A Comparison of *H. Pylori* Detection Methods

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Background

- *Helicobacter pylori* (H. Pylori) is estimated to infect over 50% of the world's population and can lead to gastric malignancies if left untreated[1,2].
    - High in developing countries
    - 36% in the United States
- Symptoms:
    - Chronic gastritis
    - Peptic ulceration
    - Asymptomatic
- The American Cancer Society estimates 26,000 gastric cancer cases will occur within the United States in 2021.
- Diagnosis
    - Invasive – relies on biopsy
    - Non-invasive
        - Currently, issue is doing both histology and biochemistry jointly which proves redundant and costly[4].
- With modern clinical organizations constantly searching for ways to decrease expenses, standardizing a testing plan that maximizes cost-effectiveness and increases diagnostic accuracy would prove financially advantageous

Objective

- To evaluate the efficacy of *H. pylori* invasive detection methods: stained biopsy and Rapid Urease test [RUT])

Methods

- 200 patients (100 H. pylori + and 100 H. pylori -) from a single institution that underwent gastric biopsies between June 2016-December 2017 were retrospectively evaluated.
- Exclusion criteria:
- Demographics and clinicopathologic data were collected including diagnostic tests performed, treatment, and outcomes

Diagnostic Testing Methods

- *Stained biopsy*: samples were submerged in 10% formalin solution and sent for anaylsis. Paraffin embedded, 8 µm sections were collected for microscopic analyses by pathology consultants affiliated with the institution.
- *Rapid Urease Test*: performed via the hpFast®
- *Stool Antigen Test:* tested using Premier Platinum HpSA PLUS®
- *Urea Breath Test*: performed via BreathTek® administered by a healthcare professional

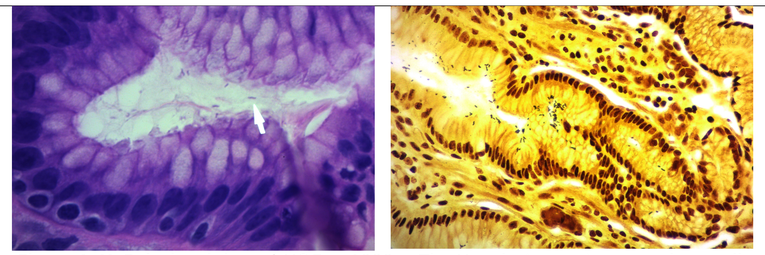


Figure 1. H. Pylori staining. a) H&E at 1000x - The H. pylori organisms are the small, slightly corkscrew appearing forms along the surface of the foveolar epithelium. **b)**Warthin Starry stain at 400x - The H. pylori organisms stain black with Warthin Starry.

Results

Table 1: Demographics

	Total (n =200)	H. Pylori + (n = 100)	H. Pylori - (n=100)	P-value
Age (mean)	52	55	49	**0.0236**
Gender				**.0919**
Male	76 (38%)	44 (44%)	32 (32%)	
Female	124 (62%)	56 (56%)	68 (68%)	
Race				**<0.001**
White	123 (61.5%)	47 (47%)	76 (76%)	
Black	51 (25.5%)	34 (34%)	17 (17%)	
Hispanic	19 (9.5%)	12 (15%)	7 (7%)	
Other	7 (3.5%)	7 (7%)	0 (0%)	
PPI history				
>2 weeks	11	9 (9%)	2 (2%)	.0614
<2 weeks	112	57 (57%)	55 (55%)	

Table 2: Efficacy of Biopsy vs. RUT

		Histology +	Histology -	P-value
RUT Result (n=73)	Positive	37 (92.5%)	3 (7.5%)	**<0.0001**
	Negative	2 (6.1%)	31 (93.9%)	

