



The diagnostic value of endoscopic narrow band imaging in *helicobacter pylori* gastritis in children

STOMACH

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ABSTRACT

Background/Aims: In this study we aimed to investigate the sensitivity and specificity of Narrow Band Imaging (NBI) in *H. pylori* gastritis and compare them with those of rapid urease test and urea breath test.

Materials and Methods: A hundred sixty-five children who admitted to Uludag University Pediatric Gastroenterology Unit between October 2009-March 2011 with upper gastrointestinal symptoms were consecutively enrolled. During the endoscopy procedure gastric corporeal, antral and fundal images were obtained, afterwards the same areas were visualized with narrow band imaging and images were recorded again.

Results: The study included 68 (41.2%) boys and 97(58.8%) girls. The mean age of the patients were 11.88±4.55. Tissue culture positivity and/or histopathological staining for *H. pylori* was determined in 56 (33.9%) patients (Group 1) and the other patients (n:109, 43.6%) didn't have an evidence of *H. pylori* infection (Group 2). Narrow band images have supported *H. pylori* infection in 56.4%. The sensitivity of narrow band images for determining *H. pylori* infection was 92.86% (95% CI 82.7-98), specificity was 62.39% (95% CI 52.6-71.5).

Conclusion: Our study is the first to show the role of NBI in diagnosing *H. pylori* infection in children, as well as determining the sensitivity and specificity of the technique. The specificity is low; however, we suggest that the specific mucosal view of *H. pylori* gastritis provided by NBI is useful for identifying the areas from which the biopsies should be taken. Moreover, by using this technique, treatment of *H. pylori* infection may be initiated immediately without performing rapid urease test and without waiting for histopathology report and tissue culture.

Keywords: *H. pylori* , children, narrow band imaging

INTRODUCTION

Helicobacter pylori (*H. pylori*) infection is one of the most common infections worldwide, and 50% of all humans are infected with this microorganism. Generally, transmission occurs in childhood, but complications develop in adulthood.

In children, the seroprevalence of *H. pylori* varies according to the socioeconomic level of the country or region: 7-33% of children in developed countries and Europe, 48-78% of children in South America, and 37.5-66% of children in Asia. In Turkey, seroepidemiological studies showed that 46-78% of children are infected with *H. pylori* (1-7). Therefore, use of non-invasive and invasive diagnostic methods of symptomatic children is important (8,9).

Recently, besides new conventional endoscopic techniques such as capsule endoscopy and chromoendoscopy, narrow band imaging (NBI) has become available for diagnosis. NBI is based on the different penetration depths of light waves, i.e. long-wavelength light penetrates deeper, while short-wavelength light remains superficial. Light with a short wavelength is reflected and better spread on the superficial layer of the mucosa, which increases the visibility of contrast areas on the epithelial layer in mucosal imaging (10-13).

A rapid urease test (RUT) usually takes 12-24 h to confirm the diagnosis of *H. pylori* gastritis, and this period is even longer for diagnosis by tissue culture and histopathological investigation. Hence, a new technique

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that helps confirm the diagnosis of *H. pylori* gastritis during endoscopy is necessary.

In this study, we aimed to investigate the sensitivity and specificity of NBI in *H. pylori* gastritis and to compare them with those of the RUT and urea breath test (UBT).

MATERIALS AND METHODS

This study was conducted at Uludag University Medical Faculty after the approval of the ethical committee and was in conformance with the Declaration of Helsinki. All parents of patients provided informed consent for this study.

Subjects were 165 children consecutively admitted for upper gastrointestinal symptoms (epigastric pain, bloating, vomiting, etc.) to the Paediatric Gastroenterology, Hepatology, and Nutrition Unit at Uludağ University between October 2009 and March 2011.

