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Vaginal Discharge: An Approach to Diagnosis and Management

SUMMARY

Vaginal discharge is a frequent presenting complaint in an office practice. The authors of this article review the most common causes of this condition, namely Candidiasis, Trichimoniasis, and Bacterial Vaginosis (Gardnerella), as well as the more serious causes, namely gonorrhea, chlamydia, and Herpes simplex. Symptoms and physical signs are generally insufficient to distinguish specific etiologic agents and, as treatment for each is different, diagnostic examination of smears in the office is critical to the management of these patients. A clinical approach and method of office diagnosis is described. (*Can Fam Physician* 1987; 33:1847–1852.)

RÉSUMÉ

Les pertes vaginales constituent une complainte de présentation fréquente au bureau du médecin. Les auteurs de cet article examinent les causes les plus fréquentes de cette condition, nommément la candidose, la trichomonase et la vaginose bactérienne (Gardnerella), de même que les causes plus sévères telles la gonnorhée, le chlamydia et l'herpès. Les symptômes et les signes physiques sont généralement insuffisants pour pouvoir différencier les agents étiologiques spécifiques et, comme chacun exige un traitement différent, l'examèn diagnostique des frottis faits au bureau devient l'élément clé du traitement de ces patientes. L'article décrit une approche clinique et une méthode permettant d'établir le diagnostic au bureau.

Key words: vaginal discharge

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THE COMPLAINT of vaginal discharge is a common presenting problem in any physician's office. It can be quite bothersome to the patient. It is present in the vast majority of women during their reproductive years, and the distress it causes is usually extremely subjective. Some patients are annoyed by the slightest amount of discharge, while others make no complaints in spite of marked discharge. This subjectivity makes it difficult to evaluate the degree to which the amount and the quality of discharge affect the patient's well-being. Therefore the physician must estimate the parameters of the condition's effect and tailor the treatment to the individual.[1] There is strong temptation to treat solely on the basis of clinical appearance, without confirmation through laboratory tests and cultures, but this approach may result in recurrence of the condition and treatment failures. In this review, we shall outline the causes of vaginal discharge and describe a step-by-step approach to accurate diagnosis and effective treatment.

When considering the causes of vaginal discharge, it is useful first to distinguish between non-infectious and infectious causes. (See Table 1.)

Non-Infectious Causes

Physiological changes throughout the menstrual cycle may produce secretions from the cervix and vagina which can cause vaginal discharge. Following menstruation, there may be a brownish discharge which is likely to represent old endometrial blood, and this may be difficult to distinguish from a discharge caused by a vaginal infection. In the normal cycle, there is noticeable dryness of the vagina shortly after menses stop. Then, under the influence of rising estrogen levels, the cervical glands secrete an increasing amount of clear mucous. The mucous is usually maximal on the day preceeding ovulation. After ovulation, the mucous becomes viscous and disappears, and a whitish, clear discharge

may appear during the secretory phase because of the influence of progesterone. Then the next period begins, and the cycle starts again.[2] Other physiological changes influenced by hormonal fluctuations that alter vaginal mucous include puberty, pregnancy, and menopause.[3] These conditions may affect both the volume and composition of vaginal mucous. Sexual activity may also result in the introduction of semen and the transient appearance of bacteria from the penile skin and the patient's perineum and vulva, which may cause a temporary vaginal discharge.

Non-physiological causes of vaginal discharge include foreign bodies (retained tampons are the most common), douches using perfumed or disinfectant additives, pessaries and spermicides. One must also rule out gynecologic abnormalities which can cause increased vaginal secretions; these include cervical erosions, fistulae, and cancer of the cervix, vagina and endometrium.[3]

Infectious Causes

In the overwhelming majority of cases vaginal discharge is caused by Candida albicans, Trichimonas vaginalis, and Gardnerella vaginalis.[3, 4] Other more serious, but less common, pathogens include Neisseria gonorrhea, Chlamydia trachomatis, and Herpes simplex virus. For effective treatment of any of these organisms, precise identification is essential, especially since symptoms of discharge, itchiness and irritation are common to all of these infections.

