Results of a Program to Test Women for Rectal Chlamydia and Gonorrhea

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OBJECTIVE: To analyze whether rectal testing among women increased chlamydia and gonorrhea case-finding and whether reported receptive anal intercourse was a risk factor for rectal infection.

METHODS: From March 2007 to August 2008, women receiving pelvic examinations at the San Francisco sexually transmitted disease clinic were tested for rectal gonorrhea and chlamydia by using a transcription-mediated amplification assay. Results of testing and clinical and demographic data were analyzed using a cross-sectional study design.

RESULTS: Of 1,308 women with both rectal and vaginal tests, test results were positive for 79 patients (6.0%) for rectal chlamydia or gonorrhea and 88 patients (6.7%) for genital chlamydia or gonorrhea. Test results were positive for 13 patients (1.0%) at the rectum only, increasing detection from 88 to 101 patients (14.8%; 95% confidence interval 8.1–23.9). No correlation existed between reported anal sex and rectal chlamydia (P=.74); however, 50% of women with rectal gonorrhea reported anal sex compared with 21% of women without rectal gonorrhea (P=.002).

CONCLUSION: Sexually transmitted disease clinics might improve chlamydia and gonorrhea case-finding through rectal testing of women, but more study is needed to determine the effects of finding and treating such infections. Reporting anal intercourse did not predict rectal chlamydial infection among women tested at both the rectum and the vagina.

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Chlamydia and gonorrhea are the two most commonly reported notifiable diseases in the United States. In 2008, 1,210,523 cases of chlamydia and 336,742 cases of gonorrhea were reported to the Centers for Disease Control and Prevention. Most reported cases were among women. Among women aged 15–24 years screened for chlamydia or gonorrhea at family planning clinics in 2008, 7.4% tested positive for chlamydia and 0.9% tested positive for gonorrhea.[1] The vast majority of reported chlamydial and gonococcal infections nationwide are of the urogenital tract; however, nucleic acid amplification tests for chlamydia and gonorrhea can be used to identify infections in the rectum.[2,3] By using nucleic acid amplification tests, the San Francisco municipal sexually transmitted disease (STD) clinic routinely

screens men who have sex with men for rectal STDs, according to Centers for Disease Control and Prevention guidelines.[4] A study among men engaging in receptive anal sex indicated that 53% of chlamydial infections and 21% of gonococcal infections might have been missed if rectal testing had not been performed.[5] However, whether these results might apply to women is unknown. In San Francisco, no rectal testing is routinely performed among women, even among those reporting penile-anal intercourse, and no national guidelines recommend rectal screening among women. Although a history of receptive anal intercourse is one reason to perform rectal STD testing among women, inoculation of the rectum with infected cervicovaginal secretions is another plausible mechanism that might account for rectal infections,[6] and testing at this site might increase STD case-finding even among women with no history of receptive anal intercourse.

In 2006, the San Francisco Department of Public Health identified an increase in gonorrhea among heterosexuals,[7,8] prompting consideration of potential interventions to increase gonorrhea case-finding. Two analyses revealed that approximately 13% of women attending the STD clinic in San Francisco (n=6,175), and women surveyed at San Francisco's only Department of Motor Vehicles office (n=103) reported having had anal intercourse during the previous 3 months (Barry PM, Kent CK, Philip SS, Klausner JD. Female anal sex prevalence and correlates, San Francisco, 1997–2006 [abstract]. International Society for Sexually Transmitted Diseases Research Conference, July 29–August 1, 2007, Seattle, WA).[9] These estimates were similar to or lower than other published estimates of anal sex prevalence among heterosexuals.[10–17] As a result of these data, rectal infections were believed to be a potential reservoir of untreated infection among women.

In response, the STD clinic began testing women for rectal chlamydia and gonorrhea. We analyzed the results of that testing to measure whether rectal testing was an effective way to increase case-finding among women and whether reported receptive anal intercourse was a risk factor for rectal infection.

