Risk Factors for Rectal Gonococcal Infection Amidst Resurgence in HIV Transmission

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Background: **Rectal gonorrhea in men has been increasing in San Francisco since 1995.**

Goal: **The goal was to determine behavioral risk factors associated with rectal gonorrhea (RGC) among men who have sex with men (MSM) by HIV serostatus.**

Study Design: **All men reporting receptive anal sex in the last 6 months are screened for RGC, regardless of reported condom use, at San Francisco's municipal sexually transmitted disease (STD) clinic. We surveyed a convenience sample of men screened for RGC at the clinic.**

Results: **Among 564 MSM surveyed, 7.1% had RGC. HIV-positive MSM were significantly more likely (relative risk, 3.5, 95% confidence interval, 1.9-5.8) to have RGC. Behavioral risks for RGC infection varied significantly by HIV serostatus. HIV-positive MSM engaging in anonymous sex were at highest risk for RGC infection. Drug use during anal sex was the strongest risk factor for RGC infection among HIV-negative or unknown HIV status MSM.**

Conclusion: **Our data suggest that STD and HIV prevention efforts among MSM in San Francisco must consider the role that HIV serostatus plays in acquisition of new infections.**

SINCE THE MID-1990s, the city of San Francisco has observed steady increases in unsafe sexual risk behavior among men who have sex with men (MSM) followed by a trend in new sexually transmitted diseases (STD) and a resurgence in new HIV infections among this population.[1-4] The HIV and STD cofactor hypothesis is well established in the literature and provides significant evidence that STDs might precede and facilitate HIV seroconversion.[5-9]

Among all STDs, male rectal gonococcal (RGC) infection could be a particularly useful marker for the risk of HIV transmission among MSM.[10,11] RGC infection is acquired through unprotected receptive anal sex, which is the primary mode of HIV acquisition among MSM. Among men who have a recent HIV seroconversion, RGC infection has been observed as an independent risk factor for HIV infection.[12] Because HIV is an infection of long duration and has only recently become reportable in California, risk factors for RGC infection could serve as an important surrogate for HIV risk factors among MSM. Furthermore, identification of behavioral risk factors associated with RGC infection provides essential epidemiologic information for the design of effective HIV prevention programs among MSM.

Preceding the temporal increases of HIV incidence among MSM in San Francisco were increases in RGC infection among MSM in both the public and private sector in San Francisco.[1,13] By year-end 1999, rising levels of RGC infection were apparent across all age and race groups among MSM in San Francisco,[1,13] alerting public health officials to address this sexual health crisis among MSM. We conducted a cross-sectional study of behavioral factors associated with RGC infection among MSM seeking STD services at San Francisco City Clinic, the municipal STD clinic. To evaluate risk for RGC as a surrogate for risk for HIV infection, we assessed differences in behavioral risk for RGC infection by HIV serostatus with the assumption that risk factors among persons with unknown or negative HIV serostatus were more similar to risk factors for HIV seroconversion. In this way, targeted prevention efforts for RGC and HIV could be developed for HIV-positive and HIV-negative MSM in San Francisco.

Methods

In 2000, as part of routine care at San Francisco City Clinic at the time of the survey, clinicians screened any men who reported receptive anal sex in the past 6 months, regardless of condom use or rectal symptoms, using standard gonococcal culture techniques. From February 2000 to October 2000, a convenience sample of men being screened for RGC infection were asked to complete a self-administered survey on demographic information, recent sexual behavior and drug use, and self-reported HIV status. The survey was distributed by clinicians after collection of the rectal specimen and completed by patients in private before leaving the clinical examination room. Because the survey was completed at the time of screening, both clinicians and patients were masked to the patient's RGC infection status. Clinic patients who had multiple RGC screenings during the survey period were asked to complete a separate survey at each screening visit. Data from the survey were linked to the computerized STD clinic database using a unique patient identification number.

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TABLE 1. Selected Sociodemographic Characteristics, Reported HIV Status, Rectal Symptoms, and Prevalence of Rectal Gonococcal Infection Among Men Who Have Sex With Men, San Francisco City Clinic, 2000

Selected Variables	All Participants (%)	Gonorrhea (+) (%)	*P* Value
Total	564	7.1 (40/564)	—
Age (n = 540)			
Median (range)	33 (18–74)	34 (24–51)	0.4
<25 y	10.4	5.4 (3/56)	0.9
25–34 y	43.7	6.4 (15/236)	
35–44 y	35.7	7.8 (15/193)	
45+ y	10.2	5.5 (3/55)	
Race (n = 564)			
White	65.1	7.4 (27/367)	0.3
Black	5.9	6.1 (2/33)	
Hispanic	15.1	7.1 (6/85)	
Asian pacific Islander	8.5	6.3 (3/48)	
Other	5.4	6.5 (2/31)	
Education (n = 542)			
Below high school	0.7	25 (1/4)	0.5
High school education	10.7	6.9 (4/58)	
College education	64.4	6.6 (23/349)	
Graduated school education	24.2	8.4 (11/131)	
Self-reported HIV status (n = 543)			
Positive	20.6	15.2 (17/112)	<0.01
Negative	58.8	4.4 (14/319)	
Unknown	20.6	5.3 (6/112)	
Rectal symptoms* (n = 564)			
Present	10.5	20.3 (12/59)	<0.01
Absent	89.5	5.5 (28/505)	

*As determined by clinician at time of screening.

