

Restraint Asphyxiation in Excited Delirium

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Eleven cases of sudden death of men restrained in a prone position by police officers are reported. Nine of the men were hogtied, one was tied to a hospital gurney, and one was manually held prone. All subjects were in an excited delirious state when restrained. Three were psychotic, whereas the others were acutely delirious from drugs (six from cocaine, one from methamphetamine, and one from LSD). Two were shocked with stun guns shortly before death. The literature is reviewed and mechanisms of death are discussed.

Key Words: Positional asphyxiation—Restraint asphyxiation—Excited delirium—Cocaine—Police custody death—Hogtie death—Hobbled (restrained)—Stun gun—Methamphetamine—LSD.

The "hogtied" prone position is commonly used by police to restrain violent persons to protect other people, property, and the subjects themselves during transport to hospital or jail. *Hogtying* means binding a person's wrists and ankles together behind his or her back while he or she lies prone. This may be accomplished by combinations of handcuffs, cords, or specially designed hobbles. Concerns have recently been expressed about the safety of such prone restraint with positional asphyxiation postulated as the mechanism of death in three reported cases (1).

Six similar deaths have been identified in Ventura County, California, during the past 6 years, two in adjacent counties, and three in Portland, Oregon. All cases involved law enforcement officers and two also involved medical personnel. Because of their excited delirious condition, all of the victims were restrained to facilitate transport for medical care or incarceration. To date, seven of the 11 cases have ended in wrongful death lawsuits against the various public agencies involved. These cases are reported here to alert law enforcement agencies, death investigators, and medical personnel that the hogtied prone position in delirious people can have sudden, unexpected, lethal consequences, and requires close monitoring or alternative restraint methods to prevent sudden death.

CASE REPORTS

Case 1

Police were called to an apartment complex because a 29-year-old man was disturbing the peace and damaging property. When police arrived, they found six people attempting to control the suspect. After a brief scuffle, police managed to handcuff him and tie his ankles and wrists behind his back in a hogtie fashion. He continued to struggle and was placed prone, still hogtied, in the back seat of the police car for transport to jail. He continued to scream and struggle for ~5 min. When he suddenly

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stopped struggling, officers noted that he was not breathing. They stopped the car, started cardiopulmonary resuscitation, and called for an ambulance. Resuscitation by paramedics was unsuccessful and he was pronounced dead ½ h later in the emergency room.

Autopsy findings included numerous superficial contusions and abrasions and fresh needle injection sites on a foot. Two parasternal rib fractures were the only internal injuries. Slight coronary artery atherosclerosis was present without microscopic evidence of ischemia, contraction-band necrosis, or inflammation.

Postmortem toxicologic analysis revealed a blood ethanol concentration of 0.08 g/dl and a blood cocaine concentration of 0.6 mg/L.

Case 2

Police were dispatched to a residence when relatives reported that a 44-year-old man, who was high on cocaine and had a knife, was destroying the house. Officers found the suspect screaming and throwing furniture. The suspect broke a window with his fist and grabbed at an officer. With the help of relatives, he was eventually handcuffed. Officers canceled a call for an ambulance and transported him to the hospital in the back seat of the patrol car. When he began kicking at the car windows, he was further restrained in a hogtied, prone position on the car seat. He was talking incoherently and struggling for the first 8 min, but suddenly quieted within two blocks of the hospital. At the emergency room, he was not breathing and was asymptotic. Resuscitation attempts lasting 20 min failed.

Autopsy findings were minor abrasions and contusions on the arms, legs, and head, and a large contusion on the back. Old needle track scars and fresh needle punctures were in tattoos on the arms. There were no internal injuries. The heart was slightly hypertrophied, but microscopically normal.

Postmortem toxicologic analysis revealed a blood cocaine concentration of 0.34 mg/L.

