%) were males and 49(38.60%) were females. The percentage of H pylori infection rate was almost equal in both above and below 50 years age group, with slightly more below 50 years. The diagnostic accuracy of standard and NBI endoscopy are 82.68% and 89.76% respectively. For gastric atrophy accuracy of Standard and NBI endoscopy was 57.28% and 57.48% respectively. For Intestinal metaplasia it was 66.14% and 88.98% respectively.

Conclusion: Narrow band imaging is an advanced tool to help in enhanced detection of gastritis caused by Helicobacter pylori and gastric precancerous condition like intestinal metaplasia,

Keywords: Endoscopy, Narrow-band imaging, Helicobacter pylori, Gastric atrophy, Intestinal metaplasia, Body mass index.

INTRODUCTION

Helicobacter pylori (H. pylori),[1] is a gram-negative microaerophilic rod-shaped bacterium which infects more than half of world's population. H pylori is found in the deeper regions of the mucous gel covering of the gastric mucosa or between the gastric epithelium and mucous containing layer. One of the most prevalent causes of chronic gastritis in patients presenting with dyspepsia,[2] is H pylori.[3] H pylori infection,[3] can lead on to intestinal and extra intestinal manifestations,[4] which include peptic ulcers, vitamin B12 deficiency, immune thrombocytopenic purpura, intestinal metaplasia and dysplasia, which may progress on to gastric carcinomas such as gastric mucosa, associated

lymphoid tissue (MALT) lymphoma and gastric adenocarcinoma.[6]

Narrow-band imaging (NBI),[7] is an advanced endoscopic imaging technology which enhances the endoscopic images by high lighting the micro vascular pattern and mucosal surface. NBI technology filters the blue spectrum out of the white light. The filtered wave lengths penetrates the surface of human tissue, and show the capillaries on mucosal surface in brown colour and veins of sub mucosa layer to appear as cyan colour in the imaging monitor. NBI has been proposed as an important adjunct technique to white light endoscopy for characterising lesions in the gastrointestinal tract. The main applications are to distinguish between benign and malignant lesions, to target the exact area for biopsy, to predict the risk of invasive cancer, to delimit resection margins, and to identify residual neoplasia in a scar. Close observation of gastric mucosa by white light imaging helps to predict the presence of H pylori infection. More recent evidence suggests that NBI can be used to detect H pylori induced gastritis. The different gastric mucosal pattern in H pylori infected stomach helps in enhanced detection rate of the gastritis caused by the organism and thereby helps in identifying premalignant conditions.

This study was aimed to assess the efficacy of white light imaging endoscopy and Narrow band imaging for diagnosing H pylori induced gastritis and premalignant conditions like gastric atrophy and intestinal metaplasia.

MATERIAL AND METHODS

A prospective observational analytical study was conducted on 127 patients after receiving approval by the Institutional Ethics Committee of our institution. Written informed consent was taken from each patient. Patients who were more than 18 years of age and had significant dyspepsia lasting for more than three months coming for treatment in our gastroenterology department, were included in our study. Significant dyspepsia[8] was defined as patient having the following combination of four symptoms: postprandial fullness, early satiety, epigastric pain and epigastric burning that are severe enough to interfere with the wellbeing, at a frequency of three days per week lasting more than three months with the onset of symptom six months or more. The patients with a history of gastric surgery, eradication of H pylori infection in the past, psychiatric ailments, patients on non-steroidal anti-inflammatory drugs, antiplatelet agents, anticoagulants, steroids, antibiotics, and proton pump inhibitors in past four weeks prior to inclusion to study were excluded from study. Severe liver, renal, and cardiopulmonary dysfunction, coagulopathy, anaemia were also excluded.

A detailed history and clinical examination was carried out in all patients. Based on the history of postprandial fullness, early satiety, epigastric pain and epigastric burning, patients were selected. Upper gastrointestinal endoscopy was done with high definition endoscopy using OLYMPUS ELVIS EXERA III CV-190 processor. Gastric mucosa was initially examined with high definition white light endoscopy and then using narrow band imaging. Findings were recorded in a standard format. Biopsy samples were obtained for rapid urease test (RUT) using PYLO DRY Card test and histopathology examination as per Sydney,[9] protocol. H pylori was considered positive if anyone or both were positive.