Exclusion criteria for this study included the following:

1. Any other reason for abdominal pain (urinary tract infection, parasites in stool, gastroenteritis, etc.)
2. Antibiotic usage 1 month before endoscopy
3. Usage of a proton pump inhibitor or an H₂-receptor blocker 1 month before endoscopy
4. Usage of a steroid or non-steroidal anti-inflammatory drug

For each patient, a medical history was obtained, along with a physical examination. Serum *H. pylori* IgG and IgA antibodies and gastrin levels were measured, and a C14-UBT was performed for all patients as well. In the next step, all patients underwent an upper gastrointestinal endoscopy with an Olympus EVIS EXERA-II CV-180 Pediatric Endoscopy System (2006, Tokyo, Japan). During the endoscopic procedure, oesophageal, gastric corporeal, antral, fundal, and duodenal images were obtained; afterwards, the same areas were visualized using NBI, and images were again recorded. Narrow band images were evaluated according to the classification of Alaboudy et al. (Figures 1-4) (12).

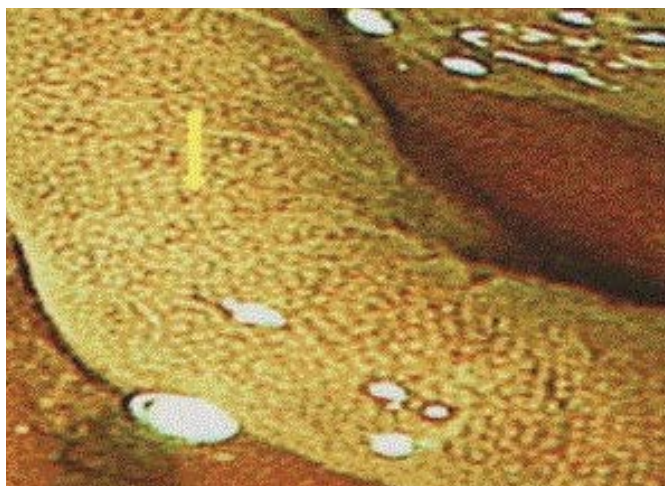


Figure 1. NBI view of the antral mucosa. Cone-shaped mucosal pitting in mild *H. pylori* (Type 1 mucosal change).

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Endoscopic biopsies were taken from the following areas of the stomach: five from the antrum and two from the corpus. A histopathological examination was performed for antral and

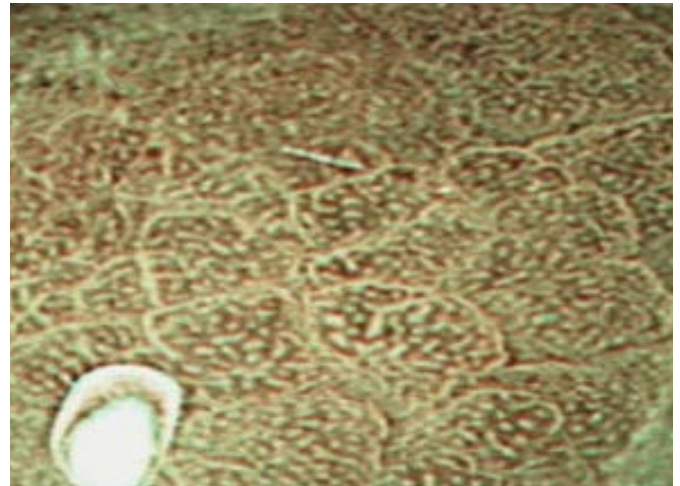


Figure 2. Moderate *H. pylori* gastritis shows marked sulci and rod shaped mucosal pitting (Type 2 mucosal change).

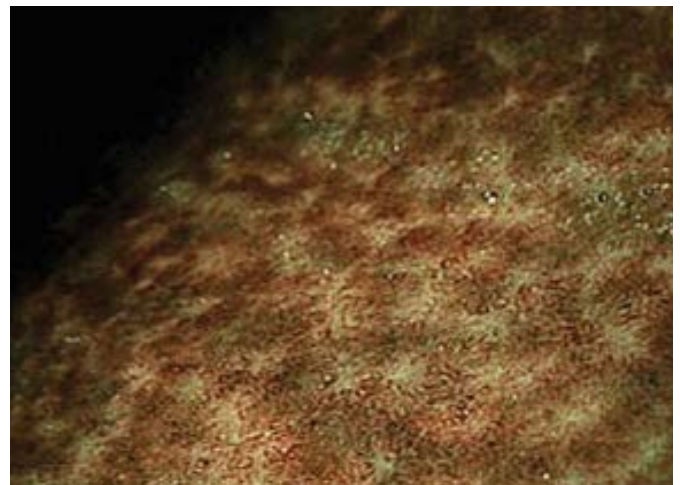


Figure 3. Significant *H. pylori* gastritis shows ground glass appearance (Type 3 mucosal change).