MATERIALS AND METHODS

We analyzed the results of rectal testing performed at the STD clinic from March 2007 to August 2008. Starting in March 2007, providers were asked to collect a rectal swab for chlamydia and gonorrhea testing from women who received a pelvic examination and from whom a vaginal swab was collected by a provider for chlamydia and gonorrhea testing. Reasons for receiving a pelvic examination included pelvic symptoms and routine Papanicolaou smear examinations. Testing was performed at the San Francisco Department of Public Health Laboratory by using Aptima Combo 2 Assay (Gen-Probe, Inc., San Diego, CA). This assay has been verified locally for use with rectal and pharyngeal specimens.[2,3] All patients who tested positive regardless of anatomic site were treated according to routine STD clinic protocols. For purposes of calculating a change in case-finding, we defined a case of chlamydial or gonococcal infection as a positive test from a woman's genital or rectal site. Statistical comparisons used χ^2 test and Student t test to assess for statistical significance.

As part of the STD clinic visit, providers conduct a standardized interview with the patient, which includes the reason(s) for her visit and any symptoms, as well as sexual risk behaviors in the preceding 3 months. All data are recorded on paper forms and entered in an electronic database. Clinical and demographic information (eg, symptoms, physical findings, reported anal sex, race, and age) was extracted from that database for analysis.

This analysis was conducted to evaluate STD clinic practice in response to an increase in gonorrhea. The evaluation was formally reviewed and determined to be a public health program evaluation, which is considered nonresearch by both the Centers for Disease Control and Prevention and by the San Francisco Department of Public Health on the basis of the standard guidelines of each institution. Additionally, on the basis of U.S. Department of Health and Human Services policy regarding protection of human research subjects (*Code of Federal Regulations*, Title 45, Part 46), the evaluation did not require further institutional review.

RESULTS

From March 2007 to August 2008, women made a total of 8,182 visits to the STD clinic. During 3,008 (36.8%) of these visits, women underwent a pelvic examination and had a vaginal swab collected for gonorrhea and chlamydia testing. During 1,308 (43.5%) of those visits, a rectal swab was also collected. Women who received rectal swabs were older than women who did not (mean age 29.0 compared with 28.0 years, $P<.001$), and rectal tests were more frequently performed at visits where risk behaviors were reported compared with visits where risk behaviors were not reported: unprotected anal intercourse (56.4% compared with 40.7%, $P<.001$), unprotected vaginal intercourse (41.9% compared with 34.6%,

P=.003), and multiple male sex partners (44.1% compared with 35.9%, P<.001). Of the 1,308 women who received rectal and vaginal tests for chlamydia and gonorrhea, 747 (57.1%) experienced symptoms or had physical findings of vaginal discharge, 125 (9.6%) reported dysuria, 90 (6.9%) experienced symptoms or had physical findings consistent with pelvic inflammatory disease (ie, abdominal or pelvic pain, cervical motion tenderness, adnexal tenderness, or uterine tenderness), 5 (0.4%) experienced symptoms or had physical findings of rectal discharge, and 222 (17%) reported no symptoms. Of the 1,308 women tested at both sites, 79 (6.0%) tested positive for a rectal chlamydial infection, gonococcal infection, or both; and 88 (6.7%) tested positive for a genital chlamydial infection, gonococcal infection, or both (Tables 1 and 2). Thirteen women (1.0%) tested positive for a rectal but not genital infection; thus, testing women for rectal infections increased the number of infections detected overall by 14.8%, from 88 to 101 infections (95% confidence interval [CI] 8.1–23.9%). None of the five women experiencing symptoms or with physical findings of rectal discharge tested positive for a rectal infection. All women who tested positive for both genital and rectal infections tested positive for the same organism at both sites. A total of 1,173 (89.7%) women were asked questions about anal sexual activity. Of these, 256 (21.8%; 95% CI 19.4–21.3%) reported having had anal intercourse. For chlamydia, the proportion of women reporting anal intercourse did not significantly differ between those with positive (20.0%) compared with negative (21.9%) rectal swabs (P=.74). However, among women with rectal gonorrhea, 50% reported anal intercourse compared with 21.3% of women without rectal gonorrhea (P=.002). With the exception of age, by univariable and multivariable analysis, there were no significant predictors of having a positive rectal swab (Table 1). Older age was associated with a decreased risk of having a positive rectal swab. Of the 13 women with rectal infections only, 10 were asked questions about anal sexual activity, and two reported having had anal intercourse (one had gonorrhea and chlamydia, and the other had chlamydia). By univariable analysis, no significant differences existed between women testing positive for rectum-only infections and women testing positive for genital-only or genital and rectal infections with regard to age, race/ethnicity, numbers of sex partners, symptoms, physical findings, reporting receptive anal intercourse, or reporting unprotected receptive anal intercourse (data not shown).

