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Comparison of Two Rapid Whole-Blood Tests for *Helicobacter pylori* Infection in Chinese Patients

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Consecutive Chinese patients undergoing endoscopy for dyspepsia were tested for *Helicobacter pylori* infection by two rapid whole-blood tests: FlexPack HP (Abbott Laboratories) and Helisal One-Step (Cortecs Diagnostics). Biopsy-based tests (rapid urease test and histology) and the [^{13}C]urea breath test were used as the "gold standard." One hundred sixty-one consecutive patients were studied, and 88 (54.7%) were confirmed to have *H. pylori* infection. The sensitivities, specificities, and positive and negative predictive values were 81.8%, 83.6% ($P = 0.008$), 85.7% ($P = 0.04$), and 79.2% for FlexPack HP and 84.1%, 63.0% ($P = 0.008$), 73.3% ($P = 0.047$), and 76.7% for Helisal One-Step, respectively.

With increasing public awareness of the role of *Helicobacter pylori* in gastrodudoenal diseases, many patients are seeking treatment from their primary care physicians. Screening young dyspeptic patients for *H. pylori* by serology has been shown to reduce the need for endoscopy without missing significant disease in Western countries (15, 17). Conventional noninvasive tests such as enzyme-linked immunosorbent assay (ELISA) and urea breath test require laboratory support and are not widely available in primary care settings. Recently, commercial rapid whole-blood tests for *H. pylori* have been introduced. These tests do not require separation of serum, and results are available within minutes. Preliminary studies showed that these commercial kits may be as accurate as laboratory-based serology tests (6, 10). However, data on direct comparison of different commercial kits are lacking.

Due to the antigenic heterogeneity of *H. pylori*, the performance of commercial serology tests varies considerably among different populations (3, 9). To date, most published data have been based on Western populations (2, 4–6, 8, 10, 11, 13, 14, 16, 18). Whether these results can be reproduced in Asians remains unknown. The aim of our study was to compare the performance of two rapid whole-blood tests, FlexPack HP (Abbott Laboratories, North Chicago, Ill.) and Helisal One-Step (Cortecs Diagnostics, Deeside, United Kingdom) in Chinese patients with dyspepsia.

Consecutive ethnic Chinese patients undergoing endoscopy for dyspepsia in the Endoscopy Center of the Prince of Wales Hospital were enrolled. Exclusion criteria included (i) patients younger than 18 years, (ii) previous gastric surgery, (iii) previous antihelicobacter therapy, and (iv) current use of antibiotics or proton pump inhibitors. Informed consent was obtained from all patients for the study. Three biopsy specimens from the antrum and two specimens from the corpus were taken at the time of endoscopy for the determination of *H. pylori* status. One antral biopsy was used for the rapid urease test (CLO test; Delta West, Western Australia), and the other specimens were processed for histological examination by hematoxylin and eosin stain. The pathologists were blinded to the endoscopic findings and the results of rapid urease test. [^{13}C]urea breath test, performed on the same day of endoscopy, was used as the third reference test. Diagnosis of *H. pylori* infection was confirmed if at least two of the three tests (rapid urease test, histology, and [^{13}C]urea breath test) were positive.

Whole-blood samples were obtained from patients prior to endoscopy for testing by FlexPack HP (Abbott Laboratories) and Helisal One-step (Cortecs Diagnostics) diagnostic tests. All test kits were stored at 4°C and equilibrated to room temperature before use. The tests were performed with strict adherence with the manufacturer's instructions. Results were read at 5 min for Helisal One-Step and at 4 min for FlexPack HP. For both test kits, the appearance of two distinct lines was treated as positive, a single control line represented a negative result, and the absence of any line indicated an invalid test. The presence of a faint line in the expected positive position was also regarded as a positive result. To avoid interobserver variation, a single observer who was unaware of the sample identification, endoscopy findings, and the results of the urea breath test, read all the rapid whole-blood test results. Sensitivity, specificity, and positive and negative predictive values (PPV and NPV, respectively) of each test were calculated with 95% confidence intervals, with the reference tests used as the "gold standard." Pearson's chi-square and Fisher's exact test were used for statistical analysis when appropriate. A P value of less than 0.05 was considered statistically significant.

