

## Comparison of touch cytology and histology in diagnosing helicobacter pylori infection in gastric biopsy

Hossein Sharifi<sup>1</sup>, Raika Jamali<sup>2</sup>, Tahere Mazoochi<sup>3</sup>, Tahere Khamechian<sup>4</sup>

### ABSTRACT

**Objective:** To compare the Touch cytology with histology method for diagnosing Helicobacter pylori (HP) infection.

**Methodology:** Dyspeptic patients who were candidate for upper gastrointestinal endoscopy were included in the study. Those using Proton Pump Inhibitors, Bismuth compounds or antibiotics over the last month or had prior gastric surgery were excluded. Imprints and histological samples were taken from gastric antrum and stained by Giemsa for HP detection. HP infection was diagnosed if the organism was present in either method.

**Results:** One hundred and fifty patients were included. The Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value in touch cytology method were 95.65%, 100%, 100%, and 66%, and in histology method were 84.78%, 100%, 100% and 36.36% respectively. The sensitivity of touch cytology was more than histology method. (P value < 0.001).

**Conclusion:** It is better to use cytology to diagnose HP infection when the histological information may not be necessary.

**KEY WORDS:** Helicobacter pylori, Sensitivity and Specificity, Cytology, Histology.

Pak J Med Sci January - March 2011 Vol. 27 No. 1 90-93

### How to cite this article:

Sharifi H, Jamali R, Mazoochi T, Khamechian T. Comparison of touch cytology and histology in diagnosing helicobacter pylori infection in gastric biopsy. Pak J Med Sci 2011;27(1):90-93

### INTRODUCTION

The role of Helicobacter Pylori (HP) in the pathogenesis of Peptic Ulcer Disease and gastric carcinogenesis is recognized.<sup>1,2</sup> Therefore detection of this pathogen in the samples obtained from the stomach of the patients and proper treatment is important. Touch cytology (TC) is introduced as a sensitive, fast and cost effective method in HP detection that can be employed in nearly all Pathology laboratories.<sup>3,4</sup> Histology method is another technique for diagnosis of HP but it takes a longer time than TC.

The aim of this study was to determine and compare the Sensitivity, Specificity, Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of TC and histology of gastric biopsy samples in detection of HP, and to define the agreement of these tests.

### METHODOLOGY

The protocol of study was reviewed and approved by the Ethical Committee of the Kashan University of Medical Sciences based on Declaration of Helsinki.

1. Hossein Sharifi, Internist, Associate Professor of Medicine, Gastroenterology Department.
2. Raika Jamali, Gastroenterologist, Assistant Professor of Medicine, Anatomical Sciences Research Center, Gastroenterology Department.
3. Tahere Mazoochi, Assistant Professor of Medicine, Anatomical Sciences Research Center.
4. Tahere Khamechian, Pathologist, Associate Professor of Medicine, Anatomical Sciences Research Center.
- 1-4: Kashan University of Medical Sciences, Kashan, Iran.

#### Correspondence:

Tahere Khamechian, MD,  
Associate Professor of Medicine,  
Anatomical Sciences Research Center,  
Kashan University of Medical Sciences,  
Kashan, Iran.  
E-mail: drj1351@yahoo.com

- \* Received for Publication: June 22, 2010
- \* Revision Received: October 23, 2010
- \* Revision Accepted: October 26, 2010

The purpose of the study and the risks and benefits of the procedures were explained to the participants and the individuals signed a detailed written informed consent to undergo the procedures necessary for the study.

Dyspeptic patients referred to gastroenterology clinic in Shahid Beheshti Kashan Hospital in 2009 that were candidate for upper gastrointestinal endoscopy were enrolled in the study. Those with the previous history of gastric surgery or cancer, using proton pump inhibitors, bismuth compounds and Antibiotics in the past four weeks were excluded from the study.

