Clinical prediction of *Gardnerella vaginalis* in general practice

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SUMMARY. In a study of 162 women with vaginal symptoms the clinical features of increased discharge, yellow discharge, 'high cheese' odour and pH greater than 5 were statistically strongly associated with the presence of Gardnerella vaginalis, *confirmed by microbiological culture. The sensitivities and specificities of these clinical tests, although not as high as those of previously described sideroom tests using the amine test and microscopy for 'clue cells' nevertheless allow the clinician to predict* G. vaginalis *reliably and initiate treatment at first consultation.*

Introduction

VAGINITIS is a recurring problem in general practice; about 80 per 1000 non-pregnant adult women present with vaginal symptoms each year. Until recently approximately half of these women showed no recognizable pathogenic organism to explain their symptoms and were described as having 'non-specific vaginitis'. Gardner and Dukes described *Gardnerella vaginalis* as causing the clinical features of a grey, homogenous, odorous vaginal discharge with higher than normal pH of 5.0–5.5 and minimal vaginal inflammation.[1] *G. vaginalis* now appears to explain the symptoms of a significant proportion of patients previously described as having 'non-specific vaginitis' in general practice.[2] Yeasts, mainly *Candida albicans,* are traditionally said to cause pruritus, dyspareunia, dysuria and a curdy white discharge and the vagina may look normal or have vulvitis and vaginitis with typical cheese plaques.[3] It has also been shown that patients with both yeasts and *G. vaginalis* have more severe symptoms than those with yeasts alone.[2]

Low technology methods (sideroom techniques) of diagnosing *G. vaginalis* using the amine test, examination for 'clue cells' and measuring vaginal pH have been shown to be effective when compared with microbiological diagnosis.[4,5] However, these sideroom techniques are not widely used. In this study we have compared a set of clinical features and sideroom techniques with laboratory diagnosis to distinguish vaginitis associated with gardnerella from 'yeast vaginitis' and 'non-specific vaginitis' to assist prediction at a clinical level and to speed up diagnosis and management.

Method

The study was conducted in the practice at the Department of General Practice, University of Wales College of Medicine, in which 2609 women aged 16 years and over were registered. Two groups of non-pregnant women aged 16 years and over registered with the practice were included in the study: those who presented with vaginal symptoms and those who presented for cervical smears or family planning consultations. The doctor requested patients to see the research sister. She used a standard questionnaire to enquire about soreness, discharge, pruritus and discomfort at intercourse (both severity and duration of symptoms). Women who consulted for vaginitis had vaginal examinations and the following were recorded: soreness on examination, amount, colour and odour of discharge and vaginal pH using Duotest strips (Machery-Nagel). Swabs were taken for detailed microbiological investigation at the Public Health Laboratory Service: the details of swab procedures have been described previously.[2] A further swab was taken for the amine test and for examination of the discharge under the microscope for 'clue cells' by the practice's attached laboratory technician. Women who consulted for cervical smears or family planning were similarly examined, the presence or absence of vaginal discharge and vaginitis were noted and a simple high vaginal swab was taken for the culture of *G. vaginalis* by the laboratory.

Microbiological isolations by the Public Health Laboratory Service were taken to indicate the 'definitive diagnosis' of *G. vaginalis.* For the purposes of clinical prediction three diagnostic categories have been compared in this paper for vaginitis patients: (1) vaginitis of currently accepted pathogenic origin, that is from yeasts, *Trichomonas vaginalis, Chlamydia trachomatis* or herpes species, (2) gardnerella vaginitis, whether alone or in combination with the above pathogens and (3) non-specific vaginitis (culture negative). Two classifications have been compared for women who presented for cervical smears or family planning consultations: *G. vaginalis* positive and *G. vaginalis* negative, whether or not positive for other organisms.

Results

Women presenting with vaginitis

Two hundred and ten women consulted for vaginal symptoms during the study year (1983) and 162 of these were included in this study. Women were excluded if they presented on Friday afternoon when early transfer of specimens to the Public Health Laboratory Service was not possible, if the doctor considered immediate treatment necessary, if the doctor forgot to refer or if the research sister was on holiday. Eight-one women (50%) were *G. vaginalis* positive: *G. vaginalis* were found alone in 30 women, in combination with anaerobes in 26 and with 'known pathogens' in 25. Of the remaining women 42 (26%) were positive for other known pathogens (yeasts, *T. vaginalis, C. trachomatis,* herpes) but not for *G. vaginalis* and 39 women (24%) were culture negative (although eight of these were subsequently found to have laboratory-proven urinary tract infections).