The abnormal mucosal pattern in white light endoscopy (WLE) was classified into three types. When a regular arrangement pattern was absent, abnormal patterns were named based on the mucosal appearance as type A- mosaic-like appearance, type B- diffuse homogenous redness or type C- irregular redness with groove as per Cho et al,[10] classification. We thoroughly examined the stomach with mainly in the middle and lower part of corpus along the greater curvature, lesser curvature and antrum. Then we changed the settings in the endoscope to the NBI mode. NBI was set in enhancement mode A7. Magnification is obtained by underwater imaging. Digital zoom function was not used, however good quality images were included in the study. Examination of stomach with NBI was done as similar pattern to white light imaging endoscopy. The NBI images were classified according to Yagi et al,[11] classification. A regular arrangement of collecting venules (RAC) and honey comb like sub epithelial capillary network (SECN) were taken as a normal pattern. Abnormal pattern were divided into three types type 1-regular round pits with polygonal sulci, type 2- more dilated and linear pits without sulci, type 3- loss of gastric pits with coiled micro vessels. If any mixed pattern occurs in white light imaging or NBI the predominant pattern was recorded.

Sample size calculation was based on the assumption that the sensitivity of new test,[12] was 95.2%, with an absolute precision of 5%, confidence interval of 95% and the prevalence of the disease,[13] to be 62%, we required a minimum sample size of 113. The collected data obtained was recorded in MS excel work sheet and statistical analysis was done using IBM SPSS v23 program running on windows operating system. The continuous variables were presented as Mean and standard deviation. Based on the analysis, sensitivity, specificity, positive predictive value and negative predictive value were obtained. Categorical variables were presented in terms of percentage, frequency and proportions and were compared with Chi-square test. $P < 0.05$ was taken as statistically significant.

RESULTS

Among 127 patients in the study 26% (n=33), patients were of age group 51-60, followed by 24%

of age group more than 60. The age distribution of H pylori in age groups above and below 50 years, was almost equal with slightly more prevalence below 50 age group (32.8% vs 31.4%). The study had more male subjects (78 vs 49). Among the males (54/78) 43% were H pylori positive, while among the females (28/49) 22% were H pylori positive. H pylori positivity infection was significantly higher in BMI >25 patients than in BMI <25 patients. No statistical significant association was found between anaemia and H pylori infection. Comorbidities were found to be more prevalent among H pylori patients. H pylori positivity was found among 67 % of all CAD patients, 67 % of systemic hypertension patients and 57 % of diabetes mellitus patients in the study. Of our total study subjects, majority (63%) had combination of symptoms. Postprandial fullness was most common isolated symptom (20.5%), in comparison to epigastric pain, epigastric burning sensation & early satiety. Antral gastritis was found in 45.90% of patients (n=58), followed by antral predominant gastritis in 15% (n=19), corpus predominant gastritis in 9.50% (n=12). Normal mucosa was found in 30% (n=38).

RUT was positive in 57.50% (n=73) and negative in 42.50% (n=54) of the patients. Among patients with dyspeptic symptoms patients (45/127)-35% had moderate to severe H pylori density while (24/127) 18.90% patients had mild H pylori density. [Table1] Patients who were either Biopsy or RUT positive was considered as final diagnosis of H pylori positive. If both are negative, H pylori diagnosis is negative. As a result, 82 were positive and 45 were negative. From the study, it was observed that, in standard endoscopy, irregular redness with groves is the most predictable pattern, despite being the least common, followed by diffuse homogenous redness. While in NBI, Type 1 pattern is most common while Type 3 pattern is least common but highly specific for H pylori infection. [Table 2]

Our study showed statistical significance between abnormal mucosal pattern on WLE associated with gastric atrophy (P=0.001). In WLE 67 people were true positive out of a total of 82 positives, where as in NBI, out of the confirmed total of 82 positivity, 74 subjects were true positive. [Table 3] The sensitivity, specificity, PPV, NPV, and accuracy of NBI imaging in H pylori diagnosis was found to be superior to those of white light imaging. [Table 3]