Gastrointestinal endoscopy was performed with upper gastrointestinal endoscope (Fujinon Quarea EPX-2200, Tokyo, Japan) using 5 mili gram infusion of intravenous Midazolam and local anaesthesia of pharyngeal mucosa with 10% spray of Lidocaine. At least four gastric biopsies were taken from pre-defined sites of the lesser and greater curvature of antrum.

One biopsy sample was rolled gently on a clean glass slide with the help of a needle to make TC sample. Then it was air dried and stained with Gimsa method for evaluation of HP. All the other biopsies were flattened and oriented by the muscularis mucosa side over small pieces of filter paper. These samples were immediately and completely submerged in neutral buffered formalin in clearly labelled containers. They were processed by tissue processor (Shandon Soutern, England) and embedded in paraffin wax blocks. Four micron sections were prepared by Microtome (Leitz 1512 Microtome, Germany) and stained with haematoxylin and eosin method for tissue diagnosis and Gimsa stain for detection of HP.

Considering Interobserver variability as a diagnostic bias, all the histological and touch cytology samples were evaluated by an experienced pathologist with special interest in Gastro Intestinal pathology. Histological evaluation for classification and grading of gastritis was carried out according to the "Updated Sydney System".<sup>5</sup> HP is curved, spiral or

S shaped and become violet when stained with Gimsa method. HP infection was diagnosed based on the identification of the organism in either histology or touch cytology samples. No single test was considered as the gold standard for detection of HP.

The Sensitivity, Specificity, PPV and NPV of TC and histology method in detection of HP in total sample and histological subgroups were computed. Mc Nemar's test was performed to evaluate the statistical differences of the tests in Sensitivity and Specificity. P values less than 0.05 was considered statistically significant. Kappa was calculated to define the agreement level of histology and TC method.

## RESULTS

A total of 150 participants (67 females and 83 males) were included in the study. Mean age ( $\pm$  SD) of the participants were  $46.63 \pm 5.93$  years. The frequency of HP in TC and histology method in total sample and histological subgroups are shown in Table-I.

The Sensitivity, Specificity, PPV and NPV of TC and histology method in detection of HP in total sample and histological subgroups are shown in Tables-II and III.

The Sensitivity of TC (95.65%) is statistically different from the histology method (84.78%). (P value = 0.001). The agreement of TC and histology method in detection of HP is low. (P value = 0.001, kappa = 0.373).

## DISCUSSION

The prevalence of HP was 92% in this study which is comparable to the other studies in Iran.<sup>6-10</sup> Difference in the reported prevalence is probably due to the variation of the study population in diet, race, socioeconomic status, occupation and smoking.<sup>11,12</sup> The reported prevalence of HP in the studies in United Arab Emirates, Kuwait, Jordan and Yemen is 90.39%, 96.6% 82% and 82.2% respectively which is similar to the reported prevalence of HP in Iran.<sup>13-16</sup> The prevalence of HP in this study was 100% in the histological diagnosed ulcer samples which is comparable to the prevalence of endoscopy

Table-I: The frequency of Helicobacter Pylori in touch cytology and histology method in total sample and histological subgroups.

Touch Cytology	Histology	Acute Gastritis	Chronic Gastritis	Chronic Gastritis with Intestinal Metaplasia	Ulcer	Gastric Cancer	Total
Positive	Positive	46	35	19	5	6	111
Positive	Negative	2	17	1	1	0	21
Negative	Positive	2	2	1	0	0	6
Negative	Negative	1	7	3	1	1	12
Total		51	61	24	7	7	150

Table-II: The Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of touch cytology method in detection of Helicobacter Pylori in total sample and histological subgroups.

