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Causes of Death in Hospitalized Intravenous Drug Abusers

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ABSTRACT: The authors reviewed at autopsy the causes of death of 274 patients with evidence of intravenous drug abuse who had been admitted to a large public hospital. There were 127 who died from diseases unrelated to intravenous drug abuse, and in 41% of these, chronic alcoholism was implicated. Deaths from overdose syndromes and drug-related organ pathology comprised only 11% of all cases. The mean age at death was 39 years. There was a male/female ratio of 3.6:1. Half of all patients died from infection—72 from acquired immunodeficiency syndrome (AIDS) alone. These findings indicate that persons hospitalized with a history of intravenous drug abuse usually die from causes other than overdose and that AIDS and chronic alcoholism are significant problems. Emphasis should be placed upon detecting "hidden" intravenous drug deaths to provide more accurate statistical information.

KEYWORDS: toxicology, drug abusers, death, AIDS, cardiovascular disease, cause of death, chronic alcoholism, endocarditis, forensic autopsy, hepatitis, HIV, hospital, infection, infectious disease, intravenous drug abuser, overdose, readdiction

The problem of drug abuse in the United States has become more acute in recent decades. As a result, health care systems and forensic science specialists are increasingly impacted by the number of persons requiring medical care for drug-related illnesses or accidents and cases requiring investigation by the medical examiner or coroner. Deaths from accidental or suicidal overdoses come under the jurisdiction of the medical examiner or coroner in most places and are probably overrepresented in published series from these sources. Moreover, the impact of the acquired immunodeficiency syndrome (AIDS) epidemic has not been seen in previous studies, and not all human immunodeficiency virus (HIV)-infected intravenous drug abusers die from AIDS.

The authors of this paper reviewed the records of patients found to have autopsy evidence of intravenous drug abuse who had been admitted to a large, acute-care public hospital. We assessed the medical history of these patients in relation to the cause of death determined from the findings at autopsy. This information may be useful to forensic

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pathologists and specialists for investigation and certification of the deaths of intravenous drug users.

Materials and Methods

Cases for review were retrieved from the files of the Autopsy Department of the Los Angeles County–University of Southern California (LAC-USC) Medical Center from 1981 through June 1989 by means of a coded database (College of American Pathologists' SNOMED software) compiled by one of the authors (ECK). The LAC-USC Medical Center Autopsy Department acts as a satellite facility for the office of the Chief Medical Examiner for the County of Los Angeles and conducts forensic autopsies on all hospital deaths under the medical examiner's jurisdiction, except homicides. The autopsy case reports, with abstracted clinical histories, medical examiner's investigations, microscopic slides, gross pathologic descriptions, and toxicological evidence, were used to identify the cases of intravenous drug abusers included in the study [1]. Complete autopsies, including examination of the central nervous system and retention of specimens for toxicological examination, were performed in all the cases and made it possible to determine the cause and manner of death.

Results

There were 3442 adult autopsies performed over the eight and one-half years reviewed, and in 274 (8%) evidence of intravenous drug abuse was found. Of these, 214 were males and 60 were females. The mean age was 39 years (range, 18 to 82 years), and the median age was 37 years. There were 127 who died from diseases unrelated to intravenous drug abuse (Table 1). The commonest disease in this group was chronic alcoholism (41%), followed by cardiovascular diseases (17%), infections (15%), malignant neoplasms (14%), accidents (9%), and miscellaneous diseases (4%). In 147 patients, death was related to intravenous drug abuse, and the causes included AIDS (49%), infective endocarditis (19%), overdose syndromes (14%), and various forms of bacterial sepsis (10%). In only 3% of the cases was hepatitis B the disease which led to death. Drug-related cerebral hemorrhage or encephalopathy, cocaine-induced ischemic cardiovascular disease, and diffuse pulmonary fibrosis from foreign body emboli led to death in 5% of cases in this subgroup.