Case 3

Police were dispatched to a freeway where a 41-year-old man was running in the traffic lanes, shouting, and waving his arms in an excited manner. The subject kept shouting "Don't let them get me!" Officers and civilians eventually had to remove him physically from the traffic. Because he was combative and irrational, he was placed prone on the ground with wrists and ankles restrained behind his back. He broke the first ankle restraint. A second ankle restraint was being applied while an officer had a knee on the subject's back when the subject suddenly became quiet and stopped breathing. He was in the hogtied, prone position for ~4

min. Paramedics transported him to the hospital where an axillary temperature of 100.3°F was obtained. He was pronounced dead within 30 min.

A friend indicated that the subject had smoked cocaine or methamphetamine several hours before the incident and had become paranoid and excited, hallucinating that police were chasing him. He had had a history of drug abuse.

Autopsy findings were multiple minor skin abrasions, contusions, and lacerations, and a large patterned abrasion on the back. Petechiae involved the conjunctivae and pleura. Slight coronary artery atherosclerosis was present.

Postmortem toxicologic analysis revealed a blood methamphetamine concentration of 0.95 mg/L.

Case 4

Police were called to a residence because a 36-year-old man was physically threatening the owner and destroying property. Officers were confronted by an uncooperative, delirious, violent person who appeared to be on drugs. He was forced to the floor and restrained with wrists and ankles secured behind his back in a hogtie fashion. A pulse of 160 beats/min was noted by one officer. The suspect was carried outside to the front walkway where he was placed prone while officers searched the residence and called an ambulance. When paramedics arrived, the subject was without vital signs. Resuscitation attempts at the scene and at the emergency room were unsuccessful and he was pronounced dead 30 min later. He had not been closely observed during the 20 min that he was hogtied on the walkway and it was unclear when he actually stopped struggling. The subject had a history of prior cocaine and heroin use.

Autopsy findings were numerous superficial contusions and abrasions, many of which were probably self-inflicted, and fresh needle injection sites on the left arm.

Postmortem toxicologic analysis revealed the following blood drug levels: cocaine, 0.28 mg/L; benzoylcegonine, 3.2 mg/L; and morphine, 0.06 mg/L.

Case 5

Police were called to a residence where a man had barricaded himself and minor children inside. Officers broke in to find the subject standing on a bed and waving a beer bottle. He was violent and screaming irrationally about people trying to kill him. Officers handcuffed him and brought him, struggling and screaming, to the police station.

In the police station parking lot, the subject was placed prone on the ground in an attempt to shackle

his ankles. He grabbed an officer and several baton blows and stun-gun shocks were used to loosen the grip. He was carried into the police station where he was placed prone on the floor, still screaming and thrashing. Officers used the stun gun again while placing a leather restraint belt on him, attaching his wrists to it and shackling his ankles. Police reports do not indicate how much weight was placed on the subject's back or whether the ankles were raised behind the back. Officers noticed the subject's respiratory distress and called for medical aid, but resuscitation attempts failed and he was pronounced dead 1/2 h later. Police reports indicate that several minutes of struggling intervened between the last stun-gun shock and the subject's respiratory arrest.

Autopsy findings were minor cutaneous abrasions and bruises, several paired, punctate, erythematous lesions on the skin of the back from the stun-gun prongs, and focal myocardial contraction-band necrosis.

Postmortem toxicologic analysis revealed a blood ethanol concentration of 0.13 g/dl and a blood cocaine concentration of 0.915 mg/L.

Case 6

Police were called to a hospital room where staff were attempting to control a violent, schizophrenic, 24-year-old male patient who was being evaluated for atrial flutter. Officers used a nightstick and stun gun in controlling the subject. The patient was eventually strapped, prone, to a hospital bed and was transported across a parking lot to a mental health facility. During transport, police used a Taser's antennae on him several times for unclear reasons. The Taser was used several more times in the mental health facility while removing restraints and placing handcuffs behind the patient's back. He was then carried into the isolation room and placed prone with wrists and ankles secured to the bed. Within a minute he had ceased struggling and within several minutes he had ceased breathing. Resuscitation attempts failed.