	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Total	95.65%	100%	100%	66%
Acute Gastritis	96%	100%	100%	33%
Chronic Gastritis	96.29%	100%	100%	77.7%
Chronic Gastritis with Intestinal Metaplasia	95.23%	100%	100%	75%
Ulcer	85.71%	*	100%	*
Gastric Cancer	100%	100%	100%	100%

\* Calculation was impossible due to insufficient number of patients in ulcer group.

diagnosed peptic ulcers in the study of Hashemi et al, (81.36%) in Iran.<sup>17</sup> The prevalence of HP in this study was 98.03% in acute gastritis, 88.52% in chronic gastritis, 87.5% in chronic gastritis with intestinal metaplasia and 85.71% in gastric cancer samples. HP induces acute gastritis which progress to chronic gastritis with loss of acid secretion and then to metaplasia, dysplasia and cancer.<sup>18-20</sup>

Progression of gastritis together with decreasing the acidity of stomach leads to inappropriate environment for the persistence of HP infection.<sup>21</sup> In this study the prevalence of HP is greatest in acute gastritis and become lower in chronic gastritis and shows the least frequency in the gastric cancer samples which is consistent with the above mentioned natural course of HP infection in the stomach. In the study of Trevisani et al, in 238 dyspeptic patients sensitivity of TC and histology method was 100% and 94.9% respectively. The specificity of TC and histology method was 96.4% and 100% respectively. This study concluded that TC is better than histology for detection of HP due to cost effectiveness, higher sensitivity and faster technique, when the histological information is not necessary. In gastric ulcers that histological data is needed TC can be used as an additive method to histology to increase the sensitivity.<sup>22</sup>

Considering the existence of HP in mucus layer or deep beneath the mucus layer, sometimes when preparing the histological samples, the HP can not be well appeared and detected, especially when the amount of the organism is low. Detection of HP is difficult when the background of the slides is dirty in TC method.<sup>22,23</sup> Kaur et al, study on 150 dyspeptic patients showed the Sensitivity, Specificity, PPV and NPV of 83.3%, 100%, 100% and 98.6% in TC method for detection of HP. Considering the limitations of

Table-III: The Sensitivity, Specificity, Positive Predictive Value and Negative Predictive Value of histology method in detection of Helicobacter Pylori in total sample and histological subgroups.

	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Total	84.78%	100%	100%	36.36%
Acute Gastritis	96%	100%	100%	33%
Chronic Gastritis	68.5%	100%	100%	29%
Chronic Gastritis with Intestinal Metaplasia	95.23%	100%	100%	75%
Ulcer	85.71%	*	100%	*
Gastric Cancer	100%	100%	100%	100%

\* Calculation was impossible due to insufficient number of patients in ulcer group.

these methods alone in detection of HP, this study proposed using both methods to increase the sensitivity of HP detection especially when the amount of the organism is low in gastric samples.<sup>24,25</sup>

In the study of Hashemi et al, in 100 dyspeptic patients the Sensitivity, Specificity, PPV and NPV of TC method for detection of HP was 91.3%, 74.07%, 75% and 90.9% respectively, while Sensitivity, Specificity, PPV and NPV was 100%, 74%, 90.2% and 100% in histology method respectively. This study concluded that the accuracy of TC method for detection of HP is depended on the staining method, experience of the pathologist and preparation technique. In this study the highest sensitivity and specificity was seen in Wright staining method (97.83% and 88.89%) and the lowest was seen in Papanicolaou staining method (86.96% and 70.37%).<sup>26</sup>

The Sensitivity of TC method for detection of HP was between 75.8% to 97% and the Specificity is between 83.6% to 100% in the previous studies which is comparable with our results.<sup>27-30</sup> In this study the Sensitivity of TC is higher than the histology method. The lower Sensitivity of the histology method is probably due to the preparation technique which had limitations in showing the organism as mentioned above. In this study all the samples were evaluated by a single expert pathologist to exclude the Interobserver variability bias.

Considering the higher sensitivity, cost effectiveness, easier technique and equal specificity of TC compared with histology, it is recommended to use this method for detection of HP when the histological information is not necessary. In cases of gastric ulcers that histological data regarding dysplasia and cancer is of importance, adding the TC to histology increase the sensitivity for detection of HP.

