

# Asphyxial Death During Prone Restraint Revisited

## A Report of 21 Cases

Ronald L. O'Halloran, M.D., and Janice G. Frank, M.D.

Determining the cause of death when a restrained person suddenly dies is a problem for death investigators. Twenty-one cases of death during prone restraint are reported as examples of the common elements and range of variation in these apparently asphyxial events. A reasonable diagnosis of restraint asphyxia can usually be made after ruling out other causes and collecting supportive participant and witness statements in a timely fashion. Common elements in this syndrome include prone restraint with pressure on the upper torso; handcuffing, leg restraint, or hogtying; acute psychosis and agitation, often stimulant drug induced; physical exertion and struggle; and obesity. Establishing a temporal association between the restraint and the sudden loss of consciousness/death is critical to making a correct determination of cause of death.

**Key Words:** Restraint asphyxia—Positional asphyxia—Prone restraint—Hogtying—Sudden death in custody—Agitated delirium—Excited delirium—Cocaine—Methamphetamine—Baton—Pepper spray—Taser—Stun gun.

The sudden, unexpected death of an individual while in police custody is always a matter of public concern and frequently leads to litigation. Such high-profile deaths often are a diagnostic dilemma for medical examiners or coroners and the forensic pathologists who work with them. The autopsy findings are frequently nonspecific, detailed witness descriptions of the circumstances of the terminal event are often not initially obtained, and accurate accounts are difficult to collect later because of potential litigation.

Reports of sudden death of individuals who were restrained prone, many of whom were also hogtied, appeared in the 1990s (1-5). The term hogtying is used in this paper to refer to the restraint of a person in a prone position with their wrists and ankles bound together behind the back. Based on such reports, many members of the law enforcement community have discussed the problem of sudden death during restraint procedures, and many have attempted to modify or eliminate the use of the hogtied prone position; however, sudden deaths during prone restraint continue to occur. We present the previously unreported sudden deaths of 21 individuals who died while being restrained in a prone position and discuss the factors that seem to put these persons at risk.

### METHODS

The case histories and autopsy findings of 21 men who died suddenly while being restrained prone during the years 1992 to 1996 were reviewed, analyzed, and summarized. In all cases, the records included interviews with the restrainers and other witnesses, if any. In most cases, transcripts of statements or testimony were also reviewed. Four of the autopsies were done by the authors, and the case histories were reviewed as an adjunct. The other cases were seen in consultative review related to potential litigation.

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From the Office of the Medical Examiner, Ventura County, Ventura, California, U.S.A.

Address correspondence and reprint requests to Ronald L. O'Halloran, 3291 Loma Vista Road, Ventura, CA 93003, U.S.A.

## CASE REPORTS

## Case 1

Police responded to a domestic violence situation. A man in his early thirties was holding his wife against her will. He was physically violent and irrational and did not respond to verbal commands. Four police officers used control holds and a baton to force him into a prone position on the floor, hog-tied. He seemed to calm down and stop wrestling shortly before the hogtying was completed. He was carried from the residence and laid prone on the grass in the yard, still hogtied, awaiting transportation to jail. Officers soon noticed that he was unconscious, was not breathing, and had no pulse. They started cardiopulmonary resuscitation (CPR) and called paramedics. Paramedics found him asystolic and not breathing. They intubated him and administered advanced cardiac life support (ACLS), eventually obtaining an idioventricular rhythm. Marginal cardiac function was restored, but he remained unconscious without spontaneous respiration. He was transported to a hospital where he was maintained on a respirator for 24 hours before he died, having sustained extensive ischemic brain damage. His temperature on admission was 36.1°C (97°F). He was known to have abused methamphetamine in the recent past and had associated paranoid ideation.

It was not clear from the investigation how long the officers struggled with the man prior to his efforts subsiding, what pressure was applied to the prone person while restraints were applied, or how long he was prone on the grass before his unconscious state was recognized.

An autopsy disclosed a 175-cm (70-inch), 88.6-kg (195-lb) man with abrasions and contusions on his shoulders, arms, and abdomen and no internal injuries. The eyes were not described. His heart weighed 420 g and was normal microscopically. Blood drawn in the emergency department tested positive for cocaine and methamphetamine but the levels were not quantitated. Postmortem blood was negative for cocaine and contained benzoylecgonine 1.7 mg/L, methamphetamine 0.85 mg/L, and amphetamine 0.08 mg/L. The cause of death was listed as acute intoxication due to the combined effects of cocaine/methamphetamine/amphetamine, and the manner of death was listed as accident.

## Case 2

A man in his mid-thirties appeared to be intoxicated in public. When approached by police, he was described as delirious, agitated, and sweaty. He fled on foot and after a long pursuit was cornered,

and electrical darts (i.e., tasers) were used with little effect. He was eventually hogtied by many police officers and carried to a police car, where he was placed prone in the back seat. After a few minutes, he was found not breathing. Paramedics transported him while asystolic to the hospital, where he was pronounced dead on arrival.