Pathological reports of mild/no atrophy and normal were interpreted as having no atrophy. Moderate and severe atrophy of corpus are taken as patients with atrophy. Out of all study subjects (27/127), 21.25% had gastric atrophy, while the remaining (100/127) had no atrophy. Sensitivity for predicting gastric atrophy by NBI is about 96.30%, higher than WLE (88.89%), while specificity is comparatively low for both WLE and NBI, showing the accuracy of both tests about 57-58%. [Table 4]

NBI had higher sensitivity and specificity to WLE in diagnosing intestinal metaplasia. Specificity of WLE & NBI increased in intestinal metaplasia as B&C patterns of WLE and Type 2 & 3 patterns of NBI were used to determine metaplasia. [Table 5]

Table 1: Helicobacter pylori biopsy & density

H pylori Biopsy	No of Patients	H. pylori Density	No of Patients	Percentage
Positive	69	Mild	24	18.90%
Negative	58	Moderate	31	24.40%
		Severe	14	11.00%
		Absent	58	45.70%

Table 2: Abnormal Mucosal Pattern on WLE and NBI Pattern

WHITE LIGHT ENDOSCOPY			
Abnormal Mucosal Pattern	**No of Patients**	**%**	**H. Pylori positive**
Mosaic like Pattern	22	17.30%	(19/22) 86.33%
Diffuse homogenous redness	39	30.70%	(36/39) 92.3%
Irregular redness with grooves	13	10.30%	(13/13) 100%
Normal	53	40.90%	(14/53) 26%
NARROW BAND IMAGING			
NBI Pattern	**No of Patients**	**%**	**H. Pylori positive**
REGULAR ROUND PITS WITH POLYGONAL SULCI- Type1	54	42.60%	(50/54) 92.5%
MORE DILATED & LINEAR PITS WITHOUT SULCI- Type2	21	16.50%	(20/21) 95.2%
LOSS OF GASTRIC PITS WITH COILED MICROVESSELS - Type3	4	3.10%	(4/4) 100%
NORMAL- RAC/SECN	48	37.80%	(8/48) 16.6%

Table 3: H pylori final diagnosis (WLE vs NBI)

White Light Endoscopy (WLE)	H. pylori Final Diagnosis		Total
	Positive	Negative	
Positive	67	7	74
Negative	15	38	53
Total	82	45	127
Narrow Band Imaging (NBI)	H. pylori Final Diagnosis		Total
	Positive	Negative	
Positive	74	5	79
Negative	8	40	48
Total	82	45	127

H PYLORI DIAGNOSIS	WLE	NBI
SENSITIVITY	81.71%	90.24%
SPECIFICITY	84.44%	88.89%
POSITIVE PREDICTIVE VALUE	90.54%	93.67%
NEGATIVE PREDICTIVE VALUE	71.70%	83.33%
ACCURACY	82.68%	89.76%

Table 4: Gastric Atrophy (WLE vs NBI)

White Light Endoscopy (WLE)	Gastric Atrophy		Total
	Positive	Negative	
Positive	24	50	74
Negative	3	50	53
Total	27	100	127
Narrow Band Imaging (NBI)	Gastric Atrophy		Total
	Positive	Negative	
Positive	26	53	79
Negative	1	47	48
Total	27	100	127

GASTRIC ATROPHY	WLE	NBI
SENSITIVITY	88.89%	96.30%
SPECIFICITY	50.00%	47.00%
POSITIVE PREDICTIVE VALUE	32.43%	32.91%
NEGATIVE PREDICTIVE VALUE	94.34%	97.92%
ACCURACY	58.27%	57.48%

Table 5: Intestinal Metaplasia (WLE vs NBI)

White Light Endoscopy (WLE)	Intestinal Metaplasia		Total
	Positive	Negative	
Positive	10	42	52
Negative	1	74	75
Total	11	116	127
Narrow Band Imaging (NBI)	Intestinal Metaplasia		Total
	Positive	Negative	
Positive	11	14	25
Negative	0	102	102
Total	11	116	127

INTESTINAL METAPLASIA	WLE	NBI
SENSITIVITY	90.91%	100 %
SPECIFICITY	63.78%	87.93%
POSITIVE PREDICTIVE VALUE	19.93%	44 %
NEGATIVE PREDICTIVE VALUE	98.67%	100 %
ACCURACY	66.14%	88.98%