Candidiasis

Candida species are the most common cause of symptomatic vaginal discharge.[4] Candida albicans is the predominant yeast isolated from the vagina in these infections, accounting for 80%–90% of all cultures; Torulopsis glabrata and other candida species follow.[5] There is some controversy as to whether vaginal candidiasis should be considered a sexually transmitted infection.[6] Candida organisms are commonly found as part of the vaginal flora and can be cultured in anywhere from 22% of assymptomatic women to 39% of women with symptoms of vulvovaginitis. There are several host factors that are commonly associated with Candida infections, including such endogenous factors as glucosuria, diabetes mellitus, pregnancy, obesity, and exogenous factors such as recent use of antibiotics, corticosteroids, or immunosuppressive agents.[6] The use of oral contraceptives as a predisposing factor to the development of colonization with yeast remains controversial.[4] The data supporting rectal carriage and sexual transmission as sources of recurrent infection are inconclusive.[7] Despite elimination of all predisposing factors, some women continue to experience episodes of recurrent, symptomatic, vaginal candidiasis. Identification and strain-differentiation techniques suggest that persistence of organisms in low numbers in the vagina following treatment may be responsible for many of these recurrences.[6–8]

The cardinal symptoms of vaginal candidiasis are pruritus and vaginal burning, usually with increased vaginal discharge. Dysuria and dyspareunia may be reported, especially in those women whose pruritus is so intense that scratching has led to excoriation of the skin with secondary bacterial infection.[3] The main signs are those of vulvovaginal erythema (which may extend to the perineal area), vulvar edema, and fissuring. Infected secretions may vary in colour and consistency, but are commonly white or cream-coloured and curdy, resembling cottage cheese. Plaques of discharge often adhere to the inflamed vaginal wall, and a vague but inoffensive odour may be noticed. Male partners of infected women are often assymptomatic, but may present with balanitis.

Table 1
Causes of Vaginal Discharge

Non-infectious Causes
Physiological
Puberty
Menstrual cycle
Sexual activity
Pregnancy
Menopause
Non-Physiological
Foreign body
Chemical
Drug induced
Gynecologic abnormalities
Infectious Causes
Vaginal
Candida species
Trichimonas vaginalis
Bacterial vaginosis (formerly nonspecific vaginitis)
Cervical
Neisserria gonorrhea
Chlamydia trachomatis
Herpes simplex virus

The diagnosis of vaginal candidiasis can be made by examination of vaginal secretions or scrapings of the vaginal walls by direct microscopy. By adding a drop of 10% potassium hydroxide to a drop of secretion, the physician may observe the typical mycelis or pseudohyphae.[9] Cultures may also confirm the diagnosis. The vaginal pH is usually less than 4.5.[9, 10]

Treatment of this condition can be frustrating. The current recommended regimens are shown in Table 2. Relief of symptoms and eradication of the yeast can be achieved in anywhere from 50%–90% of patients, but recurrence is common.[11] The traditional approach has been the intervaginal use of antifungal agents in the form of suppositories, ointments, or creams. Several commercially available preparations are prescribed, and the most frequently prescribed of these miconazole, nystatin and clotrimazole. The recommended duration of treatment is seven to 14 days. Nystatin requires a full 14-day course to be effective; it is the only safe treatment in pregnancy.[4] Gentian violet (0.5%) provides dramatic relief in many patients with severe pruritus and vulvar irritation. Oral ketoconizole has recently become available, and the recommended dose is 200 mg twice a day for five days; its estimated efficacy is 90%.[12] When a single course of therapy is unsuccessful and/or the patient relapses following discontinuation of treatment, a second course of an alternate vaginal preparation for prolonged treatment periods may be successful.[13] Intermittent ketoconizole prophylaxis following an initial course of treatment has been shown to be an effective method of reducing recurrences in up to 40% of women with recurrent disease.[13] Other predisposing factors should be eliminated when possible, and sexual partners should be treated, especially those of women with recurrent infections, though the current literature fails to document any benefit from this approach.[7, 12]

