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Sharp Injury Fatalities in New York City

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ABSTRACT: We reviewed the case records of all fatalities due to sharp injuries in New York City in 1999. The epidemiological profile, circumstances, toxicology results, location, and injuries were examined. There were 120 deaths: 101 homicides, 17 suicides, and 2 accidents. The causes of death included: 112 due to stab(s) with or without incised wounds and 8 pure incised wound fatalities of which 5 were suicides. The detection of ethanol and/or illicit drugs was 61% in the homicide and 12% in the suicide groups. "Defense wounds" were reported in 49% of the homicides and "hesitation" wounds were found in 65% of the suicides. There were no self-inflicted sharp injuries of the face. Deaths due to a single stab wound occurred in 34% (34/101) of the homicides and 24% (4/17) of the suicides. Of these 38 deaths, 58% were of the anterior thorax (chest) and 71% injured the heart and/or great vessels. The remaining deaths with single stab wounds involved the femoral artery, abdominal organs, or head. There were no sharp injury suicides by Hispanics, Asians, or anyone under the age of 18 years. Over half of the suicides at home occurred in the bathroom and 78% of these occurred in the bathtub. Suicide notes were found in 24% of suicides, and an additional 24% verbally expressed a plan to commit suicide.

KEYWORDS: forensic science, forensic pathology, sharp, stab, New York City

Sharp injuries are the leading cause of homicides in countries with strict gun control laws such as the United Kingdom, Canada, and Sweden (1–5). In the United States, gunshot wounds are the leading modality of homicide, and account for approximately 60% of all homicides. This was not always the case. In New York City, in the mid 1960s, there were approximately 600 homicides per year (6). Sharp injuries accounted for 39% and gunshot wounds for 33% of all homicides examined at the Office of Chief Medical Examiner in Manhattan.[2] The number of homicides in New York City peaked at 2250 in 1990 and decreased during the next decade to 690 homicides in 1999. In 1990 and 1991, there were 4468 homicides in New York City, 72% of which were due to gunshot wounds and 16% were due to sharp injuries (7). The percentage of homicides due to sharp injury in 1999 was 15% (101/690).

Several studies in the United Kingdom and Sweden have examined large numbers of sharp injury deaths (1–4,8–14). Most of these studies involved long time periods for data collection that ranged from 9–45 years in order to collect from 28 to 279 sharp injury deaths (1,2,8,10–12). Other than case reports, there have been few large cohort studies of sharp injury fatalities in the United States (15–19). We reviewed the case records of all 120 people who died from sharp injuries in New York City in a single year, 1999. The epidemiological profile, circumstances, toxicology findings, and injuries were examined.

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[2] At this time, all homicides from Queens and Richmond Counties were performed in Manhattan.

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Materials and Methods

The Office of Chief Medical Examiner investigates all unexpected, violent, and suspicious deaths in the five boroughs that comprise New York City. This study was conducted on all fatalities due to sharp injuries in New York City. Decedents with sharp injuries in combination with other injury modalities (gunshot wounds, blunt injury, and neck compression) were excluded if the sharp injury was not the sole cause of death. Deaths due to the delayed complications of sharp injuries were included.

All deaths due to sharp injuries in New York City in 1999 were identified through the New York City Office of Chief Medical Examiner (OCME) database using a textword search for "stab," "cuts," and "incised." All case files were reviewed including: the autopsy, toxicology, and investigator's reports. In select instances, police reports, scene and autopsy photographs/diagrams, and medical records were reviewed. The age, race, sex, injuries (number, location, type), circumstances, medical history, location, toxicology results, and cause and manner of death were extracted. The race of the decedent is that provided by the next of kin on the identification form.