DISCUSSION

Among the various causes of gastritis, peptic ulcer, carcinoma of stomach H pylori infection is one of the preventable cause. The primary advantage of using narrow band imaging in upper gastrointestinal endoscopy for H pylori gastritis is to enhance the detection rates of H pylori and to avoid unnecessary biopsies. NBI also help in enhanced detection of precancerous conditions like intestinal metaplasia. NBI also help to find the eradication status of H pylori post antibiotic therapy. From our study, we also observed that narrow band imaging is a superior tool compared to white light imaging in diagnosing H pylori gastritis, gastric atrophy and intestinal metaplasia.

The prevalence of H pylori in our study was 64%, with a male predominance and a higher H pylori

incidence below the age of 50. This was almost similar to a study conducted by S Adlekha et al,[13] We also observed a higher amount of patients with H pylori infection in study subjects who had higher BMI, which was in concordance with several previously done studies.[10,14,15] H pylori association with obesity is postulated by many hypothesis such as H pylori infection related gastritis or peptic ulcer resulting in increased food intake, leptins and immunological cytokines.[16,17] Considering the association between anaemia and H pylori infection, our study didn't show any statistical significance for the same, in contrast to the results obtained by Monzon et al. [18]

One of the observations from this study was that there was a higher occurrence of H pylori infection in patients with co morbidities, although these associations are controversial. Patients with systemic hypertension, diabetes, and coronary artery heart disease had a higher rate of H pylori infection. This may be due to persistent local or systemic inflammation and because of autoimmune response to the infection.[19] The most common dyspeptic symptoms the patient described was a combination of postprandial fullness, early satiety, epigastric pain and epigastric burning sensation. The endoscopic findings were noted more to antrum of stomach in our study and the inflammation in antral area was also found to be severe than elsewhere.[20-22]

The most common associated lesions found in our study was duodenitis (7.10%). GERD and non-neoplastic polyps was of equal incidence (7.10%) followed by Barret's esophagus and peptic ulcer disease (both 3.90%) and the least one was carcinoma (2.40%). While Taha et al,[22] showed duodenitis in 7.6%, then GERD in 6.4% hiatus hernia in 5.1%. In our study, we noticed a statistically significant correlation between abnormal mucosal pattern in white light endoscopy and gastric atrophy in biopsy (P=0.001). Bah et al,[23] found out different endoscopic features for H pylori gastritis with white light imaging endoscopy. Abnormal antral texture, a mamillated corpus surface, and antral erosions patterns were predictive of H pylori infection, as the sensitivity and specificity of the patterns were of 75% and 63% respectively. Laine et al,[24] also showed antral nodularity as a very important and good predictive factor for H pylori infection status with a positive predictive value of 90%.

Yan et al,[25] using high resolution WLE endoscopy classified patterns of corpus who are H pylori positive into "cleft-like" pattern, a "regular arrangement of red dots," a "mosaic appearance" and a "mosaic appearance with hyperaemia." Their sensitivity, specificity and negative predictive values were 100%, 86% and 100% respectively for the above mucosal patterns. Cho et al,[10] classified mucosal patterns into RAC, type A- mosaic like appearance, B- diffuse homogenous redness and C- irregular redness with groove patterns. The sensitivity, specificity, positive and negative predictive values of abnormal patterns with regard to H pylori infection as per Cho et al was 93.3%, 89.1%, 92.3% and 90.6% respectively. While in another similar study by Cho et al,[26] showed 92%, 95.6%, 97.4%, 87% and 93.3% sensitivity, specificity, PPV, NPV and accuracy respectively. In our study, we observed H pylori infection occurrence in type A, type B, type C pattern to be 86.33%, 92.3% and 100% respectively. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of WLE for diagnosis of H pylori infection as 81.7%, 84.44%, 90.54%, 71.70% and 82.68 % respectively. These results were comparable with previous studies.