Trichimoniasis

Trichimonas vaginalis is a flagellated protozoan that attaches to mucous membranes by means of pseu-

dopods. Prevalence rates vary from 20% of patients seen in gynecologic out-patient clinics to 75% of known prostitutes.[9] In one study,[5] T. vaginalis accounted for up to 25% of all clinically significant vaginal infections in the United States. It should be noted that up to 50% of women with positive cultures for T. vaginalis are assymptomatic.[14] The most consistently described risk factors associated with trichimoniasis are increased level of sexual activity and multiple sexual partners.[15]

When symptoms are present, the patient complains of a purulent, foul-smelling, greenish discharge associated with vulvar soreness and irritation and, if severe enough, vulvar edema.[3] The discharge may be frothy in appearance, but this symptom may also be associated with Gardnerella vaginalis. The characteristic frothy, purulent discharge is common in T. vaginalis, but if it is used as the sole criterion for diagnosis, 88% of women with the infection will not be identified, and 29% will be erroneously diagnosed as infected.[14] Punctate hemorrhagic areas or the so-called "strawberry cervix" are pathognomonic of the disease, but, again, these symptoms are seen in only 2% of patients.[14] Up to 20% of patients have dysuria, and long-standing infection may occasionally be accompanied by lower abdominal pain and dyspareunia. Male partners are frequently assymptomatic except for the possibility of post-coital penile pruritus. The organism is generally harboured in the urethra, the paraurethral ducts, prostate or bladder, and released into the vaginal milieu during intercourse. A non-infected male coming into contact with an infected female is at high risk of being infected and, in turn, may infect his other sexual partners.[4, 14]

Office diagnosis depends mainly on microscopic demonstration of the organism using the highly specific wet mount test. This test is simply done by placing a drop of vaginal secretion on a glass slide, adding a drop of saline, and mixing the two. The slide is then covered with a coverslip and examined microscopically after slight warming to increase trichimonal activity. Trichimonads are recognized by their characteristic twitching motility.[4] Microscopy will demonstrate trichimonads in approximately 75% of cases. While culture is more sensitive in detecting the infection,[14] it is not widely used because of its high cost. Pap smears demonstrate trichimonads, but offer no advantage over office wet mount. A vaginal pH of greater than 5.0 is helpful in distinguishing trichimoniasis from candidiasis, which has a pH of less than 4.5.[5]

The treatment of choice for T. vaginalis infections is metronidazole in a standard seven-day course or a single-dose regimen, as shown in Table 2. Cure rates with either regimen vary from 86% to 97%. Metronidazole-resistant strains have been reported and may be responsible for refractory vaginitis caused by this organism. Adverse effects associated with treatment include nausea, vomiting and a metallic taste. Male contacts should generally be treated whether or not they are symptomatic.[4]

Table 2
Treatment of Infectious Vulvovaginitis

Organism	Recommended Drug(s)	Alternate Drug(s)
Trichimoniasis	Metronidazole 2 gm orally single dose or 250 mg orally TID×7 days	Clotrimazole[a] 2×100 mg Vaginal tabs QHS ×7 days
Candidiasis	Clotrimazole Miconazole 100 mg vaginally QHS×7 days or 200 mg vaginally QHS×3 days or Clotrimazole 500 mg tab vaginally single dose	Nystatin 100,000 unit tab vaginally QHS×2 weeks
Bacterial vaginosis (Gardnerella vaginalis)	Metronidazole 500 mg orally BID×7 days	Ampicillin Amoxicillin 500 mg QUD×7 days or Doxycycline 100 mg BID×7 days

Source: Adapted from Centers for Disease Control: 1985 STD Treatment Guidelines.
a. Recommended regimen for treatment during pregnancy; may provide symptomatic relief, but is not as effective as metronidazole.