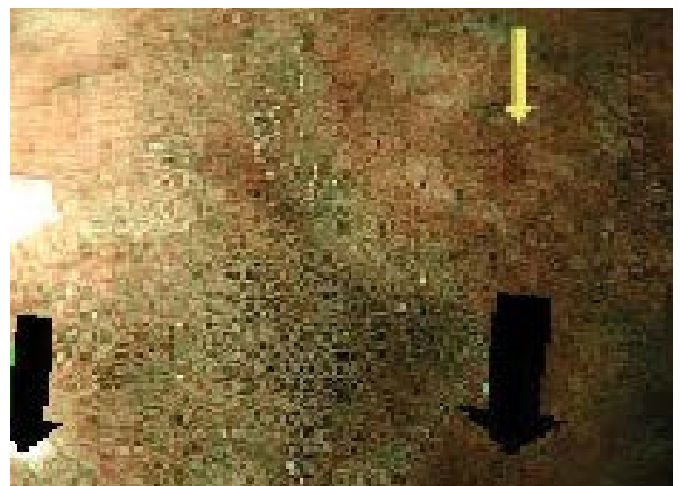


Figure 4. Severe *H. pylori* gastritis shows brown spots with bluish margins (between black arrows) (Type 4 mucosal change).

corporeal biopsies; in addition, antral samples were used for an RUT, a tissue culture, and gram staining for *H. pylori*. The patients were divided into two groups according to the presence of *H. pylori*, as detected in a tissue culture, by histopathology, or both: Group 1 (*H. pylori* positive; n=56) and Group 2 (*H. pylori* negative; n=109).

SPSS 16.0 for Windows (IBM Corp., NY, USA) was used for statistical analysis of the variables. The differences between the frequencies of categorical variables were analysed by using the χ^2 test. The Shapiro-Wilk test was used to assess the distribution pattern of the data. For continuous variables, the difference between the two groups was evaluated using the Student's *t* test. A receiver operating characteristics (ROC) analysis was performed using the MedCalc (version 9.3.9.0 MedCalc Software, Ostend, Belgium) statistics program. For all tests, a *p* of <0.05 ($\alpha=0.05$) was accepted as significant.

RESULTS

In total, 165 children 68 (41.2%) boys and 97 (58.8%) girls admitted for dyspeptic complaints were enrolled. The patients' mean age was 11.88 ± 4.55 years, and 27.9% of the patients were younger than 10 years. Upon admission, symptoms included epigastric pain (76.4%; n=26), recurrent vomiting (9.1%; n=15), nausea (5.5%; n=9), upper gastrointestinal bleeding (3.6%; n=6), dysphagia (2.4%; n=4), melena (1.2%; n=2), belching (1.2%; n=2), and chronic diarrhoea (0.6%; n=1).

H. pylori IgG and IgA antibody positivity was present in 50.3% (n=83) and 14.5% (n=24), respectively, of the patients. The *H. pylori* positivity rate was 39.1% for patients younger than the age of 10 years; however, in older patients, it was higher (54.6%). A UBT could be performed in 46 patients who were older than 6 years, and the UBT was positive in 52.1% (n=24) of these patients.

An endoscopic examination revealed gastritis in 61.2% (n=101), nodular gastritis in 25.5% (n=42), and a gastric ulcer in 3% (n=5) of the patients, while it was normal in 10.3% (n=17).

H. pylori was detected in 56 patients (33.9%) by either a tissue culture or a histopathological procedure (Group 1); 109 patients (66.1%) were *H. pylori* negative (Group 2).

