
Bacterial Infections and Skin Cleaning Prior to Injection Among Intravenous Drug Users

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Synopsis

In a survey of 1,057 active intravenous drug users in Baltimore, MD, who were recruited

through extensive community outreach, 12 reported endocarditis and 113 reported subcutaneous abscesses in the 6 months before being interviewed. Of all the persons surveyed, 556 reported cleaning their skin prior to injection at any time and 173 reported cleaning their skin all the time in the 6 months before the interview.

The frequency of subcutaneous abscesses was lower among those who reported skin cleaning all the time; a similar trend was noted for frequency of endocarditis.

The relatively simple procedure of encouraging intravenous drug users to clean their skin prior to injection will not eliminate but might reduce the frequency of these serious and expensive infectious complications of intravenous drug use.

Medical complications of intravenous drug use include bacterial endocarditis and subcutaneous abscesses at the site of injection (1). We conducted a survey among intravenous drug users in Baltimore, MD, to estimate the prevalence of these complications, to determine the frequency of skin cleaning prior to injection, and to identify the extent to which skin cleaning was associated with a lower occurrence of these injection-related infections.

Methods

Sample. We used a sample of intravenous drug users who had been recruited in 1988-89 for a longitudinal study of HIV infection. This cohort was established through extensive community outreach, including distribution of brochures at drug abuse treatment facilities, sexually transmitted disease clinics, local emergency rooms, homeless shelters, state parole and probation offices, and through the street outreach AIDS prevention (SOAP) project of a local community education organization. In addition, enrolled participants were encouraged to refer eligible friends. Eligibility criteria included being at least age 18 and having a

history of intravenous drug use in the previous 10 years.

Data collection. Eligible persons were instructed to arrive at the study clinic, which was not associated with any community service agency. After counseling and informed consent procedures, eligible consenting participants were interviewed by a trained interviewer in a private room about their medical history, drug use, and sex practices. They then underwent venipuncture for HIV antibody assays. On completion of these procedures, interviewers provided HIV risk reduction counseling and scheduled participants for appointments to receive test results and 6-month followup appointments. These procedures, described in detail elsewhere (2), were reviewed and approved by the Institutional Review Board at the Johns Hopkins School of Hygiene and Public Health.

Starting with the second followup visit in mid-1989, we added a brief questionnaire on infectious complications of drug injection and the frequency of skin cleaning. Participants were asked about the occurrence of endocarditis and subcutaneous abscesses during the 6 months prior to interview.

Table 1. Rates of endocarditis and subcutaneous abscesses by frequency of skin cleaning prior to injection in the last 6 months among intravenous drug users in Baltimore, MD

Category	Number	Endocarditis		Abscess	
		Number	Percent	Number	Percent
No use of IV drugs last 6 months	335
Used IV drugs but never cleaned skin	501	8	1.6	56	11.2
Used IV drugs, cleaned skin	556	4	0.7	57	10.3
Some of the time	383	3	0.8	46	12.0
All the time	173	1	0.6	11	26.4
Totals	1,392	12	31.1	113	310.7

¹ Odds ratio for ever cleaned vs. never cleaned = 0.45 (0.10, 1.68).

² Odds ratio for cleaned all the time vs. cleaned < all the time and never cleaned combined = 0.52 (0.26, 1.02).

³ Percents calculated for current injectors only.

Endocarditis was defined as infection inside the heart and in the blood that required treatment with antibiotics in a hospital for 6 weeks. Abscesses were defined as infections at the site of injection.

Participants were asked if they ever did anything to disinfect their skin at the point of injection, such as washing or wiping, and how often they had used a disinfection procedure during the 6 months prior to interview. Participants who reported skin cleaning were asked what they used—alcohol, soap and water, povidone-iodine, other—and how often they used something—all the time, more than half the time, half the time, less than half the time, rarely, never.

For our analysis, we extracted from the behavioral interview variables on age, race, sex, frequency of injection in the 6 months prior to interview, whether injections had been only in the arms or elsewhere, and use of antibiotics.

To validate self-reports on abscesses, we compared history of abscess in the past 6 months with observed “recent” abscess recorded on the 399 HIV seropositives and 54 negatives who underwent physical examinations as part of the clinical immunologic subcohort. The percent agreement between self-report and examination was 89 percent, indicating high concordance.

Serums were assayed for antibody to HIV-1 using standard ELISA (A) and Western blot (B) techniques, and criteria described elsewhere (2). More than 90 percent of the HIV seropositives returned to the clinic to receive test results.

Frequency distributions were generated and cross-tabulation of variables were performed using Chi-square or Fishers exact statistics to guide interpretation (3).

Results

Of 1,392 intravenous drug users who consented to the special study interview on medical complications of drug injection, 335 (24 percent) reported no injections in the 6 months prior to being interviewed and were excluded from further analysis. Of the remaining 1,057, the median age was 34 years, 96 percent were black, 77 percent were male, 53 percent injected at least daily in the 6 months prior to interview, and 37 percent were HIV seropositive. During the 6 months prior to interview, 12 (1.1 percent) reported an episode of endocarditis, and 113 (10.7 percent) reported at least one abscess at a site of injection. Of the 1,057 active injectors, 556 (53 percent) reported ever cleaning their skin prior to injection; of these, 173 (31 percent) reported cleaning their skin “all the time” before injection in the 6 months prior to interview.

Table 1 shows the self-reported frequency of endocarditis and abscesses in the past 6 months by the frequency of skin cleaning during the same period. The rate of endocarditis was lower among those who reported ever cleaning their skin than among those who never cleaned their skin (0.7 percent vs. 1.6 percent), although the association was not statistically significant ($P > 0.05$). The rate of abscesses was not lower in those who gave a history of ever cleaning their skin prior to injection compared with those who reported never cleaning their skin. The rate of abscesses, however, was significantly lower for those who reported skin cleaning all the time than for those who did not clean all the time or ever (Chi-square = 6.92, $P < 0.01$).