An autopsy disclosed a 182.5-cm (73-inch), 145.5-kg (320-lb) man with many superficial injuries and several darts in the skin of the trunk. No petechial hemorrhages were described. No internal injuries were found. The heart weighed 480 g, was dilated, and had microscopic foci of fibrosis. Toxicology blood test results disclosed cocaine 1.9 mg/L and benzoecgonine 2.7 mg/L. The death was certified as due to cocaine intoxication and asphyxia from restraint, and the manner of death was listed as homicide.

## Case 3

Police responded to reports of a man in his mid-forties walking the street, yelling, and hitting objects. When officers approached the man, he appeared to be under the influence, delusional, and incoherent. He fled and was pursued on foot. When caught, he was delirious and combative. Pepper spray and baton strikes had no apparent effect. Three to five officers eventually forced him in the prone position on the ground with weight applied to his back and legs, and his arms were handcuffed behind his back. Minutes later, police noticed that he was not moving or breathing. They started CPR and called for an ambulance. Paramedics found no vital signs and were unable to resuscitate him. They noted that he was sweaty. He was transported to a hospital, where he was declared dead on arrival.

An autopsy disclosed a 185-cm (74-inch), 86.4-kg (190-lb) man with many external bruises but no internal injuries. No petechial hemorrhages were described. He had a history of paranoid schizophrenia. The death was certified as due to excited delirium due to paranoid schizophrenia, and the manner of death was listed as natural.

## Case 4

Police responded to a man in his early thirties babbling incoherently on the street. He was arrested for public intoxication and was transported to jail in handcuffs. At the jail he became combative and was hobbled (i.e., ankles bound) and transported to another jail. At the second jail he was screaming and struggling, clearly agitated but not delirious. He was dragged into a safety cell struggling and sweating. Several officers held him prone on the floor, applying body weight to the back, arms, and

legs as they switched handcuffs. After a few minutes of struggling, he became limp and made snoring sounds. Officers soon noticed the prisoner was not breathing. CPR was started, and paramedics were called. He was transported to an emergency department and shortly thereafter was pronounced dead. No vital signs were detected at any point after the arrival of the ambulance.

An autopsy disclosed a 182.5-cm (73-inch), 113.6-kg (250-lb) man with many superficial abrasions and contusions of the head, trunk, and extremities. Intrathoracic petechial hemorrhages were noted. The heart weighed 500 g but was microscopically normal. Toxicology blood tests results revealed cocaine 1.2 mg/L, benzoecgonine 6.4 mg/L, cocaethylene 0.4 mg/L, and alcohol 0.02%. The death was certified as due to alcohol and cocaine toxicity, and the manner was listed as accident.

#### Case 5

A man in his early forties, with a history of alcohol and cocaine abuse, was arrested for burglary and booked into jail. He had a history of alcohol withdrawal, and a nurse ordered that he be started on Dilantin 2 days prior to his death. On the day of death he became violent in his cell, was kicking the door, and was delirious and sweating. He was then handcuffed and moved to a safety cell. He was placed prone on the floor and held down by two officers on his back and legs while they attempted to remove his clothing and cuffs. After an estimated 2- to 5-minute struggle, he became limp and turned blue. Chest compressions were started, and an ambulance was called. He was transported to a hospital in full cardiopulmonary arrest. After epinephrine administration and electric shock, the heart started beating again, but he never regained consciousness and died about 18 hours after the incident. No temperature was recorded.

An autopsy disclosed a 175-cm (70-inch), 77.3-kg (170-lb) man with many abrasions and contusions. Intrathoracic petechial hemorrhages were noted. The heart weighed 480 g and had septal contraction bands. The liver was fatty and cirrhotic. Toxicology tests disclosed only therapeutic levels of phenytoin and very low levels of chlorthalidone. The death was certified as due to hypoxic encephalopathy following a cardiac arrest due to positional asphyxia. Complications of chronic alcoholism were considered contributing conditions, and the manner of death was listed as accident.

#### Case 6

A man in his mid-thirties was seen by security guards wandering suspiciously between cars in a

parking lot. Three guards chased him 400 m before catching him. He was reported to be combative and talking gibberish and was wrestled to the ground. The guards held him prone, with one guard straddling his back, as they handcuffed him. He was held prone for an estimated 2 minutes, and then he stopped struggling. Two guards went searching for a weapon, and when they came back they discovered he was not breathing. They started CPR and called for an ambulance. Paramedics administered ACLS and transported him to a hospital, where he was pronounced dead on arrival. He was asystolic from the time the paramedics arrived.

The autopsy disclosed a 170-cm (68-inch), 81.8-kg (180-lb) man with cutaneous abrasions and small contusions. No petechiae were seen. The postmortem blood cocaine level was 1.1 mg/L. The death was certified as due to cocaine intoxication, and the manner was listed as accident.