The patients' mean ages were 13.00 ± 3.70 years in Group 1 and 11.30 ± 4.84 years in Group 2 (*p*=0.014). Group 1 included 35 girls (62.5%) and 21 boys (37.5%), and Group 2 included 62 girls (56.9%) and 47 boys (43.1%) (*p*=0.59).

The main complaint upon admission in both groups was epigastric burning and pain. The presence of epigastric pain and burning was statistically similar in both groups (*p*>0.05).

The endoscopic findings from both groups are shown in Table 1. The percentage of nodular gastritis was significantly higher

in Group 1 than in Group 2. Other endoscopic findings were more frequent in Group 2 than in Group 1.

The results of the diagnostic tests are shown in Table 2. RUT and UBT positivity were significantly higher in Group 1 than in Group 2.

The sensitivity of the RUT was 92.86% (95% confidence interval [CI], 82.7-98.0%) and specificity was 100% (95% CI, 96.6-100%). For the UBT, the sensitivity was 95.45% (95% CI, 77.1-99.2%), and the specificity was 87.5% (95% CI, 67.6-97.2%).

With NBI, mucosal changes were significantly greater in Group 1 than in Group 2. NBI positivity was found in 92.2% (n=52) of the *H. pylori*-positive patients; however, it was found in 37.6% (n=41) of the *H. pylori*-negative patients (*p*<0.0001) (Table 3).

The sensitivity of the mucosal changes with NBI that shows the presence of *H. pylori* was 92.86% (95% CI, 82.7%-98%), while the specificity was 62.39% (95% CI, 52.6-71.5%).

In comparison, RUT and UBT were found to be significantly more specific than NBI for detecting *H. pylori* gastritis (Table 4).

DISCUSSION

An *H. pylori* infection is primarily acquired in childhood and unless treated, persists throughout a patient's life. It is known that

Table 1. Endoscopic findings of groups

Endoscopic findings	Group 1 [n(%)]	Group 2 [n(%)]	p
Normal	0 (0)	17 (100)	<0,001
Gastritis	27 (26,7)	74 (73,3)	0,022
Nodular gastritis	29 (69)	13 (31)	<0,001
Gastric ulcer	0 (0)	5 (100)	<0,001
Total	56 (33.9)	109 (66.1)	

Table 2. The results of diagnostic tests in groups

Diagnostic test	Group 1 [n(%)]	Group 2 [n(%)]	p
Rapid urease test			
Positive	52 (92.9)	0 (0)	
Negative	4 (7.1)	109 (100)	<0,001
Urea breath test			
Positive	21 (95.5)	3 (12.5)	
Negative	1 (4.5)	21 (87.5)	<0,001

Table 3. The detection rates of *H. pylori* gastritis in NBI

	NBI negative (n/%)	NBI positive (n/%)	p
H.pylori negative	68 / 62.4	41 / 37.6	<0.0001
H.pylori positive	4 / 7.1	52 / 92.9	

NBI: Narrow Band Imaging

Table 4. The compared sensitivity and specificity of rapid urease test, urea breath test and NBI

	NBI	RUT	UBT
Sensitivity	92.86%	92.86%	95.45%
Specificity	62.39%*†	100%*	87.50%†
AUC	0.77	0.96	0.91

*p<0.001, †p=0.009

AUC: Area Under the Curve

NBI: Narrow Band Imaging

RUT: Rapid Urease Test

UBT: Urea Breath Test

the seroprevalance of *H. pylori* increases with increasing age (7,13,14). Similarly, our study showed that the rate of serum *H. pylori* IgG positivity was higher in children older than 10 years old.

Previous studies have shown that an endoscopic view of nodular gastritis is associated with an *H. pylori* infection, as well as the mucosal density of the microorganism (15-18). Studies performed on young adults and children have indicated a higher prevalence of mucosal atrophy compared to mucosal nodularity in these group of patients (19-21). An *H. pylori* infection is generally accompanied by mucosal nodularity in children (8). In accordance with medical literature, our study results revealed that nodular gastritis was significantly frequent in *H. pylori*-positive children. However, mucosal atrophy was not detected in our patients with *H. pylori* gastritis. This may be due to the fact that, the mean age of the patients in our study was lower than the mean age of the patients in other studies.