Bacterial Vaginosis

Gardnerella vaginalis is the most common organism in bacterial vaginosis, formerly termed 'non-specific vaginitis'. While it is the most benign of the three common vaginal infections, it is also likely the most prevalent and one of the most contagious.[16] Previously termed Hemophilus vaginalis by Dr. Herman Gardner, who first identified the infection,[15] G. vaginalis may act synergistically with other organisms, including the Mobiluncus species, curved aerobic gram-negative rods, and vaginal anerobes.[18, 19] Bacterial vaginosis has been identified by 37%–64% of women presenting to sexually transmitted disease clinics for treatment of other infections; two-thirds of these women were assymptomatic.[4] The infection is characterized by a malodorous, fishy-smelling discharge that may vary in intensity during the menstrual cycle, becoming worse at mid-cycle, and that is worse after intercourse. The patient's sexual partners and children may complain of an odour necessitating the frequent use of douches and perfumed bath additives that may cause a chemical vaginitis.[3] Physical examination may reveal a thin, adherent, homogeneous discharge with a foul-smelling odour. On addition of 10% potassium hydroxide

to a drop of vaginal secretions, a fishy amine odour is often released ("whiff test") which is characteristic of the infection. A vaginal pH greater than 5 and the presence of "clue cells" on microscopic examination of a wet prep are also characteristic.[4, 5]

The most effective treatment is metronidazole, as shown in Table 2. Asymptomatic carriage of G. vaginalis is common and need not be treated. Opinions vary as to whether sexual partners should be treated.[4] Gardner[17] has pointed out that the frequent isolation of G. vaginalis in sexual consorts is indication for the simultaneous treatment of sexual partners. Others have shown that treatment of male sexual partners of infected women has not resulted in a lower rate of recurrent bacterial vaginosis compared to that of women whose partners were not treated.[19–21] The clinician will have to use his/her own discretion in deciding to treat the sexual partner of a patient with this condition.

Gonorrhea

Neisseria gonorrhea infections have decreased in Canada in recent years: their incidence dropped by 15% from 1984 to 1985.[22] Nonetheless, they continue to be a major source of pelvic inflammatory disease and subsequent sterility. The significance of screening for this infection in office practice has been clearly shown in earlier studies.[23] Up to 80% of women undergoing pelvic examination from whom N. gonorrhea was isolated had no symptoms. Similarly, one study showed that of men from whom N. gonorrhea had been isolated, 68% were assymptomatic.[24] Those persons, therefore, who are assymptomatic or who have mild, unrecognized symptoms remain the primary reservoir of the disease.[4] This emphasizes the importance of taking appropriate cultures in all women with vaginal discharge and ensuring that all sexual contacts of patients with confirmed gonorrhea be referred for examination and treatment.

Symptoms in women result from a mucopurulent cervicitis and urethritis as a consequence of infection with the gram-negative diploccocus. The most common symptoms follow an incubation period of two to 10 days and include an increased vaginal discharge, dysuria, and urethral irritation.[23] Infections of the periurethral glands and Bartholin's ducts are common in the presence of endocervical infection. As the infection progresses, the patient may experience abdominal pain and, if the infection is severe enough, pelvic peritoneal signs.

Diagnosis depends on culture of the organism from infected secretions. Proper collection of endocervical specimens will increase the yield of culture. The cervix should be viewed directly and cleansed of external exudate or vaginal secretions with a large cotton swab. A second swab should then be inserted 1–2cm into the external os and rotated for several seconds.[16] Gram stains may be helpful if they are adequately prepared.