#### Case 7

A man in his early thirties was driving a truck erratically and was followed by a police officer until the truck broke down. He fled on foot, and the officer chased him hundreds of meters and finally caught him, pinning him to the ground. Two other officers arrived, and pepper spray was used with no apparent effect. After a 10- to 15-minute struggle on the ground, he was finally controlled by hog-tying him in a prone position. Within a few minutes after the officers got off the man they noticed he was not breathing. They started CPR, and he vomited. Within 10 minutes an ambulance arrived. Paramedics removed the wrist and ankle restraints and continued resuscitation attempts, and the man was transported to a hospital, where he was pronounced dead on arrival. He had a history of previous paranoid and psychotic behavior after methamphetamine use.

An autopsy disclosed a 162.5-cm (65-inch), 63.6-kg (140-lb), muscular man. Only injuries of the wrists and ankles were noted. Internal organs were not weighed. Toxicology tests disclosed methamphetamine 0.1 mg/L in postmortem blood. The cause of death was listed as due to methamphetamine toxicity, and the manner of death was ruled an accident by a coroner inquest jury.

#### Case 8

A man in his mid-thirties drove his speeding vehicle into a restaurant parking lot, followed by police. Civilians and police observed him acting agitated and talking to God. He asked for a knife to kill himself, and later bolted to a police car and went for a gun. A police officer pulled him from

the car before he could get the gun, but he began chasing the officer. Several bursts of pepper sprayed were used, and the man was struck with a baton with little effect. Eventually, seven police officers wrestled him to the ground, and after a 5- to 10-minute prone struggle, he was controlled with handcuffs behind his back and his ankles bound. One officer was straddling his lower back area, one held a forearm on his upper back, and more officers were holding down his upper torso when he lost consciousness. Officers administered CPR until paramedics arrived minutes later. The man was without vital signs during transport to a hospital, where he was pronounced dead on arrival. He had a history of a bipolar or chronic schizophrenic psychotic disorder.

An autopsy disclosed a 182.5-cm (73-inch), 127-kg (280-lb) man with abrasions and contusions of the head, back, and extremities. Laryngeal mucosal petechial hemorrhages were seen, along with faint neck strap muscle contusions. The heart was estimated to weigh 450 g. Minimal patchy areas of sub-endocardial fibrosis were noted. Postmortem toxicology drug screens were negative. The cause of death was listed as stress induced cardiopulmonary failure due to restraint and acute psychotic episode. Schizophrenia, blunt force injuries, and cardiac hypertrophy were listed as contributing factors. The manner of death was listed as accident.

#### Case 9

A severely mentally retarded teenaged boy was being disruptive and damaging property at a public residential care facility. Two custodial officers cuffed his hands behind his back as they held him prone on the floor for an estimated 3 to 10 minutes. One officer placed a knee on his back and pulled upward on his wrists while the other put pressure on his upper back or neck area with a forearm and body weight. Some witnesses said a neck hold may have been applied. A third officer held his legs. Several witnesses heard a wheezing sound before he stopped struggling. He was soon noted to be unconscious and to have stopped breathing. CPR attempts by staff and later by paramedics were unsuccessful, and he was pronounced dead on arrival at a hospital.

An autopsy disclosed a 167.5-cm (67-inch), 104.5-kg (230-lb) teenaged boy with abrasions and contusions of the head, back, arms, and legs. A neck muscle contusion and hemorrhage beside the thyroid cartilage were noted, but no petechial hemorrhages were seen. Postmortem blood toxicology tests detected therapeutic levels of doxepin and thioridazine. The cause of death was listed as as-

phyxiation due to restraint, and the manner of death was listed as undetermined.

#### Case 10

A teenaged boy was arrested for suspected intoxication. He was combative and appeared delirious. After a struggle, police transported him to jail in the hogtied prone position in the back of a police car. At the jail he was placed on the concrete floor, reportedly lying on his side, still hogtied, struggling, swearing, sweating, and spitting. Six officers held him down, and a towel was placed around his face and neck area to prevent spitting or biting and control head movement. After approximately 3 to 5 minutes on the floor, he stopped moving, and ~1 minute later, officers realized he was not conscious and summoned help. Resuscitation attempts by jail staff and later by paramedics were unsuccessful, and he was pronounced dead after 50 minutes in a hospital emergency department. He had a 3-year history of psychosis.

An autopsy disclosed a 190-cm (76-inch), 109-kg (240-lb) teenaged boy with palpebral conjunctival petechiae. Scattered contusions and abrasions of the head, extremities, and trunk were observed. The heart weighed 450 g. A haloperidol level within the therapeutic range was found in the blood. The cause of death was certified as dysrhythmia due to positional hypoxia due to excited delirium while restrained. The manner of death was recorded as natural.