NBI is an advanced image enhancement method with improved ability to diagnose H pylori gastritis. Alaboudy et al,[27] classified mucosal patterns in NBI without magnification into five different types Type 1: RAC present, Type 2: Cone-shaped gastric pits, Type 3: Rod shaped gastric pits, prominent sulci, Type 4: Ground-glass appearance, Type 5: Dark brown patches, bluish margin, irregular border, in which type 3,4,5 patterns were considered positive for H pylori infection. Their sensitivity, specificity, and PPV and NPV values of type 3, 4, or 5 patterns for diagnosing H pylori positive were 94.28%, 96.66%, 98.50%, and 87.87%, respectively. Tahara et al,[28] in their study divided gastric mucosal patterns under magnifying NBI into three types, type 1-slightly enlarged, round pits with unclear or irregular sub epithelial capillary networks; type 2-obviously enlarged, oval or prolonged pits with increased density of irregular vessels; and type 3-well demarcated oval or tubule villous pits with clearly visible coiled or wavy vessels. The sensitivity and specificity for detection of H pylori for these patterns were 95.2% and 82.2 % respectively. While Cho et al,[26] used magnified NBI dividing the patterns into type 1-regular round pits with polygonal sulci, type 2- more dilated and linear pits without sulci, type 3- loss of gastric pits with coiled micro vessels. Their study showed sensitivity, specificity, PPV, NPV and accuracy of 96.3%, 95.6%, 97.95%, 93.5% and 96.1% respectively. The present study showed H pylori infection occurrence of 92.5%, 95.3% and 100% for type 1, 2 and 3 patterns respectively. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of NBI for diagnosis of H pylori infection are 90.24%, 88.9%, 9.67%, 83.33% and 89.76% respectively. These results were superior to WLE imaging in diagnosing H pylori gastritis and thus shows the superiority in diagnosing H pylori induced gastritis with NBI.

Atrophic gastritis in H pylori infection is secondary to chronic inflammation caused by the organism. Kono et al,[29] found out that endoscopic gradings can predict histological atrophic gastritis using WLE. Also NBI imaging by various studies showed definite advantage in predicting gastric atrophy.[26,30] A study by Cho et al,[26] study showed sensitivity, specificity PPV, NPV and accuracy of 96.6%,

59.8%, 54.4%, 97.2% and 72% respectively for diagnosing atrophy by WLE, while 100%, 59%, 54.7%, 100% and 72% respectively by NBI. When compared to WLE, our study found that NBI had higher sensitivity in diagnosing atrophy.

Intestinal metaplasia (IM) is considered to be a premalignant condition. A study by Capelle et al,[31] showed sensitivity, specificity, positive and negative predictive values for detection of premalignant lesions by NBI were 71%, 58%,65% and 65% respectively, for WLE were 51%, 67%, 62% and 55% respectively. Whereas Cho et al,[26] obtained a sensitivity, specificity, PPV, NPV and accuracy of 97.4%, 51.8%, 35.9%, 98.26% and 61.7% respectively in diagnosing metaplasia by WLE with NBI showing 100%, 50.4%, 35.8%, 100% and 61.1% respectively. NBI has advantage of distinguishing intestinal metaplasia from normal tissue based on the difference in colour of mucosa. In a study by Tahara et al,[28] they showed sensitivity and specificity of diagnosing intestinal metaplasia by NBI was 73.3 % and 95.6% respectively. In our study also, we observed a superior diagnostic quality for IM compared to previous studies with NBI. NBI had a definitive advantage in detection of IM compared to WLE and sensitivity, specificity, PPV, NPV and accuracy of WLE for IM in our study were 90.1%, 63.78%, 19.93%, 98.7%, 66.14% respectively and for NBI were 100%, 87.93%, 44%, 100% and 88.98% respectively.

This study had several limitations that warrant consideration. Firstly, WLE and NBI was performed by the same gastroenterologist. Hence, detection of IM and dysplasia by NBI might possibly be biased by the previously done WLE findings, which would have resulted in an overestimation of the rate of detection using NBI. Secondly, we did not use the OLGA and OLGIM staging systems for evaluating the severity of IM and gastric atrophy. Finally, our study was a single centre trial. A multi centric study involving gastroenterologists with varying levels of expertise, with a bigger sample size might be required to validate the reliability of the findings.

CONCLUSION

Narrow band imaging is an advanced tool to help in enhanced detection of gastritis caused by Helicobacter pylori and gastric precancerous condition like intestinal metaplasia.

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