## ACKNOWLEDGMENT

The authors would extend their gratitude to Dr. Seyyed Alireza Moravveji from Kashan University of Medical Sciences as the participating investigator and the staff of the gastrointestinal endoscopy clinic and pathology laboratory of Shahid Beheshti Kashan Hospital for their special help and support of this study.

*Authors Contribution:* Dr. Sharifi and Dr. Khamechian designed the study. Dr. Sharifi and Dr. Jamali performed the endoscopies and gastric biopsies. Dr. Khamechian studied the pathological and cytological samples. Dr. Jamali and Dr. Mazoochi collected and analyzed the data and wrote the draft. All the authors approved the final version for publishing.

## REFERENCES

- Correa P, Houghton J. Carcinogenesis of Helicobacter pylori. *Gastroenterology* 2007;133:659-672.
- Lai LH, Sung JJ. Helicobacter pylori and benign upper digestive disease. *Best Pract Res Clin Gastroenterol* 2007;21:261-279.
- Stromar IK, Jakic-Razumovic J, Knezevic-Obad A. Imprint cytology of gastric mucosa biopsy-fast, simple and reliable method for detection of Helicobacter pylori infection. *Coll Antropol* 2008;32:171-175.
- Saksena S, Dasarathy S, Verma K, Ahuja V, Sharma MP. Evaluation of endoscopy-based diagnostic methods for the detection of Helicobacter pylori. *Indian J Gastroenterol* 2000;19(2):61-63.
- Dixon MF, Genta RM, Yardley JH, Correa P. Classification and grading of gastritis. The updated Sydney System. International Workshop on the Histopathology of Gastritis, Houston 1994. *Am J Surg Pathol* 1996;20:1161-1181.
- Malekzadeh R, Sotoudeh M, Derakhshan MH, Mikaeli J, Yazdanbod A, Merat S, et al. Prevalence of gastric precancerous lesions in Ardabil, a high incidence province for gastric adenocarcinoma in the northwest of Iran. *J Clin Pathol* 2004;57:37-42.
- Asl MK, Nasri H. Prevalence of Helicobacter pylori infection in maintenance hemodialysis patients with non-ulcer dyspepsia. *Saudi J Kidney Dis Transpl* 2009;20:223-226.
- Alborzi A, Soltani J, Pourabbas B, Oboodi B, Haghighat M, Hayati M, et al. Prevalence of Helicobacter pylori infection in children (south of Iran). *Diagn Microbiol Infect Dis* 2006;54:259-261.
- Massarrat S, Saberi-Firooz M, Soleimani A, Himmelmann GW, Hitzges M, Keshavarz H. Peptic ulcer disease, irritable bowel syndrome and constipation in two populations in Iran. *Eur J Gastroenterol Hepatol* 1995;7:427-433.
- Bafandeh Y, Esmaeeli H, Aharizad S. Helicobacter pylori infection rates in duodenal ulcer patients in a population with high prevalence of infection. *Indian J Gastroenterol* 2005;24:130.
- Singh V, Trikha B, Nain CK, Singh K, Vaiphei K. Epidemiology of Helicobacter pylori and peptic ulcer in India. *J Gastroenterol Hepatol* 2002;17:659-665.
- Perez-Perez GI, Rothenbacher D, Brenner H. Epidemiology of Helicobacter pylori infection. *Helicobacter* 2004;9(Suppl 1):1-6.
- Zaitoun AM. Histological study of chronic gastritis from the United Arab Emirates using the Sydney system of classification. *J Clin Pathol* 1994;47:810-815.
- Britt DP, Barakat MH, Tunekar MF, Painchaud SM, Adlouni M, Kern K, et al. Helicobacter pylori in dyspeptic patients in Kuwait. *J Clin Pathol* 1990;43:987-991.