Table 1. Characteristics of Women Undergoing Testing for Vaginal and Rectal Chlamydia and Gonorrhea at the Sexually Transmitted Disease Clinic by Rectal Swab Result, San Francisco, March 2007–August 2008

	Negative Rectal Swab	Positive* Rectal Swab	OR† (95% CI)	Positive Rectal Swab Only‡
Total	1,229 (100)	79 (100)		13 (100)
Age	29.1 (15–65)	25.8 (14–53)	0.94 (0.9–1.0)	25.1 (18–37)
Race/ethnicity				
White	496 (40.4)	24 (30.4)	1.0 (reference)	3 (23.1)
African American	288 (23.4)	23 (29.1)	1.7 (0.9–3.0)	4 (30.8)
Hispanic	211 (17.2)	13 (16.5)	1.3 (0.6–2.6)	2 (15.4)
Asian	190 (15.5)	16 (20.3)	1.7 (0.9–3.4)	4 (30.8)
Other/unknown	44 (3.6)	3 (3.8)	1.5 (0.4–5.2)	0 (0.0)
Male sex partners§ (n=1,242)				
0	18 (1.5)	0 (0.0)	0.0 (0–1.9)	0 (0.0)
1	661 (56.6)	41 (55.4)	1.0 (reference)	7 (63.6)
2	274 (23.5)	18 (24.3)	1.1 (0.6–1.9)	2 (18.2)
More than 3	215 (18.5)	15 (20.3)	1.1 (0.6–2.1)	2 (18.2)
Anal intercourse§ (n=1,173)	238 (21.6)	18 (25.4)	1.2 (0.7–2.1)	2 (20.0)
Vaginal discharge‖	696 (56.6)	51 (64.6)	1.4 (0.9–2.2)	9 (69.2)
Rectal discharge‖	5 (0.4)	0 (0.0)	0.0 (0–7.3)	0 (0.0)

OR, odds ratio; CI, confidence interval.
Data are n (%) or mean (range) unless otherwise specified.
* Positive for chlamydia or gonorrhea.
† Odds ratio for having a positive rectal swab. Multivariable model including all variables in the table revealed no substantial differences from univariable results and is not shown.
‡ Subset of women in positive rectal swab column.
§ Previous 3 months.
‖ Symptoms or physical finding.

Table 2. Distribution of Vaginal and Rectal *Chlamydia*- and *Gonorrhea*-Positive Swabs by Anatomic Site Among Women Undergoing Pelvic Examination at the Sexually Transmitted Disease Clinic, San Francisco, March 2007–August 2008

	n (% Positive)	95% CI
Total women	1,308 (100)	
Total women positive	101 (7.7)	6.3–9.2
Positive vaginal swabs		
GC	24 (1.8)	1.1–2.6
CT	70 (5.4)	4.1–6.6
GC and CT	6 (0.5)	0.1–0.8
GC or CT	88 (6.7)	5.4–8.1
Positive rectal swabs		
GC	22 (1.7)	1.0–2.4
CT	62 (4.7)	3.6–5.9
GC and CT	5 (0.4)	0.0–0.7
GC or CT	79 (6.0)	4.7–7.3
Women with positive rectal swab only		
GC	1 (0.1)	0.0–0.2
CT	13 (1.0)	0.5–1.5
GC and CT	1 (0.1)	0.0–0.2
GC or CT	13 (1.0)	0.5–1.5
Women with positive vaginal swab only		
GC	3 (0.2)	0.0–0.5
CT	21 (1.6)	0.9–2.3
GC and CT	0 (0)	
GC or CT	24 (1.8)	1.1–2.6

CI, confidence interval; GC, *Neisseria gonorrhoeae*; CT, *Chlamydia trachomatis*.