Survey data were entered into Epi Info version 6 by a trained data entry clerk at a separate location. Stratified and multivariate logistic regression analyses were conducted using SAS version 6.11. The prevalence of RGC infection, 95% confidence intervals (CI), and prevalence rate ratios (PR) were examined by sociodemographic and behavior variables and self-reported HIV status. The chi-squared test of association was used for bivariate comparisons. Variables associated with RGC infection at $P < 0.2$ significance level were included in 2 separate multivariate logistics regression analyses, one for HIV-positive participants and one for HIV-negative participants and participants with unknown HIV status. Using a backward variable selection method, variables that remained associated with RGC infection at $P < 0.1$ significance level for HIV-positive participants and $P < 0.05$ significance level for HIV-negative and unknown status participants were retained in the multivariate models after controlling for important confounders such as age. A lower threshold of significance was used for the HIV-positive participants because the sample size was small (n = 112) and therefore had lower power to detect key differences. Multivariate models included adjusted odds ratios (OR) and 95% CI. Collinearity of variables in the model was evaluated using Pearson's correlation coefficient.

Results

From February 2000 to October 2000,1181 tests for RGC infection among male clinic patients were performed at City Clinic, of which 122 were repeat tests on individuals. A total of 564 (48%) men, none of whom were repeat testers, participated in the survey during this time period. Additional data were collected on the number of persons who were approached and refused the survey. The median age of survey participants was 33 years (range, 18-74 y) (Table 1). Although the majority of survey participants were white (65%), 15% were Hispanic, 9% were Asian and Pacific Islanders, and 6% were black. Participants reported high levels of education, with 78% reporting a college-level education. Most participants were residents of San Francisco (85%) and had lived in San Francisco for a median of 5 years (range, 0-41 y). No differences in age (median, 33 y vs. 33 y), race (white, 65% vs. 65%; Hispanic 15% vs. 20%; black, 6% vs. 8%; Asian and Pacific Islanders, 9% vs. 6%), and RGC infection (7.1% vs. 7.8%) were observed among survey participants and persons who were screened for RGC infection during the time the survey was implemented.

Of note, survey participants reported visiting the following venues in the past 2 weeks to meet their most recent sex partners: Internet chat rooms (16%), bars (15%), sex clubs (10%), dance clubs (10%), bathhouses (9%), gyms (9%), and parks (4%). Moreover, participants reported use of alcohol (23%), nitrates (14%), amphetamines (11%), ecstasy (8%), gamma hydroxybutyrate (GHB; 5%), and cocaine (3%) during anal sex in the past 2 weeks.

Overall, RGC infection was found in 7.1% (40 of 564) of those surveyed. Rectal symptoms and signs were defined as having one or more of the following: rectal discharge, anal fissures, and/or pus identified on anoscopy. The prevalence of RGC infection was 20.3% (12 of 54) of inpatients who presented with rectal symptoms at their clinic visit compared with 5.5% (28 of 505) of inpatients who did not present with rectal symptoms ($P < 0.01$). The risk of RGC infection was significantly higher among HIV-positive MSM than HIV-negative MSM (PR, 3.46; 95% CI, 1.95-5.79). Compared with MSM who did not have RGC infection, MSM with RGC infection were not different in age, race, education, and duration of residence in San Francisco.

Table 2 describes the prevalence of RGC infection among MSM seen at San Francisco City Clinic by selected behavioral characteristics and self-reported HIV status. HIV-positive MSM who

TABLE 2. Prevalence of Rectal Gonococcal Infection by Selected Behavioral Characteristics and Self-reported HIV Status Among Men Who Have Sex With Men Seen at the San Francisco City Clinic, 2000