- Bani-Hani KE, Hammouri SM. Prevalence of Helicobacter pylori in Northern Jordan. Endoscopy based study. *Saudi Med J* 2001;22:843-847.
- Gunaid AA, Hassan NA, Murray-Lyon I. Prevalence and risk factors for Helicobacter pylori infection among Yemeni dyspeptic patients. *Saudi Med J* 2003;24:512-517.
- Hashemi MR, Rahnavardi M, Bikdeli B, Zahedani MD. H pylori infection among 1000 southern Iranian dyspeptic patients. *World J Gastroenterol* 2006;12:5479-5482.
- Inoue M, Tajima K, Matsuura A, Suzuki T, Nakamura T, Ohashi K, et al. Severity of chronic atrophic gastritis and subsequent gastric cancer occurrence: A 10-year prospective cohort study in Japan. *Cancer Lett* 2000;161(1):105-112.
- Ohata H, Kitauchi S, Yoshimura N, Mugitani K, Iwane M, Nakamura H, et al. Progression of chronic atrophic gastritis associated with Helicobacter pylori infection increases risk of gastric cancer. *Int J Cancer* 2004;109:138-143.
- Sipponen P, Graham DY. Importance of atrophic gastritis in diagnostics and prevention of gastric cancer: Application of plasma biomarkers. *Scand J Gastroenterol* 2007;42:2-10.
- Katellaris PH, Seow F, Lin BP, Napoli J, Ngu MC, Jones DB. Effect of age, Helicobacter pylori infection, and gastritis with atrophy on serum gastrin and gastric acid secretion in healthy men. *Gut* 1993;34:1032-1037.
- Trevisani L, Sartori S, Ruina M, Caselli M, Abbasciano V, Grandi E, et al. Touch cytology. A reliable and cost-effective method for diagnosis of Helicobacter pylori infection. *Dig Dis Sci* 1997;42:2299-2303.
- Debongnie JC, Donnay M, Mairesse J. Gastrospirillum hominis ("Helicobacter heilmannii"): A cause of gastritis, sometimes transient, better diagnosed by touch cytology? *Am J Gastroenterol* 1995;90:411-416.
- Kaur G, Madhavan M, Basri AH, Sain AH, Hussain MS, Yatiban MK, et al. Rapid diagnosis of Helicobacter pylori infection in gastric imprint smears. *Southeast Asian J Trop Med Public Health* 2004;35:676-680.
- Debongnie JC, Mairesse J, Donnay M, Dekoninck X. Touch cytology. A quick, simple, sensitive screening test in the diagnosis of infections of the gastrointestinal mucosa. *Arch Pathol Lab Med* 1994;118:1115-1118.
- Hashemi MR, Rahnavardi M, Bikdeli B, Zahedani MD, Iranmanesh F. Touch cytology in diagnosing Helicobacter pylori: Comparison of four staining methods. *Cytopathology* 2008;19:179-184.
- Soto OA, Martinez CM, Espinosa FL, Vargas GA, Medina RS, Figueroa SA, et al. Comparative study between rapid urease test, imprint and histopathological study for Helicobacter pylori diagnosis. *Rev Gastroenterol Mex* 2004;69:136-142.
- Yamamoto T. Evaluation of usefulness of touch smear cytology for the diagnosis of Helicobacter pylori infection. *Kansenshogaku Zasshi* 2001;75:856-862.
- Senturk O, Canturk Z, Cetinarslan B, Ercin C, Hulagu S, Canturk NZ. Prevalence and comparisons of five different diagnostic methods for Helicobacter pylori in diabetic patients. *Endocr Res* 2001;27:179-189.
- Tokunaga Y, Shirahase H, Yamamoto E, Inao R, Hamaguchi S, Kanaji K, et al. Modified rapid urease test for Helicobacter pylori detection in relation to an immunohistochemical stain. *J Gastroenterol Hepatol* 2000;15:617-621.