DISCUSSION

During a period of rectal testing among predominantly symptomatic women undergoing pelvic examination at the STD clinic among whom 21.5% reported anal intercourse, we demonstrated that rectal infections were as common as genital infections but, in the case of chlamydia, were not associated with reported anal intercourse. In addition, we demonstrated that testing women for rectal infections in addition to genital infections might increase chlamydia and gonorrhea case-finding by 15%.

Although other programs have begun to screen women for rectal gonorrhea (Asbel LE, Spain CV, Goldberg M. Rectal cultures for *Neisseria gonorrhoeae* among female patients in an STD clinic setting: an inexpensive adjunct to improve casefinding [abstract]. 2006 National STD Prevention Conference, May 8–11, 2006, Jacksonville, FL; Guerry SL, Boudov M, Higgins C, Kadrnka C, Kerndt P. Assessing the utility of rectal screening in high risk women: prevalence of cervical and rectal gonorrhea among females in juvenile detention in Los Angeles County, USA [abstract]. 17th Meeting of the International Society for Sexually Transmitted Disease Research, July 29–August 1, 2007, Seattle, WA) and identifying missed gonococcal infections was one goal of the rectal testing program, our analysis indicates that chlamydia is the more common rectal infection. A recent study of rectal nucleic acid amplification testing for gonorrhea among 3,029 adolescent women in a youth detention facility revealed that 1.2% had rectal-only infections and that testing for rectal in addition to genital infections increased case-finding by 19% (Guerry et al [abstract]). Previous studies among women attending STD clinics that use rectal gonococcal culture have demonstrated that, among women testing positive for genital gonorrhea who underwent rectal testing, case-finding was increased 3–7%, although the practice of anal intercourse was not assessed[18,19] (Asbel et al [abstract]). These studies did not test for rectal chlamydial infection. One study that assessed rectal chlamydial infection among women reported 13 of 20 women with cervical chlamydia had a positive rectal swab tested by polymerase chain reaction, but that study did not assess chlamydia at the rectum in the absence of cervical infection.[20] We might have identified more rectal infections than previous studies among women because we used Aptima Combo 2 Assay, which can test for both chlamydia and gonorrhea and is more sensitive than culture and polymerase chain reaction.[2,3] In our rectal testing study, increased case-finding was driven predominately by rectal chlamydial infection among women without positive vaginal test results.

The approach of using a specimen from an additional anatomic site to increase case-finding has been studied before. Shafer et al demonstrated increased case-finding among female military recruits when first-void urine, cervical swabs, and vaginal swabs were used. For example, among the 207 women with chlamydia, the addition of a urine specimen to a vaginal swab identified an additional 13 women with chlamydia when compared with a vaginal swab alone.[21]

Of women testing positive for a rectal chlamydial infection, 80% did not report anal intercourse, and 8 of the 10 women testing positive for rectal-only chlamydial infections who were asked questions regarding anal sexual activity did not report having had anal intercourse. This lack of association between anal intercourse and rectal chlamydial infection might be explained in at least two ways. First, women might not have accurately disclosed their anal intercourse history. However, the finding that more than 20% of women in the rectal testing program disclosed this

information, a proportion within the expected range of anal intercourse prevalence, makes this less likely. Second, rectal infections among women can result from nonsexual inoculation of the rectum with infected vaginal secretions[6]; therefore, the relative contribution of direct infection through anal sex might have been too small to be detected in this limited sample of women. Women with rectal-only infections who did not report anal intercourse might have had inoculation of the rectum from a cervical infection that might have cleared spontaneously, a false-negative vaginal test, or a false-positive rectal test. The sensitivity of the Aptima Combo 2 Assay from vaginal and cervical swabs among women has been well studied and has been reported to be high (more than 99% for gonorrhea and more than 94% for chlamydia),[22,23] making false-negative vaginal swabs unlikely.[24] False-positive rectal swabs have been studied less, but the Aptima Combo 2 Assay has a high specificity on rectal samples (more than 99%), making false-positive swabs rare among this population, with an observed combined chlamydia and gonorrhea positivity of approximately 7%.[2,3]

A higher proportion of women in the rectal testing program reported anal intercourse than in a prior analysis of women attending the STD clinic (21.8% compared with 12.7%). This might reflect the fact that the women in the rectal testing program were undergoing pelvic examination and the majority experienced STD symptoms. These women might have been more likely to have engaged in higher risk sex practices than women not undergoing pelvic examination. Additionally, although providers were asked to collect rectal swabs from all women undergoing pelvic examination and vaginal swab collection, analysis showed that women who reported risk behaviors were more likely to have been tested.

