Diagnostic Utility of Physical Examination, History, and Laboratory Evaluation in Emergency Department Patients With Vaginal Complaints

EBEM Commentators Contact
Elma Johnson, MD
Nicole Berwald, MD

From the Department of Emergency Medicine, State University of New York, Downstate Medical Center/Kings County Hospital Center, Brooklyn, NY.

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RATIONAL CLINICAL EXAMINATION REVIEW SOURCE

This is a rational clinical examination abstract, a regular feature of the *Annals*' Evidence-Based Emergency Medicine (EBEM) series. Each features an abstract of a rational clinical examination review from the *Journal of the American Medical Association* and a commentary by an emergency physician knowledgeable in the subject area.

The source for this rational clinical examination review abstract is: Anderson MR, Klink K, Cohrssen A. The rational clinical examination: evaluation of vaginal complaints *JAMA.* 2004;291:1368-1379. The *Annals*' EBEM editors assisted in the preparation of the abstract of this rational clinical examination review, as well as selection of the Evidence-Based Medicine Teaching Points.

OBJECTIVE

To review and summarize the role of clinical features and laboratory tests useful for the diagnosis of vaginal candidiasis, bacterial vaginosis, and vaginal trichomoniasis.

DATA SOURCES

The authors report a MEDLINE search from 1966 to April 2003, combining the term "diagnosis" with the terms "vaginitis," "vaginal discharge," "candidiasis," "bacterial vaginosis," and "trichomoniasis." Included articles were examined, and the authors were contacted for additional references.

STUDY SELECTION

Studies were included if they involved original research on symptomatic patients in a primary care setting, compared a diagnostic test with a recognized criterion standard, allowed for calculation of sensitivity and specificity, and identified tests that provide diagnostic data during the office visit. Studies were excluded if they were conducted primarily in specialty or referral settings, enrolled patients with recurrent or treatment refractory vaginitis, or enrolled asymptomatic patients. A total of 18 articles met the inclusion criteria. A criterion standard was set for vaginal candidiasis, bacterial vaginosis, and vaginal trichomoniasis. Studies were graded on a 3-point scale for methodological quality. To be a level 1 study (highest quality), the following criteria had to be met: explicit inclusion and exclusion criteria, 95% or more of patients received a diagnostic evaluation, including a level 1 criterion standard; 2 or more people performed the diagnostic test; interobserver variability was measured; and normal ranges were determined for the criterion standards. Level 2 studies failed 1 or more level 1 criterion or used an alternative criterion standard. Level 3 studies failed 1 or more level 1 criterion or used *Gardnerella* culture to diagnose bacterial vaginosis, microscopy or Papanicolaou test to diagnose vaginal trichomoniasis, and microscopy for vaginal candidiasis. No studies met all level 1 criteria, 15 met level 2 criteria, and 3 met level 3 criteria.

DATA EXTRACTION AND ANALYSIS

Sensitivity, specificity, and likelihood ratios were extracted from the articles or calculated. Sensitivities and specificities were calculated by the 3 authors independently for each article. The data were verified by a fourth person and sent to the authors for verification. Because of ambiguous language and lack of standard definitions for signs and symptoms, results could not be combined for all studies and in many cases ranges of results are therefore given.

MAIN RESULTS

The authors analyzed 8 symptoms for diagnostic utility. Of these, discharge characteristics, presence or absence of itching, irritative symptoms (including erythema), odor, and self-diagnosis were useful in determining the cause of vaginal complaint. Urinary tract symptoms, bleeding, and dyspareunia were not helpful.

Several clinical signs were also evaluated. The authors found that simply finding a discharge on examination did not differentiate vaginal candidiasis, bacterial vaginosis, and vaginal trichomoniasis; discharge is found in more than 60% of patients with any of the 3 diagnoses. However, thick, flocculent, or curdy discharge is strongly predictive of vaginal candidiasis, and its absence makes vaginal candidiasis less likely. In addition, fishy odor makes vaginal candidiasis unlikely, and absence of odor makes vaginal candidiasis more likely. Inflammatory findings (eg, edema, erythema) occur with vaginal candidiasis