#### Case 11

Police were dispatched to a minor traffic accident where they found a man in his mid-thirties acting bizarre and sweating profusely. He appeared to be delirious and under the influence of "PCP" and was arrested after a struggle. He was transported to jail in the hogtied prone position in the back seat of a police car. He continued to be combative and incoherent at the jail and was placed in a safety cell. While police attempted to remove his restraints and clothing, he was held prone by six detention officers. Two officers had their knees on his back and one was holding his shoulders when he suddenly relaxed. He was soon noticed to have stopped breathing. Paramedics were summoned, but resuscitation attempts were unsuccessful, and he was pronounced dead at the jail. The struggle in the safety cell lasted about 5 minutes.

An autopsy disclosed a 170-cm (68 inch), 81.8-kg (180-lb) man with conjunctival petechial hemorrhages, intramuscular hemorrhages in the neck, a large contusion on the back, and many contusions and abrasions of the head, arms, and legs. The heart

appeared normal and weighed 410 g. Postmortem blood contained methamphetamine 1.7 mg/L, and the urine level of methamphetamine was 34 mg/L. The cause of death was listed as traumatic asphyxia with neck compression and positional asphyxia. The manner of death was listed as accident.

#### Case 12

A severely mentally retarded boy in his mid-teens was damaging property in a private residential care facility. Attempts at verbal control were unsuccessful, and he was wrestled to the floor by three adult male attendants. He was held prone with a pillow under his head for about 10 minutes, with attendants holding down each arm/shoulder and one holding his legs, when they noticed he had stopped struggling and was not breathing. CPR was initiated. When paramedics arrived, they detected no vital signs and an idioventricular cardiac rhythm. At the emergency department only pulseless electrical cardiac activity was present, and he was pronounced dead within 30 minutes. He had a history of mental retardation, cerebral palsy, epilepsy, autism, and attention deficit disorder.

An autopsy disclosed a 177.5-cm (71-inch), 113.6-kg (250-lb) teenaged boy with petechial hemorrhages of the eyes, pleura, and epicardium. The heart weighed 410 g. Microscopic foci of fibrosis were seen in the heart. Fluoxetine and its metabolite, thioridazine, and mesoridazine were identified in postmortem blood in therapeutic concentrations. The cause of death was certified as asphyxia due to restraint and suffocation, with cardiomyopathy listed as a contributing condition. The manner of death was ruled as accident.

#### Case 13

A man in his early thirties was in a hospital for 2 days while being treated for hypertension and renal failure. Because of verbal abuse and physical threats against the staff, he was physically escorted by two hospital security staff to the emergency area, where a struggle developed. He was held prone on the floor for an estimated 2 or 3 minutes with weight on his back, his arms pulled upward behind his back, and his legs held down. He said that he could not breathe several times. His breathing became shallow before he lost consciousness. Resuscitation and ACLS measures were initiated promptly. Sinus bradycardia was detected initially but deteriorated quickly to pulseless electrical activity and death. No pulse was ever palpated.

An autopsy indicated no external or internal injuries in this 167.5-cm (67-inch), 81.8-kg (180-lb)

man. The heart weighed 750 g and showed severe left ventricular hypertrophy. The lungs had emphysematous changes. The kidneys had vascular and glomerular sclerosis. Toxicology tests were negative. The case was submitted to the grand jury. The cause of death was listed as sudden cardiac death during restraint due to positional asphyxia and the manner of death was called homicide.

#### Case 14

Police responded to a residential domestic abuse call. A man in his middle forties was escorted out of his residence, at which point he resisted arrest. A struggle ensued, pepper spray was used, and he was eventually hogtied and transported to jail in the prone position in the back seat of a police car. At the jail he continued to be combative, yelling obscenities and spitting, so a dust mask was put on his face. He was carried to a holding cell, where he was placed in the prone position and strip-searched. He was held prone for several minutes by several officers, with a disputed amount of weight placed on the upper torso. While handcuffs were removed and others applied, he suddenly stopped resisting, was noted to be not moving, and was found to have absent vital signs. Resuscitation attempts were initiated by a jail nurse, and paramedics were summoned. When they arrived, he was in ventricular fibrillation which progressed to asystole during transport to the hospital, where he was pronounced dead. He had a history of illicit drug use. Officers stated that during the encounter he seemed paranoid about his wife and called to God.

An autopsy of this 170-cm (68-inch), 72.7-kg (160-lb) man disclosed eye and oral petechial hemorrhages, a bite on the tongue, lip lacerations, and scattered abrasions and contusions of the extremities and trunk. The heart weighed 450 g and was microscopically normal. Toxicology testing disclosed a postmortem blood cocaine level of 1.2 mg/L and a benzoylecgonine level of 3.2 mg/L. The cause of death was listed as cardiac arrhythmia due to exertion and cocaine toxicity, with restraint asphyxia listed as a contributing factor. The manner of death was ruled accidental.