Implications of increased case-finding among women are unclear. Reasons to find and treat STDs include reducing reproductive health sequelae (eg, pelvic inflammatory disease and infertility), preventing transmission to partners, reducing the burden of disease in the community, mitigating risk for human immunodeficiency virus acquisition or transmission, and treating symptoms. The majority of women testing positive for rectal infections did not report anal intercourse; if patient reports accurately reflect anal sexual practice, infections are less likely to be transmitted to male partners through subsequent anal sex. No patients who tested positive reported rectal symptoms, and the value of treating rectal infections among women to prevent reproductive health sequelae is unknown. However, the high level of concordance between cervicovaginal and rectal infection provides evidence that infections commonly spread from the vagina to the rectum. Infections might also spread from the rectum to the vagina, where the risk for reproductive health sequelae and transmission of infection to partners is substantial. However, other studies reveal a difference in chlamydia serovars for cervical, compared with rectal, specimens.[25,26] If true, this perhaps makes spread from rectum to vagina less likely if rectal infection-causing serovars are less able to survive in the vagina, compared with the rectum. More studies are needed to characterize the risks of rectal infection and the value of treating these infections among women. A study that compares genital reinfection rate among women screened and treated for genital and rectal infections with the genital reinfection rate among women screened and treated for genital infections only might elucidate clinical benefits of rectal screening.

Increased case-finding required increased testing costs because twice as many tests were performed among these women than if they had been tested with a vaginal swab only. Prevalence of rectal-only infections among this population was 1%, below the 2–7% prevalence level considered cost-effective in other studies of genital chlamydia screening.[27–29] Because benefits of finding and treating rectal infections among women are unknown, cost-effectiveness of rectal testing for women is unknown. However, addition of rectal screening to genital screening is more likely to be cost-effective among a population with a higher overall prevalence of chlamydia and gonorrhea.

These analyses have certain limitations. The rectal testing program was limited to women undergoing pelvic examination, a substantial number of whom had experienced STD symptoms, likely making the results of this program not applicable to screening of asymptomatic women. Additionally, from March 2007 to August 2008, when rectal testing was performed, fewer than half of women receiving a pelvic examination and a vaginal swab also received a rectal swab, and these women tended to have engaged in high-risk sexual behaviors more often than women who did not receive a rectal swab. Because of this, these results might not be generalizable to all women receiving pelvic examinations. We did not have information relating to strain or serovar for *Chlamydia trachomatis* or *N. gonorrhoeae* isolates; thus, we cannot assess potential anatomic site preference by organism strain or whether each infection likely represented different exposures or a single exposure.

This analysis reveals that among women, rectal infections were as common as genital infections, and adding rectal testing to vaginal testing might substantially increase chlamydia and gonorrhea case-finding among this moderate-prevalence population. However, prevalence of rectal chlamydia or gonorrhea without concomitant vaginal infection was only 1%. The majority of women testing positive for rectal chlamydial or gonococcal infection in the rectal testing program did not report anal intercourse, and anal intercourse was not significantly associated with rectal chlamydial infection. However, because receptive anal intercourse can also put women at risk for other health problems, including human immunodeficiency virus infection, anal cancer, and anal squamous intraepithelial lesions,[14,30,31] inquiring about anal sexual activity and encouraging condom use with anal sex should remain a basic part of reproductive health care among women. Despite increased case-finding with rectal testing, because of funding limitations, the San Francisco municipal STD clinic has ceased testing women for rectal chlamydia and gonorrhea. Other STD clinics might improve chlamydia and gonorrhea case-finding by testing women for rectal STDs; however, more study is needed to determine the clinical and public health impact of finding and treating these infections.

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