	HIV-positive Participants (N = 112)			HIV-negative and Unknown Status Participants (N = 431)		
Behaviors in the Last 2 Weeks	Prevalence (%)	PR (95% CI)	*P* Value	Prevalence (%)	PR (95% CI)	*P* Value
Engaged in anal sex						
No	21.4	1.0		2.0		
Yes	14.3	0.7 (0.4–1.2)	0.1	5.4	2.7 (1.6–4.3)	<0.01
No. of RAS† partners						
0	17.9	1.0		2.1	1.0	
1	7.9	0.4 (0.1–1.4)	0.1	6.9	3.4 (1.6–6.3)	<0.01
2 or more	19.6	1.1 (0.5–2.3)	0.8	6.4	3.1 (1.1–7.0)	0.02
Unprotected RAS						
No	11.9	1.0		2.1	1.0	
Yes	17.1	1.4 (0.7–2.7)	0.3	9.5	4.5 (2.4–7.7)	<0.01
Anonymous RAS partner						
No	11.3	1.0		3.8	1.0	
Yes	20.0	1.8 (0.8–8.6)	0.1	6.8	1.8 (0.8–3.6)	0.1
Met sex partners at						
Bathhouse						
No	12.2	1.0		4.8	1.0	
Yes	35.7	1.9 (0.8–8.6)	0.06	2.8	0.06 (0.01–3.4)	0.7
Internet						
No	11.2	1.0		3.8	1.0	
Yes	30.4	2.7 (1.0–6.5)	0.04	9.4	2.5 (0.9–5.6)	0.06
Sex club						
No	14.4	1.0		5.1	1.0	
Yes	20.0	1.4 (0.3–4.9)	0.6	0	NA	0.1
High on drugs during sex						
No	15.0	1.0		2.2	1.0	
Yes	15.4	1.03 (0.4–2.2)	0.9	8.8	4.0 (2.1–6.9)	<0.01
Type of drugs used during sex						
Alcohol						
No	17.0	1.0		3.7	1.0	
Yes	5.6	0.3 (0.01–2.1)	0.3	7.6	2.0 (0.9–4.2)	0.07
Amphetamines						
No	13.2	1.0		3.8	1.0	
Yes	23.8	1.8 (0.5–4.9)	0.3	13.9	3.7 (1.1–9.4)	0.02
Ecstasy						
No	15.9	1.0		4.6	1.0	
Yes	0	NA	0.5	5.4	1.2 (0.1–4.6)	0.8
Nitrates						
No	14.4	1.0		4.0	1.0	
Yes	18.2	1.3 (0.3–3.7)	0.6	9.8	2.5 (0.8–6.2)	0.08
GHB						
No	13.8	1.0		5.5	1.0	
Yes	25.0	1.8 (0.04–18.3)	0.6	4.8	0.9 (0.02–5.4)	0.9
Cocaine						
No	15.5	1.0		4.8	1.0	
Yes	0	NA	0.8	0	NA	0.6
Combination of drugs						
No	13.0	1.0		3.9	1.0	
Yes	20.0	1.5 (0.6–3.5)	0.3	7.5	2.0 (0.8–4.2)	0.1
Injection drug use in past 3 months						
No	13.9	1.0		4.5		
Yes	27.3	2.0 (0.4–7.4)	0.3	20.0	4.5 (0.1–40.1)	0.3

*All data corresponds to behavior in past 2 weeks unless otherwise noted.
PR = prevalence rate ratios; CI = confidence interval; RAS = receptive anal sex; GHB = gamma hydroxybutyrate.

reported anonymous receptive anal sex in the past 2 weeks had a 2-fold higher risk for RGC infection than HIV-positive MSM who did not report anonymous receptive anal sex. Moreover, significantly greater risks for RGC infection were found among HIV-positive MSM who reported meeting a recent sex partner over the Internet or at a bathhouse compared with HIV-positive MSM who did not meet their recent sex partners in these venues. Alternatively, among HIV-negative MSM or MSM who did not know their HIV status, drug use during sex in the past 2 weeks was a significant correlate of RGC infection. In particular, HIV-negative MSM or MSM of unknown HIV status who reported being "high" on amphetamines during sex were significantly more likely to have

RGC infection than those who did not report amphetamine use during sex. Furthermore, HIV-negative MSM who reported unprotected receptive anal intercourse had a significantly higher risk for RGC infection than HIV-negative MSM who did not report unprotected receptive anal intercourse.

In multivariate analysis of HIV-positive MSM, meeting a partner at a bathhouse in the past 2 weeks (OR, 3.39; 95% CI, 0.80-14.44) was an independent predictor of RGC infection at $P < 0.1$ significance level. Variables remaining in the model to control for confounding were age (OR, 0.97; 95% CI, 0.90-1.06), the number of receptive anal sex partners (OR, 0.97; 95% CI, 0.71-1.33), and unprotected receptive anal sex in the past 2 weeks (OR, 0.98; 95% CI, 0.25-3.83). In contrast, among HIV-negative MSM or MSM who did not know their HIV status, being "high" on any drugs during sex (OR, 2.94; 95% CI, 1.03-8.42) and unprotected receptive anal sex in the past 2 weeks (OR, 4.06; 95% CI, 1.31-12.52) were found to be independently associated with RGC infection at $P < 0.05$ significance level. This model was adjusted for the confounding effects of age (OR, 0.98; 95% CI, 0.92-1.05) and number of receptive anal sex partners (OR, 0.81; 95% CI, 0.51–1.30).