Most strains of N. gonorrhea are sensitive to penicillins, cephalosporins, tetracyclines, and erythromycin. The guidelines for treatment of gonococcal infection have recently been up-dated by the Center for Disease Control; they are shown in Table 3. Strains of N. gonorrhea that are resistant to ampicillin and penicillin be-

Table 3
Treatment Recommendations for Sexually Transmitted Cervicitis and Urethritis

Organism/ Infection	Recommended Drug(s)	Alternative Drug(s)
Neisserria gonorrhea	Amoxicillin 3 gm orally single dose or Ampicillin 3.5 gm orally single dose or Procaine PCN G 4.8 million units IM single dose plus Probenecid 1 gm orally single dose and Tetracycline 500 mg orally QID×7 days or Doxycycline 100 mg orally BID×7 days or Ceftriaxone 250 mg IM single dose	Erythromycin 500 mg orally QID×7 days or Tetracycline 500 mg orally QID×7 days or Doxycycline 100 mg orally BID×7 days or Spectinomycin 2 gm IM single dose[a]
Chlamydia trachomatis	Tetracycline 500 mg orally QID×7 days or Doxycycline 100 mg orally BID×7 days	Erythromycin base 500 mg orally QID×7 days or Erythromycin ethylsuccinate 800 mg orally QID ×7 days[b] or Sulfamethoxazole 1 gm orally BID×10 days

Source: Adapted from Centers for Disease Control: 1985 STD Treatment Guidelines.
a. Recommended regimens for treatment of penicillinase-producing N. gonorrhea and for treatment failures.
b. Recommended alternates for treatment of Chlamydia trachomatis infection during pregnancy.

cause of the production of penicillinase, have been reported in Canada since 1977, but their annual numbers have stabilized; approximately twenty such cases were reported in 1985.[22]

Chlamydia

Chlamydia trachomatis is a nonmotile, gram-negative obligate, intracellular bacteria that in recent years has become the most common bacterial STD in the United States.[26] The prevalence of chlamydial infections has ranged from 3% in assymptomatic sexually active women to 40% in women screened in STD clinics.

As many as 67% of patients with C. trachomatis infections may be assymptomatic and without abnormalities on examination.[28] The symptoms of C. trachomatis are generally milder than those of other vaginal infections. The most common symptom is a mucopurulent discharge associated with dysuria and lower abdominal discomfort. The character of the discharge is indistinguishable from that caused by N. gonorrhea. Physical examination may discover findings of cervical friability and edema with ectopy of the cervix.[4] Since one-third of women with C. trachomatis infections carry the organism in the urethra and Bartholin's ducts, screening cultures must include urethral and cervical specimens. Diagnosis of the infection depends entirely on culture. As an obligate intracellular pathogen, chlamydia is best isolated from samples of cellular material taken from the involved epithelial cells on the anatomic site, rather than from the purulent discharge alone.[4, 27] Separate culture media are also required. Serologic tests are of limited value.

The antimicobial agents most active against C. trachomatis are tetracycline, erythromycin, sulfonamides, clindamycin, and rifampin. Short-term follow-up shows that 10–14 days of treatment with tetracycline or erythromycin eradicates the infection in nearly all patients.[26] Recommended treatment regimens are shown in Table 3. All individuals who are sexual partners of patients with chlamydia cervicitis or urethritis should be treated with a regimen effective for both gonorrhea and chlamydia.

Herpes Simplex

Herpes simplex virus (HSV) is the most common viral genital infection, as well as the most common cause of genital ulcers. While it does not produce vaginal discharge per se, the cervicitis and vaginitis that are associated with the infection may cause severe leukorrhea which, though not common, is mentioned briefly in this review as one of the rarer causes of vaginal discharge.

Herpes simplex Type 2 is responsible for 85% of genital ulcers.[29] It is the viral particle in the HSV vesicle that is highly infectious. Viral shedding occurs in an infected person until the lesions re-epithelialize. At the time of viral shedding, the lesion is most contagious. It is also at this time that if sufficient vesicles are present, a profuse leukorrhea may appear. Diagnosis can easily be made on clinical grounds with history and the appearance of the typical, multiple, painful vesicles. Culture should be used to confirm the diagnosis, and it currently provides the most sensitive method of identifying the HSV infection.

Acyclovir remains the only drug demonstrated by controlled clinical trials to be effective in the treatment of HSV-2. Topical acyclovir was initially shown to be effective in reducing local symptoms after the first episode of primary HSV infection.[29] More recently,[30] intravenous acyclovir has been shown to be effective in reducing viral shedding and accelerating the rate of lesion healing. Oral acyclovir (200 mg given five times per day) has recently become available in Canada. It has also been shown to be effective in the treatment of this infection.

