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Seminal plasma HIV levels in men with asymptomatic sexually transmitted infections

G Rieg, MD^{*,†}, DM Butler[‡], DM Smith[‡], and ES Daar^{*,†}

^{*}Los Angeles Biomedical Research Institute at Harbor–UCLA Medical Center and the David Geffen School of Medicine at UCLA, Los Angeles

[†]Division of HIV Medicine, Harbor–UCLA Medical Center, Los Angeles Biomedical Research Institute

[‡]University of California San Diego and VA San Diego Healthcare System, San Diego, CA, USA

Summary

The effect of asymptomatic sexually transmitted urethral infections on human immunodeficiency virus (HIV) RNA viral load in semen is poorly defined. We studied five such patients. Those on antiretrovirals ($n = 2$) had lower seminal plasma viral loads (SPVL) (2.11 and 1.98 log₁₀ copies/mL) than those not on antiretrovirals ($n = 3$) (2.27–3.78 log₁₀ copies/mL). One patient who was not taking antiretrovirals had a 94% decline in SPVL after treatment of asymptomatic *Chlamydia trachomatis* urethritis, suggesting that asymptomatic infection may be a co-factor for HIV transmission.

Keywords

sexually transmitted infections; HIV shedding; seminal plasma

INTRODUCTION

Symptomatic sexually transmitted infections (STIs) of the urethra are associated with increased shedding of human immunodeficiency virus (HIV) RNA in seminal fluid and may be important co-factors for HIV transmission.¹ Furthermore, treatment of symptomatic STIs reduces the HIV seminal plasma viral load (SPVL) and is considered an important intervention in controlling the spread of HIV.^{1,2} We and others have shown that asymptomatic STIs are detected in approximately 10% of HIV-infected men who have sex with men (MSM).^{3,4} Nevertheless, unlike the known association between symptomatic urethritis and increased SPVL, little is known about the effect asymptomatic urethral STIs have on SPVL.

METHOD

We studied 212 HIV-infected MSM from two urban clinics who were longitudinally followed at six-month intervals for approximately one year with nucleic acid amplification testing for urethral *Chlamydia trachomatis* and *Neisseria gonorrhoeae*.³ Of those found to have asymptomatic urethral infections, five enrolled into a genital secretion substudy. Acquisition of semen, specimen processing and seminal HIV RNA quantitation were

performed as described previously.⁵ Semen was collected 1–3 days after the diagnosis of the asymptomatic urethral STI from all the subjects, and samples were collected approximately four weeks (range 21–36 days) after STI treatment from three subjects. All patients had test of cure for the STI prior to repeat semen collection. All of these participants signed an informed consent approved by the Institutional Review Board at the Los Angeles Biomedical Research Institute at Harbor–UCLA.

RESULTS

Details regarding the study subjects are summarized in Table 1. Patients 1 and 2, both infected with *C. trachomatis*, were taking antiretrovirals (ARVs), whereas patients 3–5 were not on ARVs when two were diagnosed with *C. trachomatis* and one with *N. gonorrhoeae* infections. The urethral STI in patients 1 and 2 was an incident infection and acquired within six months of diagnosis, while the urethral STI in the three remaining patients was of unknown prevalence. Patients 1 and 2, both of whom were taking ARVs, had undetectable HIV blood plasma viral loads (BPVL) and low SPVL both before (2.11 and 1.98 log₁₀ copies/mL) and after (1.81 and 2.13 log₁₀ copies/mL) treatment of their STIs. In contrast, patients 3–5 were not taking ARVs at the time of STI diagnosis, and their BPVL were between 4.2 and 4.9 log₁₀ copies/mL with SPVL between 2.27 and 3.78 log₁₀ copies/mL. Although only one of these patients returned for repeat semen analysis after treatment of his asymptomatic urethral STI, it was notable that there was a greater than 1 log₁₀ (94%) reduction in his SPVL from 3.52 to 2.28 log₁₀ copies/mL. Although BPVL was not available at the precise time of semen acquisition for this individual, he did have BPVL measurements for up to six months before and five months after the semen studies were repeated between 3.9 and 4.58 log₁₀ copies/mL.

DISCUSSION

Previous studies have shown a positive correlation between blood and seminal plasma HIV RNA levels. Successful ARV therapy leading to an undetectable BPVL has also been shown to result in marked reductions in seminal HIV shedding,^{6–8} a finding that has been observed even in the setting of symptomatic urethral STIs.⁹ Our results are similar to these and show that SPVL were lower in patients on ARVs both before and after treatment of an asymptomatic urethral STI. The novel finding in our study, which may be relevant to HIV transmission, is what we saw in the patient who was not taking ARVs and returned for repeat semen analysis after treatment of his asymptomatic urethral infection. In this case, similar to what has previously only been studied in the setting of symptomatic STIs,² treatment of the urethral infection resulted in a dramatic decline in SPVL. This observation is consistent with two other short case studies, which showed that asymptomatic urethral STIs can be associated with increased likelihood of HIV shedding in seminal fluid.^{6,10} An important limitation of other studies attempting to examine the relationship between asymptomatic urethral infections and genital tract shedding of HIV RNA is their lack of SPVL data after STI treatment. Consequently, unlike the studies of patients with symptomatic urethritis that did collect post-treatment SPVL data, they were unable to assess whether high levels of seminal HIV were related to the STI or to other factors. Uniquely, our study demonstrates that the treatment of a urethral infection in an asymptomatic patient was associated with a marked reduction in his SPVL.

Results from this and other reports provide preliminary data that must be confirmed in larger studies designed to prospectively determine the effect of asymptomatic urethral infection has on HIV shedding in genital secretions and rates of sexual transmissions of HIV.

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Table 1

Clinical characteristics and plasma HIV RNA from blood and seminal fluids of study subjects

Patient	Pathogen	Antiretrovirals	Pretreatment for urethral infection (HIV RNA log ₁₀ copies/mL)		Post-treatment for urethral infection (HIV RNA log ₁₀ copies/mL)	
			Blood plasma	Seminal plasma	Blood plasma	Seminal plasma
1	<i>C. trachomatis</i>	ZDV/3TC/ABC, TDF, LPV/r	<1.7	2.11	<1.7	1.81
2	<i>C. trachomatis</i>	TDF, ddI, LPV/r	<1.7	1.98	<1.7	2.13
3	<i>C. trachomatis</i>	None	4.58 [*]	3.52	3.90 [†]	2.28
4	<i>C. trachomatis</i>	None	4.2	2.27	ND	ND
5	<i>N. gonorrhoeae</i>	None	4.9	3.78	ND	ND

^{*} Forty days prior to pretreatment genital secretion sample

[†] Sixty-three days postgenital secretion sampling

C. trachomatis = *Chlamydia trachomatis*; *N. gonorrhoeae* = *Neisseria gonorrhoeae*; ZDV = zidovudine; 3TC = lamivudine; ABC = abacavir; TDF = tenofovir DF; LPV/r = lopinavir/ritonavir; ddI = didanosine; ND = not done