Discussion

Previous reports of deaths in intravenous drug abusers have largely been composed of statistics compiled from non-hospital, sudden, or unexpected deaths reported to the medical examiner. Overdose syndromes or trauma may be overrepresented in such studies [2–9], and drug abusers dying from natural causes may not be reported to the medical examiner. Ghodse et al. studied the mortality of addicts in London and found that only 16% died in hospitals [10]. Moreover, accurate death certification is not possible without an autopsy, for a history of drug abuse may not always be available for either hospitalized or non-hospitalized persons.

On the other hand, toxicological studies are not as useful for hospitalized patients as for sudden and unexpected deaths investigated by the medical examiner. Persons with a clinical history, physical evidence, or pathologic findings supporting intravenous drug abuse may not have taken drugs recently or may have been hospitalized long enough for the drug levels to drop below detection limits. Intercurrent illnesses may have precluded recent drug use. In this study, toxicologic samples from hospitalized patients taken at autopsy were useful primarily in situations of suspected overdose in which the time of hospitalization was less than a day.

TABLE 1—*Causes of death in patients at autopsy with a history of intravenous drug abuse.*

Cause of Death	No. of Cases
DEATHS UNRELATED TO INTRAVENOUS DRUG ABUSE	
Chronic alcoholism	52
Cardiovascular disease	21
Infection (not drug abuse-related)	19
Malignant neoplasms	18
Accidents	12
Diabetes mellitus	4
Wegener's granulomatosis	1
Total unrelated	127
DEATHS RELATED TO INTRAVENOUS DRUG ABUSE	
Infections	118
Acquired immunodeficiency syndrome	72
Infective endocarditis	28
Bacterial sepsis (non-cardiac)	14
Hepatitis B	4
Overdose syndromes	21
Other drug-related diseases	8
CNS hemorrhage or encephalopathy	4
Ischemic cardiovascular disease	2
Diffuse pulmonary fibrosis	2
Total related	147
Total deaths	274

We found that slightly less than half of patients with a history of intravenous drug abuse (46%) died from causes unrelated to drug abuse (Table 1). Within this group, the commonest underlying cause of death was chronic alcoholism (41%). When intravenous drug abuse led to death, infectious diseases proved to be the final disease process that led to death in 80% of cases, while overdose syndromes led to death in only 14%. AIDS represented 61% of the infectious causes of death; bacterial infections, including endocarditis and other forms of sepsis, represented 36%, and hepatitis B only 3%.

Our percentage of deaths from overdose is similar to that in a study by Louria et al. of the major medical complications of 96 heroin addicts admitted to hospitals; among these there were 42 cases of hepatitis, 38 of bacterial sepsis, 9 of overdose, 8 of endocarditis, and 1 of tetanus [11]. Likewise, Bewley et al. found 39 cases of sepsis, 29 of hepatitis, and only 17 of overdose in 100 consecutive hospitalizations of intravenous drug abusers [12]. We found that AIDS has replaced hepatitis as the major nonbacterial infection associated with intravenous drug abuse. The increasing seroprevalence of HIV in parenteral drug abusers appears to have had a greater impact upon mortality than the already high seroprevalence of hepatitis B (88% in one report [13]).

Our findings are markedly different, however, from previous reports of deaths in nonhospitalized intravenous drugs abusers, including deaths reported to the medical examiner [3-9], persons registered as addicts by governmental agencies [14,15], and military personnel [16]. In these reports overdose was by far the commonest cause of death, but overdoses represented only 8% of all deaths in this series. Thus, the segment of the drug abuse population studied appears to have considerable impact upon mortality statistics.

In a study of addicts institutionalized in a U.S. Public Health Service hospital for long-term care and treatment, but not for acute illness, Sapira et al. found that infections

accounted for 33% of 385 deaths from 1935 to 1970, with tuberculosis the etiology in half of these deaths and bacterial infections the cause in slightly less than half. Cardiovascular disease led to 22%, neoplasia to 18%, and chronic liver disease to 4% of the deaths [17]. Thus, infectious complications of intravenous drug abuse seem to evolve over time with the changing prevalence of infectious agents in the community.