Urea breath test is a non-invasive test for *H. pylori* that is useful for both the diagnosis and evaluation of treatment response (22). UBT is useful for the assessment of all parts of the gastric mucosa. Therefore, UBT may be superior to invasive tests in cases with patchy involvement. Riepl et al. (23) found that this test has a sensitivity of 92% and a specificity of 94% in adults. In children, the sensitivity and specificity are reported to be 96.2-100% and 97-98.5%, respectively (24-26). In our study, the sensitivity of the UBT was similar to that reported in medical literature and was 95.45%, while the specificity was 87.5%, which was lower than that of previous reports. Our specificity was possibly lower because of the following: high false-positive results; under-diagnosed *H. pylori*, as the histopathology showed the patchy involvement of *H. pylori* infection in the gastric mucosa; or false-negative tissue cultures. False positivity may be found in early collected breath samples that are associated with urea hydrolysis in oropharynx without *H. pylori*. Antibiotic or gastric acid inhibitor usage 1 month before a UBT could cause false-positive results. In the present study, the low specificity was considered related to families misunderstanding directions regarding medication use before the test.

Rapid urease test, an invasive test for diagnosing *H. pylori* infection, is very useful as the result can be obtained immediately

after endoscopy. In a study from Italy, the test was performed in 530 children aged 10.4±3.0 years and 1060 healthy controls. The results showed that the sensitivity and specificity of the test were 84.6% and 100%, respectively (27). Tseng et al. (28) compared three different RUTs and found that the sensitivity of the tests was 86.2-93%, while the specificity was 100%. In concordance with medical literature, in our study, the sensitivity of the RUT was 92.86%, while the specificity was 100%.

Currently, there are several studies investigating the diagnostic role, as well as the rapidity, of NBI in *H. pylori* infections. Almost all these studies used magnifying NBI endoscopes, and the results revealed a high sensitivity and specificity for diagnosing *H. pylori* infection (29-32). First, Alaboudy et al. (12) defined four characteristic views of *H. pylori* infection by using a non-magnifying NBI endoscope and revealed an association between histopathological severity and endoscopic views (Figures 1-4). In the present study, for determining *H. pylori* gastritis, we used the classification of Alaboudy et al. and found that the sensitivity and specificity of the endoscopic views were 92.86% and 62.39%, respectively. Regarding sensitivity, this result was similar to that of RUT and UBT; however, the specificity of NBI was significantly lower than that of the other tests. The low specificity level seems to be related to the false-positive results associated with non-*H. pylori* gastritis. Consequently, non-magnifying NBI views may suggest an *H. pylori* infection, but an RUT, a histopathological examination, and a gastric tissue culture should be performed for definite diagnosis.

We aimed to investigate the role of NBI endoscopic technique in determining the *H. pylori* gastritis and to our knowledge, our study is the first to show the role of NBI in diagnosing and determining the sensitivity and specificity of *H. pylori* infection in children. The specificity of this technique was found to be low; however, to visualise a mucosal view of *H. pylori* gastritis, we suggest NBI, as it is useful for identifying areas from which biopsies should be obtained. Moreover, by using this technique, treatment for an *H. pylori* infection may be initiated immediately without performing an RUT and without waiting for a histopathology report or tissue culture.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of the Medical Faculty of Uludağ University.

Informed Consent: Written informed consent was obtained from parents of patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author contributions: Concept - T.Ö., T.B.Ö., G.E.; Design - T.Ö., T.B.Ö., G.E.; Supervision - T.B.Ö., C.Ö., Ö.Y.; Resource - T.B.Ö., C.Ö., Ö.Y.; Materials - C.Ö., Ö.Y.; Data Collection&/or Processing - T.Ö., G.E., T.B.Ö.; Analysis&/or Interpretation - T.Ö., T.B.Ö.; Literature Search - T.Ö., G.E.; Writing - T.Ö., T.B.Ö.; Critical Reviews - T.B.Ö., C.Ö., Ö.Y..

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