General Approach: An Overview

Once the presence of a vaginal discharge has been ascertained, the gross appearance of the discharge should be observed for certain characteristics that can aid greatly in the differential diagnosis. In one study,[31] there was a high correlation between a curd-like or "cottage-cheese" appearance of the discharge and positive microscopic examination and culture for C. albicans. However, the gross appearance was both less sensitive and less specific than microscopic examination. The same study showed that a curd-like appearance provides strong evidence for yeast and strong evidence against trichimonas. Moreover, when a curd-like appearance is absent, yeast, trichimonas and bacterial vaginosis are all likely enough so that a microscopic examination should be done for diagnostic accuracy.

Samples of the vaginal discharge should then be obtained from the posterior fornix where secretion tends to pool, for microscopic examination. Fluid adhering to the cervix or emanating from the os is the best means of identifying Chlamydia and Neisseria gonorrhea. Candida is most easily found in the scrapings from the walls of the vagina. A drop of vaginal fluid should be placed on two slides; then a drop of normal saline should be applied to one slide and the fluid examined microscopically for the motile, flagellated organisms of Trichimonas vaginalis. A trichimonad is about halfway in size between a polymorphonuclear leukocyte and a squamous epithelial cell. In differentiating this infection from bacterial vaginosis, it is also important to recognize the presence of a multitude of white cells, which occur very rarely in bacterial vaginosis.[11, 16] On the second slide, a drop of 10% potassium hydroxide

Table 4
Approach to Vaginal Discharge: A Summary

Diagnosis[a]	Candidiasis	Trichimoniasis	Bacterial Vaginosis (Gardnerella)
Clinical	"curdy" pruritus+++ no odour white-yellow	no curds pruritus++ odour+++ yellow-green	no curds pruritus+/− odour+++ thin-gray
pH	<4.5	>5.0	>5.0
Microscopic	KOH mount Hyphae & spores	WET prep motile trich. "Whiff test"+	WET prep clue cells "Whiff test"+

a. For non-infectious causes, see Table 1.

should be added and examined for pseudohyphae. A much more sensitive method of identifying Candida is by using methylene blue or gram's stain.

The next step in the office diagnosis of vaginal discharge is the amine test or "whiff test", first described by Pheifer.[32] It involves placing a few drops of undiluted vaginal discharge on a glass slide and adding 10% potassium hydroxide. A fishy, amine-like odour which is transiently released may be noted. A positive amine test indicates the presence of trichimonas or gardnerella or both. Women with pure yeast infection will have a negative amine test.

The pH of the vaginal discharge should be included as part of the evaluation, and this can easily be determined in a few seconds by dipping a piece of pH paper in the vaginal fluid, either directly into the vagina or in the fluid that is found in the speculum on removal. Normal women and women with vaginal candidiasis have acid-producing vaginal flora resulting in a pH of less than 4.5. In contrast, women with trichimoniasis and/or bacterial vaginosis have amine-producing flora, which raises the vaginal pH above 5.0.[16]

Finally, cultures should always be done to confirm a diagnosis, especially when there is a possibility of gonorrhea or chlamydia. A summary of this approach appears in Table 4.

Conclusions

Patients with the complaint of vaginal discharge and symptoms of vaginitis comprise a substantial proportion of those presenting with sexually transmitted infections. Sexual transmission of Candida species and bacterial vaginosis remains controversial, while it is a primary cause of the acquisition of trichimoniasis. Symptoms and physical findings are insufficient to distinguish specific etiologic agents, and as the treatment for each is different, diagnostic examination of smears is critical to the management of these patients.

This paper is not meant to present an exhaustive review of the topic, but it is hoped that it will provide the practising physician with a reasonable, practical approach to this common problem and increase his/her accuracy in diagnosing the condition. ◉

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