#### Case 15

Police responded to a domestic violence report at a residence. They confronted a man in his mid-forties who would not respond to verbal commands and assaulted the officers. Pepper spray was used with no effect. He was wrestled to the floor, hit several times with a flashlight, and eventually controlled in a prone position by officers pinning and

shackling his legs, cuffing his wrists behind his back, and holding his chest down with feet and knees on his back and near the base of his neck. About 10 minutes later, he was discovered to be nonresponsive. Resuscitation efforts were initiated and an ambulance was called. When paramedics arrived, he had no vital signs. ACLS measures were unsuccessful, and he was pronounced dead on arrival at a hospital. He had a psychiatric history of paranoid schizophrenia for several years, associated with poor impulse control, delusions, and homicidal threats. The initial call for police assistance involved delusions about spousal infidelity.

The autopsy of this 162.5-cm (65-inch), 81.8-kg (180-lb) man disclosed many abrasions and contusions of the face, arms, legs, and trunk. Two linear lacerations were found on the scalp. Bilateral scleral hemorrhages, a cutaneous neck contusion and abrasion, and a hemorrhage in the sternocleidomastoid muscle were seen. Postmortem toxicology tests of blood identified chlorpromazine and diphenhydramine in therapeutic concentrations. The cause of death was listed as asphyxia by compression of the neck and chest due to restraint. The manner was listed as homicide.

#### Case 16

A man in his mid-twenties who had used crack cocaine began yelling incoherently about God and the devil while banging on walls and windows. His male companion tried to quiet him, which led to a struggle. The companion told investigators that he pinned the man prone on the floor by sitting on his back, pulling his arms upward behind his back, and applying pressure to his shoulders. After several minutes, the man stopped struggling, and his companion got off his back. He heard a few short gasps but never saw the man move again. The companion eventually decided the man was dead and hours later told friends who then called police.

An autopsy of this 170-cm (68-inch), 63.6-cm (140-lb) man disclosed bilateral ocular petechiae, contusions of the lips, and several areas of internal neck soft tissue hemorrhage with intact laryngeal structures. Other abrasions and contusions of the trunk and extremities were seen. The postmortem blood levels were cocaine 0.02 mg/L, benzoylecgonine 0.4 mg/L, and ecgonine methyl ester 0.4 mg/L. The cause of death was listed as manual strangulation, and the manner was listed as homicide.

#### Case 17

Police were called because a man in his early forties had snorted cocaine and left his home, running, stumbling, and screaming incoherently to

nonexistent beings. Officers found and confronted him. He became physically aggressive toward the officers, and a 5-minute struggle ensued. Pepper spray was used with no effect, and he was wrestled to the ground. After being held prone by several officers for an estimated 2 or 3 minutes while being handcuffed with pressure on his waist and upper body and with his legs held down, officers noticed he was not moving. Restraints were immediately removed, and ambulance personnel at the scene were summoned. Agonal respiratory efforts quickly ceased, and the man was transported asystolic to the hospital, where death was pronounced. Ninety minutes after death, the rectal temperature was 36.8°C (98.3°F). He had a cocaine delusional disorder 2 years prior to death.

An autopsy of this 180-cm (72-inch), 140.9-kg (310-lb) man revealed ocular petechial hemorrhages along with abrasions and contusions of his face and extremities. The heart weighed 430 g. Autopsy blood contained 5.4 mg/L of cocaine and 1.3 mg/L of benzoylecgonine. The cause of death was certified as arrhythmia/asphyxia while restrained due to cocaine toxicity. The manner was listed as accident.

#### Case 18

A man in his mid-twenties was seen walking down the street, talking and gesturing to nonexistent persons. He broke into a house and stole a knife. Police were summoned and found the man crawling on his hands and knees near a park where he had assaulted someone. Police confronted him, a struggle occurred, and he was wrestled to the ground and held supine. Fire personnel noted a rapid pulse and incoherent speech. An ambulance arrived, he was given oxygen, and he eventually quieted. He suddenly jumped up, ran, and was tackled again by police. This time he was held prone with officers' body weight on his back and legs. Handcuffs were attached with his arms behind his back, and hobble restraints were wrapped around his ankles. He was held down an estimated 2 minutes by three officers until he became quiet and officers removed their weight. Officials were discussing what to do with him when a paramedic noticed he was not breathing and had no pulse. Handcuffs were removed, and resuscitation attempts were started. Pulseless electrical activity (idioventricular rhythm) was initially detected. Despite ACLS measures during transport to the hospital, he became asystolic. He was pronounced dead after 30 minutes in the emergency department. Twenty minutes later, the rectal temperature was 42.2°C (108°F). He had a history of drug use.