The amount of vaginal discharge assessed by the nurse on clinical examination is compared with the microbiological findings reported by the laboratory in Table 1. Three of four patients with profuse discharge were *G. vaginalis* positive and seven of 10 patients with normal discharge were culture negative. Since few women had either profuse or normal discharge the table has been analysed as normal or mild versus moderate or profuse. Patients with *G. vaginalis* were significantly more likely to have moderate or profuse discharge (53/81) than patients with non-gardnerella organisms (16/42) who in turn were more likely to

Table 1. Discharge amount, colour and odour compared with microbiological isolations in 162 women with vaginitis.

Clinical examination	Microbiological isolations: *G. vaginalis* (*n* = 81)	Other pathogens (*n* = 42)	Culture negative (*n* = 39)
Discharge amount			
Normal	1	2	7
Mild	27	24	27
Moderate	50	15	5
Profuse	3	1	0
	χ^2 = 28.3, 2 df, $P < 0.001$		
Discharge colour			
Clear	0	0	12
White	30	32	23
Yellow	49	9	3
Green	1	1	0
Bloodstained	1	0	1
	χ^2 = 33.9, 2 df, $P < 0.001$		
'High cheese' odour			
No	18	29	32
Yes	63	13	7
	χ^2 = 43.9, 2 df, $P < 0.001$		

n = total number of women. df = degrees of freedom.

have moderate or profuse discharge than patients with negative cultures (5/39) ($P<0.001$).

The appearance of discharge was classified by the examining nurse as white in 85 (52%) patients and as yellow in 61 (38%), and her classification is compared with the microbiological findings by the laboratory in Table 1. Since only two patients had green and two bloodstained discharges the table has been analysed as clear or white versus yellow, green or bloodstained. Patients with *G. vaginalis* were significantly more likely to have yellow, green or bloodstained discharge (51/81) than patients with other organisms or patients with negative cultures ($P<0.001$). The one bloodstained discharge in a culture negative patient was from a woman who was on the oral contraceptive pill and experiencing breakthrough bleeding.

An odour similar to that of 'high cheese' was noted on clinical examination and recorded by the examining sister for 83 patients (Table 1), 63 (76%) of whom were subsequently shown to have *G. vaginalis* by the laboratory, another highly significant association ($P<0.001$). The sensitivity for *G. vaginalis* of the odour test was therefore (63/81) 78% and the specificity was (61/81) 75%.

The acidity of the vagina for 138 women with vaginitis was compared with the subsequent microbiological findings. Taking pH 5 as the 'cut-off' level, 66/74 (89%) of *G. vaginalis* positive patients had pH greater than 5 while only 9/34 (26%) of the known pathogens group and 7/30 (23%) of culture negative patients had pH greater than 5. There was a highly significant association between raised pH and absence of *G. vaginalis* (χ^2 = 62.3, 2 df, $P<0.001$).

Both the amine test and microscopy for 'clue cells' were performed by the practice technician for the last 87 consecutive patients prior to the swabs being forwarded to the laboratory. Comparison of the clinical and sociodemographic features of these 87 patients and the first 75 patients did not show any differences. The amine and 'clue cell' tests were positive in 37 of the 87 (43%) and *G. vaginalis* was recovered by the laboratory in 36 of those. The amine or 'clue cell' test was negative in 50 swabs and no gardnerella was recovered by the laboratory in 47 of these. Hence sensitivity and specificity of this combined sideroom procedure for *G. vaginalis* were 92% and 98% respectively.

Women presenting for cervical smears or family planning

One hundred and thirty eight women consulted for cervical smears or family planning and therefore were 'asymptomatic' with respect to vaginitis. *G. vaginalis* was isolated in 30 of these women: in 24 on its own and in six in combination with anaerobes. In Table 2 the amount of discharge noted on examination of the 30 *G. vaginalis* positive swabs is compared with 108 *G. vaginalis* negatives (105 culture negatives and 3 yeast positives). There were clearly fewer women in this group with abnormal discharge than in the group with vaginitis but once again there was a positive association between the amount of discharge and the presence of *G. vaginalis* when none or normal discharge was compared with mild, moderate or profuse ($P<0.001$).

The colour of the vaginal discharge of these 138 'asymptomatic' patients is also compared with the laboratory findings in Table 2. There were fewer women with coloured discharge in this group than in the vaginitis group (only six with yellow discharges) and among these 'asymptomatic' patients some discrimination between gardnerella positives and negatives was possible by distinguishing white (and coloured) discharges from clear and no discharges ($P<0.001$).