Stabs are sharp injuries that are deeper into the body than long on the skin surface. Incised wounds (or cuts) are sharp injuries that are longer on the surface than deep. Hesitation or tentative wounds are defined as superficial/shallow stabs or cuts usually in the area of the deeper wound(s). The cuts are often parallel or colinear. So-called "defense wounds" are sharp injuries of the extremities (typically the hands and arms) which are consistent with the decedent interposing his/her extremities between the sharp object and his/her body or with grabbing a sharp object (1,2,4,10,11,20,21). In this study, blunt injuries of the extremities were not included as "defense wounds." Sharp wounds were considered "grouped" if there were greater than five wounds within a 10 in. diameter.

Toxicological testing was performed on all deaths. Specimens routinely collected for toxicological analysis include: blood (peripheral preferred), urine, bile, vitreous humor, brain, liver, and gastric contents. Autopsy blood specimens were collected with the addition of sodium fluoride and stored at 4°C. The toxicology laboratory at the Office of Chief Medical Examiner analyzed all specimens. Ethanol concentrations were determined in blood (and vitreous or urine if available) using head space gas chromatography.

Urine specimens were routinely tested for opiates, barbiturates, benzoylecgonine (BE), cannabinoids, amphetamines, phencyclidine, and methadone by enzyme immunoassay. In cases where urine was not available, blood was tested for opiates, benzoylecgo-

nine, barbiturates, and cannabinoids using radioimmunoassay. Urine or blood also was screened for basic drugs (including ketamine and cocaine) by gas chromatography with a nitrogen phosphorous detector (GC/NPD).

Results

In 1999 in New York City, there were 120 sharp injury deaths: 101 homicides, 17 suicides, and 2 accidents. The causes of death included: 112 due to stab(s) with or without incised wounds and 8 pure incised wound fatalities of which there were 5 suicides and 2 homicides. The age, race, and sex results by manner are listed in Table 1. The age range was 5 to 84 years for homicides (mean of 34 years) and 18 to 76 for suicides (mean of 49). There were more men than women for both homicides (3.2 to 1) and suicides (2.4 to 1). Hispanic (40%) and Black (44%) decedents made up 84% of the homicides. Among the suicides, 65% were white and 35% were black. There were no sharp injury suicides by Hispanics, Asians, or anyone under the age of 18 years.

The number of sharp injuries are in Table 2. Defense wounds were reported in 49% (49/101) of the homicides and hesitation wounds were found in 65% (11/17) of the suicides. There were no self-inflicted sharp injuries of the face. There were five deaths due to delayed complications of sharp injuries including: infection, pulmonary embolism, anoxic encephalopathy, and an abdominal compartment syndrome following laparotomy.

Deaths due to a single stab wound occurred in 34% (34/101) of the homicides and 24% (4/17) of the suicides. Of these 38 deaths, 58% (22/38) were of the anterior thorax (chest) and 71% (27/38) injured the heart and/or great vessels. The remaining deaths with a single stab wound involved injuries of the femoral artery, abdominal organs, or head. Among the 22 single stab wounds of the anterior thorax, 20 had no other sharp injury of the body. In only one of these 20 deaths did the stab wound track have a front to back direction without upward/downward or right/left deviations. Both suicides (7/17) and homicides (18/101) had "grouped" sharp injuries.

The toxicological and psychiatric findings are presented in Table 2. The detection of ethanol and/or illicit drugs was 61% in the homicide group compared to 12% in the suicide group. Suicide notes were found in 24% of suicides, and an additional 24% verbally expressed a plan to commit suicide. The location and time of year of the injuries are reported in Table 3. Over half of the suicides at home occurred in the bathroom (9/15) and 78% of these occurred in the bathtub (7/9).