One hundred sixty-one patients (76 male, 85 female) were studied. The patients' mean age was 49 years (range, 19 to 90). Eighty-eight (54.7%) patients were confirmed to be *H. pylori* positive based on at least two positive results by rapid urease test, histology, and [^{13}C]urea breath test. Eleven (6.8%) patients had duodenal ulcers, 8 (5.0%) had gastric ulcers, 40 (24.8%) had gastritis or duodenitis, and 11 (6.8%) had gastroduodenal erosions. Of the 19 patients diagnosed with peptic ulcers, 17 (89.5%), including 9 duodenal ulcers and 8 gastric ulcers, were *H. pylori* positive. The sensitivity, specificity, PPV, and NPV of the two rapid whole-blood tests are shown in Table 1. The sensitivities of FlexPack HP (81.8%) and Helisal One-Step (84.1%) were comparable. The specificity of FlexPack HP (83.6%) was significantly better than that of Helisal One-Step (63%) ($P = 0.008$). As a result, the PPV of FlexPack HP was significantly higher (85.7 versus 73.3%) ($P = 0.047$). Poor readability, manifested as faintly positive results, was

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TABLE 1. Performance of two rapid whole-blood tests for *H. pylori*

Test and CI[a]	Sensitivity (%)	Specificity (%)	Predictive value (%)	
			Positive	Negative
FlexPack HP	81.8	83.6[b]	85.7[c]	79.2
95% CI	72.2–89.2	73.1–91.2	76.4–92.4	68.5–87.6
Helisal One-Step	84.1	63.0[b]	73.3[c]	76.7
95% CI	74.8–91.0	50.9–74.0	63.5–81.6	64.0–86.6

[a] CI, confidence interval.
[b] $P = 0.008$.
[c] $P = 0.047$.

more frequent by Helisal One-Step (42.6%, 43 of 101) than FlexPack HP (21.4%, 18 of 84) ($P = 0.004$). Among the 17 patients with *H. pylori*-associated peptic ulcers, false-negative serology was encountered in 3 (17.6%) patients by Helisal One-Step and 2 (11.8%) by FlexPack HP.

This is the first direct comparison of two rapid whole-blood tests for *H. pylori*. Although the sensitivities of FlexPack HP and Helisal One-Step were comparable, the specificity of Helisal One-Step was significantly lower. With the sample size of the present study, we were able to detect a 20% difference in specificity with a statistical power of 80%. Nevertheless, the overall performance of the two tests in Chinese patients was inferior to that in published data from the West, which reported sensitivities of 83 to 96% and specificities of 70 to 93% (2, 4–6, 8, 10, 11, 13, 14, 16, 18). The discrepancy between Western and Asian populations in the performance of commercial serology tests for *H. pylori* was previously reported (3, 12, 18). A study from Thailand showed that a commercial ELISA (Pylori Stat; BioWhittaker, Walkerville, Md.) was inferior to an in-house ELISA developed from local *H. pylori* strains (3). Our experience with commercial ELISAs (both first- and second-generation tests) in a group of Chinese patients was also disappointing (12). A recent study from Britain evaluated the performance of the Helisal rapid blood test between two groups of European and South Asian patients (18). The authors reported unexpectedly poor results in Asian patients (sensitivity, 79 to 81% versus 93 to 96%; specificity, 42 to 50% versus 57 to 64%) despite a higher prevalence of *H. pylori* infection.

The reasons for these discrepant results are unclear. The poor sensitivity may be accounted for by the considerable antigenic heterogeneity of *H. pylori*. Strains that prevail in Asia may exhibit different antigenic properties from those of the Western world. By using bacterial isolates and sera from different continents, Hook-Nikanne et al. demonstrated that antigens prepared from individual bacterial strains obtained from North America and China were not sensitive enough for serological detection of *H. pylori* in a heterogeneous population (9). This phenomenon may be overcome by using pools of bacterial strains obtained from different ethnic groups. On the other hand, the high carriage of other cross-reacting intestinal pathogens in developing countries, such as *Campylobacter* species, may produce false-positive serological results (8). Moreover, the inadvertent use of antibiotics for respiratory and intestinal infections in the community, which may inhibit or even eradicate *H. pylori*, may also contribute to these discrepancies. Since antibody can persist in serum long after eradication, serological results may be false positive.

In North America and Europe, the screen-and-treat strategy has been adopted for the management of dyspepsia (1, 7). Serology, being more widely accessible than the urea breath test, is likely to become more popular for this purpose. However, we found that 12 to 18% of *H. pylori*-associated peptic ulcers would have been missed had endoscopy been withheld in these Chinese patients with negative rapid whole-blood tests. Furthermore, the risk of missing young patients with gastric cancer has not yet been considered.

In conclusion, FlexPack HP is superior to Helisal One-Step for diagnosing *H. pylori* infection in Chinese patients. However, the performance of these rapid whole-blood tests is still far from ideal, and more accurate office-based serology tests are needed in Asia.

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