This evolution is reflected in our study through the impact of the AIDS epidemic. Los Angeles, like most large metropolitan areas of the United States, has a higher prevalence of HIV infection than the national average, in part, because of the greater prevalence of intravenous drug abusers and individuals with other risk factors. AIDS accounted for 26% of all deaths in this study. Stoneburner et al. found that AIDS had contributed the most to the increase in deaths observed in drug abusers from review of health department statistics in New York City from 1978 to 1986. From 1981 through 1986, 27% of death certificates issued for drug abusers in New York City listed AIDS as a cause, although it was felt that not all the AIDS cases were recognized and that the actual rate may have been 50% [18].

Our autopsy findings are similar (26%), but the New York City data represent an earlier, shorter time period, and AIDS may well account for an even greater percentage of deaths in drug abusers now. This percentage will rise in coming years as an estimated 400 000 currently HIV-infected intravenous drug abusers progress to clinical AIDS [19,20]. In 1988, there were 4.3 cases of AIDS associated with intravenous drug abuse per 100 000 population in the United States [21].

We found that the risk of death from drug-abuse-related bacterial infections still remains significant, with the incidence (15%) being within the range reported in previous studies prior to the AIDS epidemic [3,6,14,15,17]. In fact, HIV-infected drug abusers may die from bacterial infections before clinical AIDS develops, because the risk of infection depends not on the frequency but on the manner of drug use, so that even casual abusers or experimenters are at risk. The transmission of HIV by blood is highly efficient, often requiring only one exposure [22]. If infection related to contamination by injection—usually from sharing of nonsterile needles—were eliminated, the natural history of intravenous drug abuse could be modified significantly [23].

We could not accurately assess which patients had ceased intravenous drug use prior to death. Spontaneous and temporary abstinence may be more frequent than generally realized, may occur without the benefit of treatment or counseling programs, and may depend upon the social context of drug use. A pattern of casual use without permanent addiction was observed in a study of Vietnam veterans [24]. Vaillant found that, although 90% of narcotic addicts relapsed at some point in a twelve-year follow-up from a treatment program, 46% were drug-free at death [25]. This same pattern was seen by Duvall et al. in a follow-up study of 453 narcotic addicts over five years after a treatment program, in which 97% were readdicted during that interval but only 46% were still readdicted at the end of the period [26]. Our finding that 46% of deaths were unrelated to drug use substantiates these observations on drug use.

Remission from intravenous drug use may result from substitution or concurrent use of other drugs. Thus, over 50% of the deaths of British addicts in one series were caused by barbiturate overdose, not narcotics [10]. Our data suggest that alcohol use, which was implicated in 19% of the deaths in the study and 41% of the deaths not related to drug abuse, may be a common mechanism for this to occur in our population. Ruttenber and Luke found evidence for ethanol use in 74% of heroin-related deaths at autopsy [27]. Barr et al., in a report on mortality of alcoholics and drug addicts, concluded that there was no evidence that narcotic misuse had life-threatening chronic effects comparable to those of alcohol. However, they found substantial evidence that joint misuse of drugs and alcohol affected mortality [28]. Our findings appear to corroborate this evidence.

Conclusions

In summary, nearly half (46%) of the deaths of hospitalized intravenous drug abusers occurred from causes unrelated to such use. Chronic alcoholism was the underlying cause of death in 19% of all cases, reflecting the serious long-term effects of alcohol abuse. Deaths directly related to intravenous drug effects represented only 11% of all cases. Although bacterial infections were still common in this series, AIDS was the proximate cause of death in 26% of all cases and in 49% of patients whose death could be associated with intravenous drug abuse. The AIDS epidemic has markedly modified mortality statistics in intravenous drug abuse. These findings may assist medical examiners in death investigations to identify possible drug abusers and provide more accurate biomedical data for health statistics and assessment of problems associated with drug abuse.

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