Table. Predictive value of vaginal complaints and findings.*

Signs and Symptoms	Positive LR (95% CI)	Negative LR (95% CI)
Vaginal candidiasis symptoms		
Cheesy discharge	2.4 (1.4–4.2)	0.48 (0.27–0.86)
Itching	1.4 (1.2–1.7) to 3.3 (2.4–4.8)	0.18 (0.05–0.70) to 0.79 (0.72–0.87)
Watery discharge	0.12 (.02–0.82)	
(Mal)odor	0.35 (0.16–0.77) to 0.48 (0.23– 1.0)	
Self-diagnosis	3.3 (1.2–9.1)	
Vaginal candidiasis signs		
Thick, flocculent, curdy discharge	2.7 (1.3–5.5) to 130 (19–960)	0.28 (0.19–0.44) to 0.86 (0.80–0.93)
Bacterial vaginosis symptoms		
(Mal)odor		0.07 (0.01–0.51)
Bacterial vaginosis signs		
Normal/mild discharge	0.11 (0.01–0.86) to 0.53 (0.37–0.75)	1.1 (1.0–1.2) to 1.8 (1.3–2.5)
Moderate discharge	2.5 (1.7–3.8)	
Profuse discharge	3.0 (0.32–28)	
Yellow discharge		
"High cheese" odor	3.2 (2.1–4.7)	0.30 (0.19–0.45)
Vaginal trichomoniasis signs		
Yellow discharge	4.1 (2.4–7.1) to 14 (6.1–31)	0.12 (0.02–0.75) to 0.46 (0.35–0.62)
Erythema or edema	6.4 (1.6–26)	

LR, Likelihood ratio.
*LR represents 1 or more sources dependent on the available reference(s) for a particular sign or symptom. Values included only for variables with LRs greater than 2.0 or less than 0.5, with CIs that do not cross 1.

and vaginal trichomoniasis. A "normal" or white discharge decreases the likelihood of bacterial vaginosis, whereas moderate to profuse, malodorous, or yellow discharge increases its likelihood. Yellow discharge also increases the likelihood of vaginal trichomoniasis. Likelihood ratios for significant symptoms and signs are presented in the Table.

In addition the authors assessed the accuracy of office laboratory tests: (1) microscopy for clue cells, yeast, and trichomonads; (2) microscopic evidence of inflammation; (3) vaginal pH; and (4) the whiff test.

Studies that were included in this rational clinical examination used different reference standards for diagnosis of the vaginal infections in question. This fact makes comparison of the presented sensitivity/specificity results difficult. With that in mind, the sensitivity of microscopy for yeast derived from the included studies ranged from 38% to 83%. Therefore, the absence of yeast on microscopy does not exclude the diagnosis. Bacilli with corkscrew motility are highly associated with bacterial vaginosis (likelihood ratio 44; 95% confidence interval [CI] 6.2 to 310) and scant or no lactobacilli make bacterial vaginosis more likely (likelihood ratio 3.1; 95% CI 2.4 to 3.9). Because clue cells are part of the diagnostic criteria for bacterial vaginosis, the authors could not comment on likelihood ratios for their presence. Finding trichomonads on wet mount makes the diagnosis of vaginal trichomoniasis, but their absence does not preclude the diagnosis. Microscopic evidence of inflammation is uncommon in vaginal candidiasis and bacterial vaginosis but may be useful in diagnosing vaginal trichomoniasis. In one study, all patients (9) with vaginal trichomoniasis had a predominance of leukocytes on microscopy. Last, although the majority of patients with vaginal candidiasis had a normal vaginal pH (59% to 96%), the data failed to show a significant difference with respect to vaginal pH for the 3 diagnoses.

CONCLUSIONS

It appears that the clinical evaluation is limited in determining the cause of vaginal complaints. Several patient characteristics can support the diagnosis of vaginal candidiasis and bacterial vaginosis; however, the likelihood ratios are not particularly strong. Few findings distinguish bacterial vaginosis and vaginal trichomonas from each other, making these diagnoses even more difficult. Furthermore, bedside tests and laboratory equipment are not readily available in all clinical settings, leaving it up to the clinician to make a diagnosis solely based on medical history and physical examination results. Despite many studies on this topic, the competence of the clinical examination to determine the cause of vaginal complaints remains ill defined.

Rational Clinical Examination Author Contact

Matthew R. Anderson, MD, MS
Montefiore Family Health Center
Bronx, NY
E-mail: andersonma@aol.com

COMMENTARY: CLINICAL IMPLICATION

Vaginal complaints top the list of all the gynecologic complaints that premenopausal female patients present with to the emergency department (ED).[1] They can be a source of significant discomfort for the patients, yet a definitive diagnosis often is not achieved, partly because definitively diagnostic

measures are inconvenient and time and labor intensive, making them infrequently performed. Given the lack of a reliable or consistent bedside diagnostic test, the contemporaneous use of clinical findings is frequently important for estimating likelihood of disease and determining treatment plans in the setting of vaginal complaints. In premenopausal women with vaginal complaints, bacterial vaginosis, vaginal candidiasis, and vaginal trichomoniasis account for the most common causes. Although more than 50% of women with bacterial vaginosis are asymptomatic, this entity is the most common cause of vaginal discharge or malodor in premenopausal women. An estimated 75% of women will have at least 1 episode of vaginal candidiasis in their life, with 40% to 45% experiencing 2 or more episodes. Finally, vaginal trichomoniasis is the most common curable sexually transmitted infection (STI) in young sexually active women.[1]