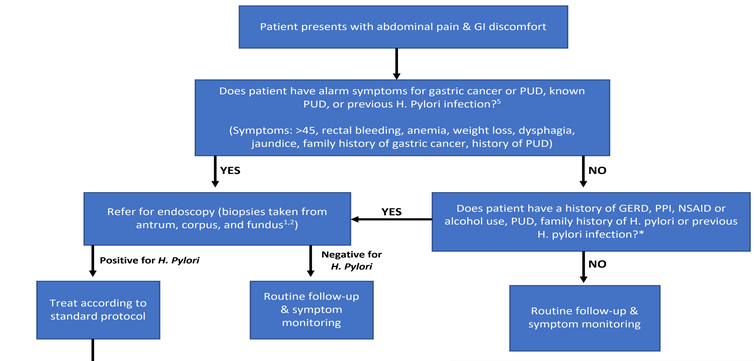
Table 3: Post-Treatment Testing

	Total (n = 200)	H. Pylori + (n=100)	H. Pylori - (n=100)	P-value
Histology	**n=26**	**n=9**	**n=17**	0.0748
Positive	4 (15%)	3 (33%)	1 (6%)	
Negative	22 (85%)	6 (67%)	16 (94%)	
RU	**n=10**	**n=3**	**n=7**	0.1288
Positive	1 (10%)	1 (33%)	0 (0%)	
Negative	9 (90%)	2 (67%)	7 (100%)	
Stool antigen	**n=40**	**n=38**	**n=2**	0.6812
Positive	3 (8%)	3 (8%)	0 (0%)	
Negative	37 (92%)	35 (92%)	2 (100%)	
UBT	**n=12**	**n=10**	**n=2**	0.6000
Positive	4 (33%)	3 (30%)	1 (50%)	
Negative	8 (67%)	7 (70%)	1 (50%)	

Conclusions

- Historically, the gold standard of diagnosis for H. pylori is stained biopsy (sensitivity and specificity >95%)[5,6]
- Sensitivity of stained biopsy and RUT impacted by: [5,6,7,8,9,10]
    - gastric location (higher densities in the upper body and greater curve of the stomach)
    - intestinal metaplasia
    - atrophic changes
    - antibiotic and PPI use
- RUT can be a false positive result from urease producing organisms or the specimen and media are in contact for over 24 hours[10].
- Our study found that the RUT had a false negative rate of 6.1% and a false positive rate of 7.1% for those that were considered H. pylori positive by stained biopsy (Table 2)
- Because the two tests have the same specificity (95%) and yield similar results, there is no efficacious reason to run both tests.
- Since histology has a greater sensitivity (>95%) and added benefit of being able to evaluate for other gastropathies, it can be considered the "gold standard" as the literature suggests.
- When H. pylori is treated and confirmed to be eradicated, gastric cancer risk decreases by approximately 44%, but post-treatment evaluation to confirm eradication is low

Testing Algorithm



[1]PPI use has been associated with the movement of H. Pylori from the antrum to fundus of the stomach [Chan, Logan].

[2]Recommend being off PPI 2 weeks prior to diagnostic and post-treatment testing.

[3]Stool antigen test is the best non-invasive test based on sensitivity and specificity.

[4]Antibiotic resistant *H. Pylori* are more common in the US than previously reported with rates varying by geographic region. Metronidazole resistance was high in all regions and Clarithromycin resistance was higher in the East. Rifabutin (Talicia) and bismuth quadruple therapy are the only therapies currently available in the US in which *H. Pylori* resistance is rare [Hulten]. Given increasing resistance rates, post-treatment testing is crucial to determine if treatment was successful.

Testing for *H. Pylori* based on symptoms is not always accurate given many *H. Pylori* patients are asymptomatic, however, infection has been associated with PUD, dyspepsia, and GERD symptoms [Crowe, Murer]
*This is why we need to use diagnostic testing to detect infection and confirm eradication

Note: Prophylactic treatment of *H. Pylori* is being considered in some developing countries with a high prevalence of *H. Pylori*, however, more data is needed before applying to the general population

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