The patient had had a long history of schizophrenia. One month prior to death, he had been hospitalized for malignant neuroleptic syndrome.

Autopsy revealed moderate coronary atherosclerosis without evidence of ischemia. The only external lesions were minor abrasions of the wrists and ankles. No electrical burns were seen.

Postmortem toxicologic analysis demonstrated blood concentrations of amobarbital of 1.9 mg/L and lorazepam of 0.15 mg/L, both consistent with therapeutic levels of drugs given in hospital.

Case 7

Police were called to a home where a 14-year-old boy, who was reportedly on a bad LSD trip,

had jumped through a window and cut his leg. He was screaming obscenities, talking incoherently, and spitting. It took four adults to restrain him and transport him to the hospital emergency room. Because of his constant struggling, attempts to suture his lacerations were halted and, prone on a hospital gurney, with his hands cuffed behind his back, he was transported three blocks to a juvenile detention center. Still struggling and spitting, he was placed in soft restraints and hogtied. The subject's father reported that manual pressure was applied to his back and shortly thereafter he went limp. He was carried to a padded room, placed prone on the floor, and within a minute was discovered to be unconscious and not breathing. He was rushed back to the hospital where he died after 7 days in a coma.

Autopsy findings were negative for injuries or other abnormalities.

Toxicological tests of admitting blood samples from the hospital were positive for LSD only.

Case 8

Police were summoned by a neighbor who reported a 28-year-old man with a gun who was acting bizarrely and hiding behind bushes, but police didn't make contact with the subject. Seven hours later, he was nude at work, bathing in a sink, and the police were called again. The nude subject fled and entered a small store where he attempted to hide under shelves. He was yelling, kicking, spitting, and biting as he was restrained and handcuffed, prone and hogtied on the floor. One officer was kneeling on his back and others were restraining his arms and legs for ~4 min, when he suddenly lost consciousness. Paramedics transported him to the hospital where he was pronounced dead minutes later.

Neighbors stated that the subject had snorted and smoked cocaine and had been acting strangely for 3 months. The only autopsy findings were abrasions and contusions of the arms, legs, and trunk.

Postmortem toxicologic analysis revealed a cocaine concentration of 0.70 mg/L in blood and amphetamine in urine.

Case 9

A 37-year-old manic-depressive man was in a manic phase when he took his family hostage. Police were called and after a struggle he was restrained prone with ankles and wrists tied behind his back. At some point during restraint, he lost consciousness and stopped breathing. Cardiopulmonary resuscitation was unsuccessful and he was pronounced dead at the hospital.

Autopsy findings were abrasions and contusions along with a bicuspid aortic valve.

A therapeutic level of valproic acid (24 mg/L) was in his postmortem blood.

Case 10

Police were called because a 37-year-old "wild man" with a history of chronic schizophrenia was trying to rip off the top of a car to free someone inside, although the car was unoccupied. The man asked police to cuff him because he was "crazy." He was placed in the back seat of the patrol car, but attempted to kick out the windows and was removed from the car. He was placed prone on the ground and hogtied with handcuffs and leg restraints. Following brief seizures, he stopped breathing. Resuscitation attempts failed and he died within an hour at hospital.

He had a history of chronic schizophrenia.

Autopsy findings were ligature marks on the wrists and ankles, small abrasions and contusions of the face, and mild cardiomegaly.

A toxic level of amantadine (Symmetrel) was found in the victim's blood.

Case 11

Police were called because a 33-year-old man was acting irrationally and trying to kick down a door. Friends said the subject thought someone was going to shoot him. He ran when police approached, but was eventually caught. Batons were used and he was eventually restrained in a prone, hogtied position on the ground. An estimated 2 min after being restrained, officers heard him say "I can't breathe" and, 1-2 min later, he lost consciousness, stopped breathing, and was transported to a hospital, where he was pronounced dead. He was noted to have been sweating profusely, but no temperature was taken.