An autopsy disclosed a 180-cm (72-inch), 100-kg (220-lb) man with conjunctival and epicardial petechial hemorrhages. Multiple contusions and abrasions were found on the head, extremities, and trunk. A contusion was found in a sternocleidomastoid muscle. The heart weighed 430 g and was microscopically normal. Postmortem blood contained cocaine 0.23 mg/L and benzoylecgonine 2.3 mg/L. The cause of death was listed as asphyxia/arrhythmia during prone restraint due to cocaine induced agitated delirium. Cocaine-induced hyperthermia was listed as a contributing condition, and the manner of death was listed as accident.

#### Case 19

Police were called because of complaints of a man in his late twenties damaging property. He appeared agitated and said he was having a heart attack. Police called for an ambulance, but while waiting the man became verbally aggressive, spoke inappropriately in religious and sexual terms, failed to respond to commands, and appeared to feign a seizure. Pepper spray was used without effect. The man was restrained in the prone position for an estimated 1 to 5 minutes on a lawn with an officer straddling his buttocks and another with a knee on his back while handcuffs were attached and his legs were held. Paramedics arrived during the struggle, and it was decided to transport the man to the hospital on a gurney in leather restraints. Shortly before or during the transfer to the gurney, he stopped breathing. Despite ACLS measures, only intermittent pulseless electrical activity was detected. He was pronounced dead in the emergency department. He had a history of bipolar disorder with episodes of mania as well as drug abuse.

An autopsy disclosed a 180-cm (72-inch), 131.8-kg (290-lb) man with ocular and facial petechial hemorrhages and contusions and abrasions of the face, extremities, and trunk. The heart weighed 430 g and was microscopically normal. Autopsy blood contained the following concentrations of drugs: delta-9-THC 0.028 mg/L, free codeine 0.18 mg/L, total codeine 0.40 mg/L, fenfluramine 0.05 mg/L, doxylamine 0.068 mg/L, and trace amounts of dextromethorphan. The cause of death was listed as cardiac arrhythmia due to asphyxia during prone restraint. Acute and chronic psychosis, THC intoxication, struggle, obesity and a malpositioned endotracheal tube were listed as contributory factors. The manner of death was listed as accident.

#### Case 20

An obese man in his late twenties with a history of epilepsy had a grand mal seizure at the home of

a friend. While one friend cradled his head during the seizure, another friend called 911. After the seizure, the man jumped up, became combative, and seemed confused. A third friend arrived, and the three restrained the man in the prone position on the floor by applying a "full nelson" and lying across his legs. When the fire department arrived, three firefighters assisted in holding the man down while another called for police assistance. When the first police officer arrived, he rested a knee on the man's back when applying handcuffs while the man was held by firefighters and his friends. One person stated he heard the man say "Get off, I can't breathe." Approximately 12 minutes after the start of the restraint process, more police arrived and saw the man still struggling. Straps were wrapped around his ankles, and the man was placed prone on a stretcher, where he appeared to lose strength and had a pulse rate of 120 beats per minute. Within seconds of being held prone on the stretcher he became calm, stopped breathing, and had no pulse. Restraints were removed and CPR commenced while a call for paramedics went out. Four minutes later, paramedics started full ACLS measures. He was defibrillated several times at the scene and en route to the hospital without ever regaining life signs and was pronounced dead in the hospital. He had epilepsy since birth, was having several seizures per month, and was taking Dilantin.

An autopsy disclosed a 175-cm (70-inch), 118-kg (260-lb) man with abrasions on the wrists and hip but no petechial hemorrhages or other injuries. The heart weighed 510 g and was microscopically normal. Toxicologic tests of postmortem blood revealed phenytoin 0.2 mg/L and carboxy-THC 0.007 mg/L. The death was certified as cardiac arrhythmia due to agitated delirium with restraint. Hypertrophic heart disease was listed as a contributing factor. The manner of death was listed as accident.

#### Case 21

Police were called because a man in his early forties, said to be mentally ill, hysterical, violent, and having a gun, was dancing in street traffic, shouting incomprehensibly. When two officers arrived, the man grabbed one officer by the clothing; the other officer joined in the struggle, and all three fell to the pavement. Three more officers arrived. Pepper spray was used with no effect. Several officers wrestled the man to the ground and held him in the prone position. One officer had both knees on his back while handcuffs and ankle cuffs were applied. Firemen arrived and suggested using a backboard for control. Multiple officers moved the man and placed him prone on the backboard. Straps

were secured across his back and legs. They soon noticed he had ceased struggling and had no pulse. Paramedics were called. The total prone restraint time was approximately 8 minutes. When paramedics arrived 4 minutes later, the man was in full cardiac arrest. They started ACLS but were unable to restore cardiac function, and he was pronounced dead at the hospital. He had a history of crack cocaine use with periods of delirious hyperactive behavior. He stopped taking his prescription Thorazine 2 weeks prior to death.