The 'high cheese' odour was recorded at clinical examination for 13 women, all gardnerella positives.

Table 2. Discharge amount, colour and odour compared with microbiological findings in 138 women who consulted for cervical smears or family planning.

Clinical examination	Microbiological isolations: *G. vaginalis* (*n* = 30)	Culture negative (*n* = 105) + yeasts (*n* = 3)
Discharge amount		
None	0	8
Normal	13	81
Mild	15	19
Moderate	2	0
Profuse	0	0
	χ^2 = 16.6, 1 df, $P < 0.001$	
Discharge colour		
None	0	8
Clear	0	51
White	25	42
Yellow	3	3
Bloodstained	2	4
	χ^2 = 24.9, 1 df, $P < 0.001$	
'High cheese' odour		
No	17	108
Yes	13	0

n = total number of women. df = degrees of freedom.

Discussion

The combination of the amine test and microscopic examination of discharge for 'clue cells' correctly identified 98% of *G. vaginalis* positives and 92% of *G. vaginalis* negatives among vaginitis patients. This is a thoroughly satisfactory sideroom procedure employing low technology, which gives results almost as reliable as microbiological culture itself.[5] Since 50% of vaginitis patients in this general practice study were *G. vaginalis* positive, there would be a clear case for routinely employing the amine test and microscopy for 'clue cells' for all patients presenting with vaginitis to facilitate early diagnosis, to identify patients with *G. vaginalis* at their first consultation and consequently to initiate gardnerella-specific treatment at the first consultation.

The clinical observations of discharge amount and colour provide the clinician with indications of the likely presence of *G. vaginalis,* should he or she wish to be selective in the use of the amine test and 'clue cell' examination. Increased discharge and yellow discharge are both present more often among patients with *G. vaginalis* positive swabs than among those with swabs showing either other pathogens or no pathogens. Gardner and Dukes originally described the discharge colour as grey but we felt that the colour was either yellow or, less often, white and patients themselves corroborate this description. More specifically, vaginal pH and discharge odour may be considered as tests for gardnerella, employing lower technology than the sideroom procedures. For vaginal pH, taking pH 5 as the discriminating level, this test alone demonstrated 89% sensitivity and 75% specificity in the series of patients studied. Similarly the 'high cheese' odour alone demonstrated 78% sensitivity and 75% specificity.

Gardner and Dukes described a malodorous discharge; we felt that 'high cheese' was a more specific description and of more benefit to the clinician. The 'high cheese' test would appear to be the analogue of the amine test and is probably measuring the same phenomena: the identification of the diamines, putrescine and cadaverine. This clinical test can give results even more quickly than the sideroom procedure albeit with somewhat greater error. Consequently the doctor can diagnose and treat gardnerella at the first consultation for vaginitis with reasonable accuracy on clinical grounds alone.

It will be appreciated that we have simplified a complex clinico-microbiological problem first into a 'three disease' model — pathogen vaginitis, gardnerella vaginitis and non-specific vaginitis — and then further into an over-simple two-state model — *G. vaginalis* positive or negative. We have shown that *G. vaginalis* is identifiable by low technology or clinical tests whether or not other organisms are present. We have shown elsewhere that *G. vaginalis* contributes to symptomatology whether or not other known pathogens exist and whether or not the patients originally present with vaginitis or for some other consultation (cervical smear or family planning).[2] Therefore we suggest that it is clinically appropriate to diagnose and treat gardnerella vaginitis when it presents.

The data on vaginally 'asymptomatic' women has been included to illustrate the potential for opportunistic diagnosis. Discharge amount, colour and soreness on vaginal examination were affected by the presence of *G. vaginalis* among women who originally consulted for cervical smears or family planning. There would appear to be scope for the clinician who smells 'high cheese' on pelvic examination, to enquire further as to whether the patient was covertly seeking a consultation about vaginal discharge and whether there is treatable vaginitis.

In conclusion any test, regardless of its degree of sophistication, requires skill in its execution. We have shown that our practice technician can detect *G. vaginalis* using the amine test and 'clue cell' examination with a high degree of accuracy in one series of vaginitis patients and furthermore that our research nurse can predict many *G. vaginalis* colonizations on the basis of vaginal pH and discharge odour. The amine test and 'clue cell' examination are not difficult techniques to learn. The sense of smell may be more subtle and may require practice. The replicability of these tests should be studied in other practices, by other observers. Nevertheless we consider that these are clinical skills that could be learnt, that they would reduce the number of patients wrongly diagnosed as having 'non-specific vaginitis' and would increase the number of patients satisfactorily diagnosed at their first consultation.

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