Autopsy findings were external injuries consistent with a struggle and baton blows, but no internal injuries.

Postmortem toxicologic analysis revealed a blood cocaine concentration of 2.4 mg/L, a blood benzoylcegonine concentration of 4.3 mg/L, and a blood ethanol concentration of 0.04 g/dl.

LITERATURE REVIEW

These cases exemplify a syndrome that we will refer to as positional asphyxiation during restraint in excited delirium, or restraint asphyxiation.

These cases are remarkably similar. All were young men who exhibited the acute onset of irrational, aggressive, violent behavior with paranoid features, referred to as excited delirium (2,3). The

behavior was so frightening that in all cases the police were called.

Excited delirium, or delirious mania, is a rare form of severe mania, sometimes part of the spectrum of manic-depressive psychosis and chronic schizophrenia. It is characterized by constant, purposeless, often violent activity coupled with incoherent or meaningless speech and hallucinations with paranoid delusions. Such people can be dangerous and may die of acute exhaustive mania (4). Hyperthermia is often part of this syndrome. Cases 6, 9, and 10 involved chronic psychotics, but their temperatures were not recorded.

The rest of the cases are examples of drug-associated acute excited delirium, mostly cocaine induced. In 1981, Fishbain and Wetli reported a case of fatal cocaine intoxication with delirium in a body packer (5). In 1985, Wetli and Fishbain reported the deaths of seven recreational cocaine users who developed acute excited delirium (3). Five involved police custody and three were hogtied in a prone position. One death occurred while the victim was prone with the wrists cuffed behind the back. Ankle positioning in this case was not mentioned. One was handcuffed in a police car when he stopped breathing. His position was not noted. One was restrained in an emergency room. Position was not noted. One died from abdominal injuries sustained prior to being hogtied. All but one of the deceased were men. Blood cocaine levels ranged from 0.4 to 0.92 mg/L. Four had documented hyperthermia. The authors attributed the deaths to cocaine intoxication of an atypical type and speculated that the mechanism of death might involve autonomic reflexes, toxic cardiac dysrhythmia, or "restraint stress," as has been postulated with acute exhaustive mania. The potential adverse effect of hypoxia due to prone restraint was not mentioned.

In 1987, Wetli described perplexing deaths associated with cocaine intoxication following an acute psychotic reaction termed "excited delirium" (2). He described paranoia, disrobing, hyperthermia, and aggression toward glass as common components, along with unusual strength. Typically, subjects continued to struggle after being restrained, and they died suddenly, frequently in the back of police cars.

In 1988, Reay et al. reported that the prone, hogtied position prolonged the recovery time of heart rate and peripheral blood oxygen saturation in 10 normal adults after moderate exercise (6). In his 1992 report, Reay described three deaths occurring during police transport (1). Two of the people were hogtied while prone on the back seats of police cars. One was prone with wrists cuffed behind his back and ankles bound with knees flexed, but was

not hogtied. Two of the three slid forward on the back seat such that one was on the floor of the car between the back and front seats and one was partially wedged between the back seat and the front seat backrest. One was heard to say "Gimme some air." All were taken into custody for violent, agitated behavior. Two had major psychiatric illnesses that explained the behavior, and one was under the influence of alcohol, LSD, and THC (tetrahydrocannabinol). Body temperatures were not reported. All three deaths were attributed to positional asphyxia. The authors discussed physiologic mechanisms of death during prone restraint and the importance of scene and history investigation in conjunction with autopsy and toxicologic findings.