An autopsy disclosed a 167.5-cm (67-inch), 86.4-kg (190-lb) man with conjunctival petechial hemorrhages and scattered contusions, abrasions, and lacerations of his extremities and face. The heart weighed 340 g and was described as having a 1-cm-long myocardial band over the left anterior descending coronary artery. Postmortem blood contained cocaine 0.2 mg/L and bupropion (Wellbutrin) 3 ng/ml. The cause of death was listed as agitated delirium with restraint. Recent cocaine use and tunnel coronary artery were listed as contributing conditions. The manner was listed as accident.

### ANALYSIS

These 21 case reports represent a nonrandom sample of sudden deaths that occurred during restraint from 1992 to 1996 in the United States, mostly in California. Except for the 4 deaths that we autopsied, all cases came to our attention because of litigation. In many of the cases the details of the circumstance and timing of the sudden loss of consciousness were developed during investigation subsequent to death certification.

All of the decedents were male, ranging in age from 17 to 45 years. All were involuntarily held in a prone position when they lost consciousness except for case 10, who was reportedly held on his side but had earlier been prone. Four were hogtied at the time they were noticed to be unconscious; the remainder had body weight applied to the upper torso at the time they lost consciousness. All who lost consciousness while hogtied had weight placed on their upper torso during the hogtying process. Eighteen persons were handcuffed behind the back; the other 3 had their arms restrained manually. Eleven had ankle or lower leg restraints; the remainder had body weight applied to the legs. Two were reported to have said that they could not breathe prior to dying. The number of persons applying restraint ranged from one to seven. Best estimates of the time held prone ranged from 2 to 12 minutes. Fifteen of the 21 incidents involved police

only; 3 involved private security or custodial officers; 2 involved lay persons, and 1 involved both police and firefighters. Five of the incidents occurred in a jail or detention center; 2 occurred in health care facilities. Seven of the restraint episodes were preceded by the use of pepper spray alone, 3 by use of pepper spray and a baton, 1 by baton use alone, and 1 by use of a taser. In 2 instances a towel or a mask was on the persons face during restraint.

In all but 1 case extensive resuscitation efforts were made, with initial cardiopulmonary resuscitation followed by advanced life-support measures, including intubation. All but 2 persons were taken to hospitals, where they were pronounced dead.

Eight of the decedents had a history of chronic mental illness excluding substance abuse. Eight had a history of substance abuse. Seventeen appeared to be acutely delirious. Eleven had stimulant drugs found in their blood at autopsy (8 cocaine, 2 methamphetamine, 1 both cocaine and methamphetamine). In the 8 who had cocaine found in postmortem blood, concentrations ranged from 0.02 to 5.4 mg/L (mean, 1.4 mg/L). Postmortem temperatures were taken in only 3 cases, and in only 1 was hyperthermia detected. Six were noted to be sweaty prior to death.

Six decedents could be considered obese, having a body mass index (BMI) >30; 9 were overweight (BMI = 25–30), and 6 were of normal weight (BMI < 25). In 5 autopsies, heart abnormalities were described. In 2 cases the heart weight was more than 2 standard deviations above the predicted mean for males, adjusted for body weight (6). In 4 cases the heart weight was between 1 and 2 standard deviations above the mean. In 3 cases the heart was not weighed but was reported as normal. Petechial hemorrhages were described in the eyes in 10 cases and were noted in the thorax in 2 additional cases. Evidence of soft tissue injury (hemorrhage) in the neck was noted in 5 cases, 4 of which also had ocular petechiae.

Death certificates listed asphyxia or a similar term in the cause of death section in 13 cases, and 8 listed drugs of some sort. The manner of death was listed as accident in 14 cases, homicide in 4 cases, natural in 2 cases, and undetermined in 1 case. Selected circumstances of the deaths and the causes and manners of deaths as reported by the medical examiner or coroner are summarized in Table 1.

### DISCUSSION

The concept that the sudden death of individuals held prone during police restraint might be due to



TABLE 1. Case history summary

Prone restraint	Behavior	Cause of behavior	Cause of death	Manner of death
1 Hogtied	Paranoid/irrational	Cocaine/methamphetamine	Drug toxicity	Accident
2 Hogtied	Delirium	Cocaine	Drugs/asphyxia	Homicide
3 Body weight/cuffs	Delusional/paranoid	Schizophrenia	Excited delirium/Schizophrenia	Natural
4 Body weight/cuffs	Delirium	Cocaine	Drug toxicity	Accident
5 Body weight/cuffs	Delirium/withdrawal	Alcohol	Positional asphyxia	Accident
6 Body weight/cuffs	Delirium	Cocaine	Drug toxicity	Accident
7 Hogtied	Irrational	Methamphetamine	Drug toxicity	Accident
8 Body weight/cuffs	Delusions	Schizophrenia	Restraint/psychosis	Accident
9 Body weight/cuffs	Temper tantrum	Mental retardation	Restraint asphyxia	Undetermined
10 Hogtied on side	Delirium	Psychosis	Positional hypoxia/restraint/ delirium	Natural
11 Body weight/cuffs	Delirium	Methamphetamine	Choking/positional asphyxia	Accident
12 Body weight	Temper tantrum	Mental retardation	Asphyxia/restraint	Accident
13 Body weight	Anger/obnoxious	Personality trait	Positional restraint	Homicide
14 Body weight/cuffs	Paranoid delusions	Cocaine	Drug toxicity	Accident
15 Body weight/cuffs	Delirium	Schizophrenia	Asphyxia/chest/neck compression	Homicide
16 Body weight	Delirium	Cocaine	Strangulation	Homicide
17 Body weight/cuffs	Delirium	Cocaine	Cocaine/restraint	Accident
18 Body weight/cuffs	Delirium	Cocaine	Cocaine/restraint	Accident
19 Body weight/cuffs	Delirium	Psychosis/marijuana	Restraint asphyxia	Accident
20 Body weight/cuffs	Combative/confused	Epileptic seizure	Delirium/restraint	Accident
21 Body weight/cuffs	Delirium	Cocaine	Delirium/restraint	Accident