Discussion

The prevalence of RGC infection was high in this sample: 7.1% among all survey participants and 15.2% among HIV-positive subjects. Detection of RGC infection was 3.5 times higher among HIV-positive MSM than HIV-negative MSM. Behavioral risks for RGC infection varied by HIV serostatus. HIV-positive MSM who recently met partners at a bathhouse were at increased risk for RGC infection. Moreover, use of drugs during sex contributed to a higher risk for RGC infection among HIV-negative MSM and MSM with unknown HIV status.

There are several potential limitations to our findings. Although approximately 75% of all RGC cases detected in San Francisco are diagnosed at San Francisco City Clinic, MSM seeking STD services at public clinics are likely at higher risk for STDs based on their behavior than MSM not seeking these services. Thus, because our sample is comprised of men seeking public STD services, it might not be appropriate to generalize our findings to the broader MSM population at risk for RGC. Because this study was an observational cross-sectional study, inferences on causality are limited. Whether risk behaviors reported in the past 2 weeks lie on the causal pathway to RGC infection is difficult to determine. In fact, our data suggest that long-term behavioral factors might be important to assess among HIV-positive MSM, given that a higher proportion of those who did not report anal sex in the past 2 weeks had RGC infection than those who did report anal sex. Self-reported risk behavior is subject to bias, particularly about illicit drug use and risky sexual behavior. Finally, because of the small sample sizes, risk estimates are vulnerable to imprecision.

Nonetheless, the results of this study confirm previous reports on risk factors for RGC infection[1,14,15] and provide evidence of new factors of risk associated with RGC infection according to HIV status of MSM such as anonymous sex partners among HIV-positive MSM and drug use during anal sex among HIV-negative MSM and MSM with unknown HIV serostatus. This study built on a number of methodologic strengths. Information biases that might have resulted from the knowledge of the patient's RGC test results did not occur because the survey was administered at the time of specimen collection. The diagnosis of RGC infection was based on culture, a highly accurate means to classify disease. All men who reported receptive anal sex in the past 6 months regardless of condom use were screened for RGC infection; therefore, clinicians could not inadvertently recruit participants based on differing levels of risk behavior. If, however, clinicians were more likely to distribute the survey to persons whom they perceived to be at higher sexual risk, the behavioral risks detected in our study would be an underestimate of the true population risk.

Given the increases in RGC infection among MSM in San Francisco and the strong biologic association between RGC infection and HIV transmission among MSM, RGC infection might have fueled the current resurgence in new-incident HIV infection among MSM in San Francisco. In light of the recent U.S. public health agenda calling for increased attention and response to the prevention of HIV and STD in MSM,[16] it is incumbent that current prevention efforts be refined to address the different factors that facilitate new STD and HIV transmission according to the HIV status of MSM.

Our data support that HIV-positive MSM are getting new STDs, highlighting a unique opportunity for HIV prevention among HIV-positive MSM and their partners through the integration of STD preventative services with HIV care services. Public sex venues such as bathhouses continue to be places where MSM, particularly HIV-positive MSM, engage in unsafe risk behavior.[17,18] Effective prevention efforts among HIV-positive MSM who frequent venues that promote anonymous sex are urgently needed. Likewise, the Internet continues to play an important role in disease transmission and presents a continuing challenge for adequate web-based health promotion and disease prevention for MSM.[19-22]

The data presented here also bring to the forefront the risks surrounding HIV-negative MSM who engage in sex while under the influence of drugs known to enhance sexual desire such as methamphetamines. Often used as a recreational drug in sexually charged settings, this substance has been associated with high-risk sexual behavior among MSM, including unprotected anal receptive sex and high-risk partners, thus facilitating new STD and HIV transmission.[23-28] These data underscore the urgent need to address substance abuse as a significant problem among HIV-negative MSM. Efforts to integrate substance abuse prevention efforts into broader STD and HIV control strategies are critical in preventing new STD and HIV infections within this MSM population.

Finally, the results of this study highlight the need for HIV prevention to directly use STD treatment and control as an HIV prevention strategy. New national guidelines for STD treatment recommend frequent STD screening, as often as 4 times a year for MSM at highest risk for HIV transmission.[29] It is advised that programs and clinicians promote regular sexual health checkups that integrate HIV and STD prevention counseling, offer easy STD screening, and timely treatment for cases and partners.[16,29-31]

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