In 1991, Kornblum and Reddy reported 16 fatalities of young men involving police confrontations where Taser guns were used (7). The Taser is a hand-held electrical control device that utilizes barbed darts connected by thin wires to a 9-V-battery pack that delivers high-voltage, very low amperage, pulsed current to cause immobilization through painful muscle spasm. In all cases, the police were called because of bizarre, and in some cases aggressive behavior. Most subjects died between 15 min and 1 h after Taser usage. All but three had either cocaine, methamphetamine, or phencyclidine in their blood at time of death. Three died from gunshot wounds. Some of the others died while restrained, but not enough detail was given to identify cases that might fit into the syndrome of positional asphyxiation during restraint. Electrocutation was not the cause of death in any of the cases in the opinion of the authors, who believed that the common thread in such sudden, unexpected deaths while in police custody was drug use leading to bizarre behavior.

Cases 5 and 6 in the current series also involved electrical control devices. In case 5, a Nova stun gun was used. The stun gun was similar to the Taser except that the electrical shock was delivered via two short prongs, 2 inches apart. In case 6, first a Nova stun gun and later the antennae of a Taser were used. In neither case did the shocks appear to cause death directly, as several minutes of activity followed the shock application.

In 1992, the San Diego Police Department and the San Diego County Medical Examiner's Office issued a final unpublished report prepared by a custody death task force (8). The report was circulated throughout the United States to police departments that participated in a survey. The deaths of five men, aged 28-41, who fit into the syndrome of sudden death while restrained because of excited delirium were briefly summarized. In four cases,

police were called because of bizarre, violent behavior. In the other case, police were asked to help locate a mental health hospital escapee. All were agitated and delirious when placed in prone restraint by police. Two were hogtied in the back seats of police cars when they stopped breathing. One was handcuffed and tied to a gurney. One was handcuffed while prone, but methods of restraint were not further described. One was handcuffed with ankles bound, but whether or not they were secured behind his back was not detailed. In four of the cases, cocaine induced the acute psychosis. In the other, the acute psychosis was a manifestation of chronic schizophrenia. In one, a rapid pulse was described. One was documented to be hyperthermic. Two were noted to be sweating profusely and one was nude. Three of the deaths were certified as accidental and two were called homicides.

The San Diego Custody Death Task Force national survey results provided insufficient detail from respondents to comment on the number or frequency of "hogtie" deaths nationwide, but it did indicate that of the 142 police agencies that responded to the survey, 43 authorized their officers to use the hogtie procedure. On the basis of the task force findings, the San Diego Police Department has banned the practice of transporting subjects hogtied and prone in the back of police vehicles.

DISCUSSION

The 11 reported cases are summarized in Table 1. All of the deceased were male, ranging in age from 14 to 44 years. In all cases police were called because of wild, threatening, or bizarre behavior, and in all cases it took several people to control and restrain the subjects. In all cases they continued to struggle while restrained initially, and minutes later were noticed to be unconscious or dead. All subjects exhibited behavior that could be characterized as acute mania, acute psychosis, or, more descriptively, acute excited delirium. The duration of the observed delirious behavior ranged from ~6 h in case 8 to <1 h. In two cases, a racing pulse was documented. One case involved undressing, at least three involved breaking glass, and, in one, a slightly elevated body temperature was noted, but temperatures were not recorded in the rest of the cases.

All subjects were restrained in a prone position. Nine were hogtied when they lost consciousness: two in the back seat of police cars, five on the ground, and two on the floor. One was tied on a gurney and one was restrained by several officers manually holding arms and legs along with knee pressure on the back.

TABLE 1. Summary of cases

Case	Age	Reason police called	Method of prone restraint	Cause of delirium	Listed cause of death	Listed manner of death
1	29	Property damage	Hogtied in police car	Cocaine and alcohol	Acute cocaine toxicity	Accident
2	44	Property damage/knife	Hogtied in police car	Cocaine	Cocaine delirium/positional asphyxia	Accident
3	41	Man on freeway	Knee on back; hogtied	Methamphetamine	Drugged excited delirium	Accident
4	36	Threats/property damage	Hogtied on ground	Cocaine and narcotic	Cocaine/narcotic toxicity	Accident
5	34	Children taken hostage	Stun gun; wrists and ankles tied; knee on back	Cocaine and alcohol	Cocaine excited delirium	Accident
6	24	Violence in hospital	Tied prone to gurney; stun gun	Schizophrenia	Coronary disease/schizophrenia/stun gun	Undetermined
7	14	Self-inflicted injuries	Hogtied gurney/floor	LSD	LSD psychosis	Accident
8	28	Nude man with gun	Knee on back; arms and legs held	Cocaine	Cocaine delirium	Accident
9	37	Family taken hostage	Hogtied on ground	Mania/psychosis	Mania/positional asphyxia	Accident
10	37	Wild man attacking car	Hogtied on ground	Schizophrenia/amantadine	Amantadine overdose	Accident
11	33	Wild man on street	Hogtied on ground	Cocaine and alcohol	Cocaine toxicity	Accident