Table 2 shows rates of endocarditis by history of skin cleaning and rates of abscesses by self-reported skin cleaning all the time versus not all the time, stratified by selected demographics, drug use characteristics, and HIV serostatus. Although cell frequencies become small in the stratified analyses, those who reported skin cleaning continued to demonstrate a tendency to lower rates of infection than those who report no cleaning. These stratified analyses suggest that the univariate protective association between skin cleaning and medical complications is probably not due to confounding of the other factors.

Discussion

Our data indicate that endocarditis and abscesses at the site of injection are not uncommon events in a population of active intravenous drug users.

Table 2. Frequency of endocarditis and abscess by frequency of skin cleaning stratified by demographic drug use characteristics among 1,057 active intravenous drug users, Baltimore, MD

Characteristics	Frequency of skin cleaning prior to injection							
	Ever		Never		All the time		Less than all	
	Number	Percent endocarditis	Number	Percent endocarditis	Number	Percent abscess	Number	Percent abscess
Age (years):								
Older than 34	291	0.7	294	1.7	87	8.8	497	15.9
34 or younger	265	0.8	207	1.5	86	4.9	386	9.7
Race:								
Black	541	0.7	470	1.7	171	6.9	839	13.4
Nonblack	15	0.0	31	0.0	2	0.0	44	7.3
Sex:								
Male	416	0.5	400	1.5	129	4.9	686	9.1
Female	140	1.4	101	2.0	44	12.8	197	29.6
Injection site:								
Arms only	439	0.7	377	1.3	151	4.9	665	5.6
Other sites	116	0.9	123	2.5	22	22.2	218	44.4
Frequency of injection:								
Once a day or more	276	0.7	279	1.5	52	6.1	503	17.2
Less than once a day	280	0.7	217	1.4	121	7.1	376	7.7
Antibiotics:								
Yes	175	1.7	158	5.1	49	16.3	284	20.8
No	378	0.3	339	0.0	124	2.4	592	7.3
HIV serostatus:								
Positive	214	1.4	184	3.4	71	14.5	327	13.9
Negative	341	0.3	317	0.6	101	2.0	556	12.6

NOTE: Abscess history missing on 1 person, HIV status missing on 1 person, frequency of injection missing on 5 persons, site injection missing on 1 person, recent antibiotic use missing on 7 persons.

These data are consistent with a San Francisco study in which intravenous drug users were asked to estimate their frequency of endocarditis and abscesses during the previous 10 years (4). The frequency of these medical complications in our study was lower for those who reported any method of skin cleaning prior to injection—similar to the San Francisco results.

In our study, the direction of a protective association remained when data were stratified to examine the effect of potential confounders. In particular, we were concerned that those who reported a lower frequency of injection, injected only in their arms, and were younger might be more careful injectors at less risk for medical complications. They also might be more likely to clean their skin prior to injection. In this case, the association between skin cleaning and medical complications might be spurious. Similarly, antibiotic use among intravenous drug users might prevent bacterial infections and potentially could confound the association with skin cleaning. In each case we noted, however, that the directionality toward a protective association persisted even after stratification. This increased our confidence that a protective association between skin cleaning prior to injection and these two bacterial complications of intravenous drug use was not spurious.

Before firm conclusions are drawn, several study limitations should be considered. First, the extent to which this sample of intravenous drug users can be considered representative of drug users in Baltimore or elsewhere is unknown. Similarly, the extent to which self-reports of behaviors or medical outcomes are valid is unknown, although alternatives to self-reports of behaviors in this population are limited. It is worth noting that the concordance between self-report and physical findings for abscess in a subset that underwent physical examination was 89 percent. Finally, the study had insufficient statistical power to detect some differences, primarily because the occurrence of endocarditis was quite low, only about 1 percent. Additional prospective studies are needed that incorporate larger sample sizes and have medical record reviews to confirm clinical outcomes.

Despite the limitations noted, our data suggest that distribution of alcohol swabs or other antiseptics with instructions might reduce the frequency of serious bacterial infectious complications of intravenous drug use. Instructions will need to be sufficiently clear to make sure that intravenous drug users clean the injection site before rather than after injection. With avenues of access to this population limited, one approach is to have public health workers encourage operators of shooting

galleries to provide intervention, as has been reported in Miami, FL (5). A program to promote consistent skin cleaning would appear to be a cost-efficient addition to a comprehensive public health intervention directed at the prevention of infections among intravenous drug users.

References.....

- 1. Haverkos, H. W., and Lange, W. R.: Serious infections other than human immunodeficiency virus among intravenous drug users. J Infect Dis 161: 894-902 (1990).
- 2. Vlahov, D., et al.: The ALIVE Study: a longitudinal study of HIV-1 infection in intravenous drug users: description of methods. In Longitudinal studies of HIV infection in intravenous drug users, edited by P.I. Hartsock and S. G. Genser. Research Monograph, National Institute on Drug Abuse, Rockville, MD, 1991, pp. 75-100.

- 3. Siegel, S.: Nonparametric statistics for the behavioral sciences. McGraw-Hill Co., New York, 1956.
- 4. Herb F., Watters, J. K., Case, P., and Petti, D.: Endocarditis, subcutaneous abscesses, and other bacterial infections in intravenous drug users and their association with skin cleaning at drug injection sites. Abstract Th.D.O.4, presented at the 5th International Conference on AIDS, Montreal, Canada, June 8, 1989.
- 5. Chitwood, D. D., et al.: HIV seropositivity of needles from shooting galleries in South Florida. Am J Public Health 80: 150-152 (1990).

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