Certain criterion standards have been proposed for diagnosing these 3 common entities, which are mainly based on symptoms, signs, and microscopy. Microscopic evaluation of vaginal fluid is the mainstay of diagnosis, despite the fact that it is imperfect in detecting and identifying the cause.[2] Unfortunately, as highlighted in this systematic review and as outlined in the Table, the majority of physical examination findings and historical features also have limited value in making the diagnosis of vaginal infections. In addition, the presence of coinfections or multiple infections and the existence of apparently asymptomatic carrier states of infection add to the diagnostic and treatment dilemmas that surround vaginal complaints.

As mentioned in this review, using the qualitative and quantitative descriptions of the vaginal discharge is unreliable. The majority of women with vaginal candidiasis will have a normal vaginal pH. In addition, vaginal pH can be affected by a number of factors, including blood or semen in the vagina or presence of intravaginal medications.[2] Microscopic examination of the vaginal discharge can also be affected by contamination or by lack of operator skill.[3,4]

In light of the limitations of the diagnostic performance of physical examination, medical history, and wet mount preparations in making the diagnosis of vaginal infections, some investigators have recommended additional measures, including cultures and risk factor assessment, to help clinicians reach a diagnosis with reasonable confidence.[5]

Elucidating the role of empiric therapy, Carr et al[6] performed a cost-effectiveness evaluation of diagnostic variables and found that for patients with vaginitis symptoms undiagnosed by pelvic examination and wet mount preparations, pH-guided empiric therapy both shortens symptom duration and decreases costs. They found that a treatment and test plan that included treating patients who had a pH of less than 4.9 with a single dose of fluconazole and patients with a pH greater than 4.9 with 2 g of metronidazole or both medications while awaiting the test results was less expensive and more effective.[6]

Although conventional criteria may fail to confidently diagnose the 3 common causes of vaginitis, in the absence of a reference standard such as vaginal discharge, culture clinicians can guide their management of such patients according to the likelihood ratios of diagnostic criteria when diagnostically helpful signs and symptoms are present.

TAKE-HOME MESSAGE

Though nondiagnostic, a number of clinical findings do significantly increase and decrease the likelihood of one diagnosis over another and can therefore be used in combination to estimate probability of disease and utility of treatment during ED evaluation.

EBEM Commentator Contact

Elma Johnson, MD
Department of Emergency Medicine
State University of New York-Downstate Medical Center
Brooklyn, NY
E-mail: ejoh559752@aol.com

EBEM TEACHING POINT

Useful likelihood ratios. Classically, positive likelihood ratios are considered to be diagnostically useful when greater than 10, whereas negative likelihood ratios are considered to be diagnostically useful when less than 0.1. Very few signs and symptoms of disease, however, are associated with likelihood ratios this extreme. Likelihood ratios are a representation of the likelihood that a given test result is true (correct) rather than false (incorrect). The numerator of a positive likelihood ratio is the percentage of "true positive" test results (sensitivity), whereas the denominator is the percentage of "false positive" test results (1–specificity). Said another way, the positive likelihood ratio is a ratio of correct to incorrect positive results. Conversely, the numerator of a negative likelihood ratio is the percentage of "false negative" test results (1–sensitivity), whereas the denominator is the percentage of "true negative" results (specificity). Understood this way, one can see that likelihood ratios are precisely what their name implies: a positive likelihood ratio is a ratio of the positives (true:false), whereas a negative likelihood ratio is a ratio of the negatives (false:true).

With this understanding of what likelihood ratios are, one can see that a positive likelihood ratio suggesting that a test result is twice as likely to be true as it is to be false (positive likelihood ratio=2) may indeed be helpful to clinicians in estimating the probability of disease. Similarly, a negative likelihood ratio that demonstrates that a result is only half as likely to be false as it is to be true (negative likelihood ratio=0.5) is also potentially helpful. Therefore, signs and symptoms of disease, although infrequently diagnostic, can often contribute, particularly in a cumulative way, to estimating the likelihood of a diagnosis or enhancing the utility of a more formal imaging or laboratory test.

For example, a patient presenting to the ED with vaginal discharge may have a pretest probability of vaginal candidiasis

and bacterial vaginosis of approximately 25% each. A finding of no flocculent or curdish characteristics to the discharge can reduce the probability of vaginal candidiasis to less than 10%, whereas the presence of a malodorous discharge can increase the posttest probability of bacterial vaginosis to greater than 50%. Under most circumstances, even when taken alone these findings, although not definitively diagnostic, would be adequate to determine a course of treatment.

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