Cocaine toxicity appeared to be the primary factor causing the excited delirium in six cases. Acute delirium as a manifestation of underlying chronic psychosis occurred in three cases. LSD and methamphetamine precipitated the acute delirium in one case each. A high toxic level of amantadine was found in the blood of one schizophrenic. Amantadine has been reported to cause psychosis, confusion, hallucinations, aggressive behavior, and seizures at toxic levels (9) and may have precipitated the delirium.

The wide variation in terminology used to certify the causes of death reflects the multiple factors that appear to culminate in these deaths. Psychoactive stimulative drugs, especially cocaine, can precipitate an excited delirium. An acute exacerbation of a chronic psychosis can do the same. Sudden death in agitated, manic psychiatric patients has been recognized for many years. The cause of such deaths has been postulated to be neurally mediated cardiac arrest. Such deaths have been seen both in patients and in animals placed in restraints (10). Drugs such as cocaine and amphetamines can, of course, cause death without positional asphyxiation from restraint as a factor, but the frequency of sudden death in people restrained prone while in a state of excited delirium, compared with the rarity of sudden death in such people when not restrained, implicates restraint as a causative factor in such deaths.

CONCLUSIONS

Sudden death of people who are in a state of agitated delirium during prone restraint appears to be a not uncommon phenomenon that has been recognized for years but infrequently reported in the medical literature.

The mechanism of death appears to be a sudden, fatal cardiac dysrhythmia or respiratory arrest induced by a combination of at least three possible factors relating to increased oxygen demands and decreased oxygen delivery. First, the psychiatric or drug-induced state of agitated delirium coupled with police confrontation undoubtedly places catecholamine stress on the heart. Second, the hyperactivity associated with agitated delirium coupled with struggling with police and against restraints undoubtedly increases the oxygen delivery demands on the heart and lungs. This is supported by the several cases where rapid pulses were documented. Finally, the hogtied position clearly impairs breathing in situations of high oxygen demand by inhibiting chest wall and diaphragmatic movement. Reay et al. reported a case where a hogtied subject exclaimed that he couldn't breathe just before he suffered cardiac arrest (1). Case 11 is similar in that the subject cried out that he couldn't breathe just before dying.

The mechanism of death in these cases falls into

the category of positional asphyxiation. The subjects are made more susceptible to sudden death during prone restraint by their condition of excited delirium. In that regard, their deaths are similar to other positional asphyxiation deaths commonly seen in neurologically compromised people, such as epileptics or people rendered stuporous by alcohol or drugs, who fall into positions that restrict breathing.

In all but one of the reported cases, and in most of the San Diego cases, the manner of death was certified as accidental. It seems reasonable to consider these accidents rather than homicides since prone, hogtied restraint was not generally considered "potentially lethal force" by most police departments in the recent past.

As information about the potential lethality of prone restraint in excited, delirious people has been disseminated, some police agencies have eliminated hogtie restraints as a means of controlling violent subjects. In light of the possibility of sudden death, it seems both humane and prudent to develop some safer means of control and protection. Devices are currently marketed for allowing full restraint of subjects while they are in a seated position. At a minimum, prone, hogtied subjects should be closely monitored for vital signs while awaiting or being transported for medical care.

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