TABLE 1—*The age, race, and sex results by manner of death.*

Age Range (mean)	Homicides 5–84 (34)	Suicides 18–76 (49)	Accidents 13–53	Total
Men	77	12	2	91
Women	24	5	0	29
Asian	3	0	0	3
Black	45	6	1	52
Hispanic	40	0	1	41
White	13	11	0	24
Total	101	17	2	120

TABLE 2—*The number of sharp injuries by manner of death.*

	Homicides	Suicides	Accidents
Total fatalities due to sharp injury	101	17	2
Sharp injuries per person (mean)*	1–92 (8.8)	1–63 (14.4)	1 (1)
Persons with 1/2/3/4>4 sharp injuries*	29/8/9/9/46	4/1/2/2/8	2/0/0/0/0
Total fatalities due to stab injury†	99	12	1
Stab injuries per person (mean)*	1–78 (5.6)	1–23 (5.8)	1 (0.5)
Persons with 1/2/3/4>4 stab(s)*	38/12/9/8/27	4/0/1/3/4	2/0/0/0/0
Total fatalities due to cut injury	2	5	1
Cut only injuries per person (mean)	1–6 (3.5)	1–63 (15.0)	1
Defense wounds	49% (49/101)	0	0
Hesitation wounds	0	65% (11/17)	0
Suicide note/verbal expression	0	47% (8/17)	0
Ethanol and/or illicit drugs	61% (60/98‡)	12% (2/17)	50% (1/2)

* The five deaths due to complications of stab wounds were excluded from these calculations due to lack of information about the total number of sharp injuries.

† With or without other cut wounds.

‡ Due to prolonged hospitalizations, admission bloods were not available for toxicologic testing on three decedents.

TABLE 3—*Location and time of year of the injury by manner of death.*

	Homicides	Suicides	Accidents	Total
Home	43	14	1	58
Street	44	0	0	44
Other	14	3	1	18
Total	101	17	2	120
January to March	21 (21%)	6	0	27
April to June	29 (29%)	2	1	32
July to September	33 (32%)	4	1	38
October to December	16 (16%)	3	0	19
Unknown	2 (2%)	2	0	4
Total	101 (100%)	17	2	120

More homicides occurred in the warmer months from April to September. The percent of sharp homicides that occurred indoors was similar in the colder (51%) to the warmer months (49%). The percent of homicides that occurred outdoors was greater in the warmer months (78%) than the colder months (22%).

The accidental deaths involved a 53-year-old man who cut his wrist by breaking a window to get into his locked home. His blood alcohol was 0.40 mg%. The other was a 13-year-old boy impaled by a metal rod while "playing" in an abandoned building.

Discussion

Previous studies have examined specific autopsy findings that may differentiate self-inflicted from homicidal sharp injuries

(2,10,12). Of 120 sharp injury fatalities, there were no sharp injury fatalities with an undetermined manner in New York City in 1999. In sharp fatalities, the patterns of injuries and the circumstances often demonstrate the clear intent of suicide or the hand of another in homicide, thus allowing the investigator to discern the manner of death. The reasons for the difficulty of determining the manner of death in some gunshot wound fatalities do not occur with sharp injuries. It is extremely rare to kill oneself while "cleaning" a knife or by playing "Russian Roulette" with a knife (16). In addition hunters do not inadvertently kill another person with a knife.

One potential challenge with homicidal sharp injuries is the fatality from a single stab wound to the anterior trunk. Commonly, the argument is made that the decedent "ran into" the sharp object. This is typically a courtroom, not a death certification, concern since if another person were holding the knife, the death would still be certified as a homicide because it is a death at the hand of another. When evaluating this hypothesis, it is helpful to consider the overall directions of the stab wound track. It is extremely unlikely for a person to be stabbed by "running into a knife" that is positioned other than perpendicular to the decedent's body. Otherwise, the angled knife would be deflected by the body. In order for a person to sustain a stab wound of the abdomen with a downward track, it would require either that the perpetrator thrust the knife into the decedent's body or that the decedent jumped up and into the static knife.

Hesitation and defense injuries are helpful in determining manner. They frequently are seen in sharp injury suicides and homicides. Attempts at staged suicides with postmortem hesitation marks are rare. Hemorrhage (or the lack of it) in the tissue and the circumstances of these fatalities must be carefully explored. In one study, hesitation wounds were found in 62% of suicides and defense wounds in 41% of homicides (2). In three other studies, hesitation wounds were found in 64% (1) of suicides and defense wounds in 39% and 47% of homicides (4,13). Our numbers were similar: 65% with hesitation and 49% with defense wounds.

The Appellate Court of New York State has found that the term "defense wound" is improper testimony since whether an incised wound of the arm "was caused by warding off a blow or by some other means is not a fact uniquely within an expert's knowledge." The court continued: "By stating that the wound was defensive in nature, the expert usurped this function and expressed an opinion on the ultimate issue to be resolved by the jury" (see *People v Paschall,* 91 AD2d 645). Instead in court, these injuries are simply described as cuts that are consistent with the decedent interposing his/her extremities between the knife and his/her body or with the decedent grabbing the knife blade.

The body location of the injury also may help to determine the manner of death. It is extremely rare for people committing suicide to cut their own face. None of the suicides in our study had sharp injuries of the face. Karlsson et al. in Stockholm found no facial injuries in 89 sharp force suicides (11). A study of 29 suicides in London reported two fatalities with "self-inflicted" facial sharp injuries. The full details of these cases are not provided, however, the described findings are atypical. They reported that tentative/hesitation injuries were closely associated with the "main stab wounds" in all 29 deaths except two. The two exceptions were the deaths with the facial wounds. In one case, the facial injuries were "hesitation" wounds and there were stab wounds of the chest and abdomen. The second involved "hesitation" wounds of the neck with a stab wound through the mouth. The circumstances of these two deaths are not reported, but one assumes that there must be other compelling findings to certify these deaths as suicides (20).

Groupings of sharp wounds were seen in twice as many suicides (41%) as homicides (17%). Tight clusters of wounds may assist in the investigation and reconstruction of homicides and suicides. In a homicide, a grouping of sharp injuries indicates that the decedent was repeatedly stabbed after incapacitation. In a suicide, the injuries are concentrated over accessible vital region(s) and typically many of the grouped cuts or stabs are superficial (i.e., hesitation marks). In addition, suicidal incised wounds tend to be parallel or colinear. In a homicide with continued infliction of injury after incapacitation of the victim, the grouped wounds may not be in an accessible area to the decedent (e.g. the posterior thorax) and are typically deep.

Alcohol and/or illicit drugs were found in both homicides and suicides, similar to other studies of sharp injury fatalities (11,13). Among male and female homicide victims, ethanol and/or illicit drugs were detected in 72% and 38%, respectively. Ethanol, with or without other drugs, was detected in 45% of male and 21% of female homicides. In a study of sharp injury homicides in Sweden, ethanol was detected in the blood in 88% of the men and 30% of the women (10).

The season/temperature may play a role in the epidemiology of violence (22,23). A nearly equal number of sharp injury homicides occurred indoors in both the colder (October to March) and warmer months (April to September). Twice as many homicides, however, occurred outdoors than indoors during the warmer months. This also was demonstrated in the early 1990's when most sharp injury homicides occurred on the street (7). Since people, in general, spend more time outdoors during the warmer months, this finding is expected.

The majority of suicides occurred in the home, and the bathroom was the most frequent room. This may be due to the common belief that placing the wrists in warm water will make the blood vessels dilate or prevent coagulation. It also may be a terminal attempt at tidiness. A study in the United Kingdom of suicide by stabbing found that the majority of decedents were found in the bedroom or kitchen (1).

From 1990 to 1991, 86% of all homicide victims were male, and Blacks (47.5%) and Hispanics (38.2%) made up the majority of the victims. In the current study, the epidemiologic breakdown is similar. The majority of homicide victims continues to be disproportionately male (77%) and Black (45%) or Hispanic (40%). This racial breakdown differs from the suicide group (see Table 1).

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