asphyxia, even though neck holds were not applied, is relatively recent. In 1985, Wetli and Fishbain reported 7 sudden deaths during cocaine-induced psychosis, some of which occurred while the persons were restrained in police custody (7). The manner of restraint was not specified, and the deaths were attributed to cocaine. In 1992, Reay et al. reported the deaths of 3 men who died while restrained hogtied in the prone position in the back seat of police cars and attributed their deaths to positional asphyxia (1). In the same year, the San Diego Police Department circulated a task force report on 7 in-custody deaths; 3 of these persons were hogtied (2). In 1993, O'Halloran and Lewman reported 11 delirious men who died while they were restrained in a prone position; 9 were hogtied (3). In 1995, Stratton et al. reported 2 deaths in hogtied prone patients in ambulances (4). In 1998, Pollanen et al. reported 21 excited delirium-related restraint deaths between 1988 and 1995 in Ontario, Canada (5); 18 were prone and the other 3 had neck compression. Also in 1998, Ross reported on factors associated with excited delirium deaths in police custody from reports of 61 deaths in various police agencies in the United States (8).

Based on concerns raised by reports like these and knowledge of other unpublished incidents of sudden death in custody during prone restraint, articles discussing the "sudden in-custody death syndrome," "hogtying," "positional asphyxia," and "excited delirium" deaths appeared in the law enforcement literature (2,9,10). Private companies began promoting and providing products and training

to law enforcement agencies addressing the risks of hogtying, positional asphyxia, and sudden in-custody deaths in the mid-1990s (11).

It is not a new concept that a person can die from the application of body weight to the thorax. "Burking," a form of mechanical asphyxia combined with smothering which involved sitting on a person's chest, was used by the nineteenth century murderers-for-profit Burke and Hare. Deaths from asphyxia in individuals knocked down and pinned by the weight of people on top of them during crowd stampedes and "human pile" situations are widely recognized (12). That homicide can occur by kneeling or sitting on the back of a prone victim or suspect, or by hogtying, has been acknowledged in a major forensic pathology text (13). The term "restraint asphyxia" has been suggested for asphyxial deaths that occur through interference with the mechanical bellows action of the chest, such as in the prone hogtied position or in the prone position with arms and legs restrained and weight applied to the back (3,14). However, alternative explanations for sudden death are frequently offered when prone restraint while in custody is involved. These include blunt force head injury, cardiac arrest from drug toxicity, acute exhaustive mania/excited delirium, electrical shock from stun guns, respiratory arrest from pepper spray, and cardiomyopathy. One or more of these factors was present in most of the 21 cases currently reported.

Four of the 21 currently reported cases received baton blows. Two involved blows to the head with discernible skin lesions but no skull fractures or

brain injuries at autopsy. In all cases there was a several-minute period of purposeful activity and vocalization between the delivery of the baton strikes and the later loss of consciousness while held prone. It seems reasonable to exclude brain injury as a cause of death when loss of consciousness does not follow the blows to the head within seconds, when the autopsy discloses no skull fractures or brain injuries, and when there are other reasonable explanations for the death. In 1994, Mirchandani et al. emphasized this point with 4 case reports of sudden death during police restraint following a struggle in men with cocaine-induced agitated delirium who had sustained minor head injuries (15). They suggested cocaine-induced cardiac arrest or mental stress-related "stress cardiomyopathy" may have caused the deaths. They may not have considered mechanical asphyxia by chest compression during the restraint process (restraint asphyxia) as a possible cause for the deaths.

Karch has recently summarized the pathologic effects of cocaine and emphasizes the importance of considering the physical findings, history, and scene investigation before attributing a death to cocaine effect (16). Cocaine can cause sudden death and can cause delirium. Blood concentrations in individuals whose death was attributed to cocaine overlap those in which cocaine was an incidental finding and have a wide range (17). Some of the postulated mechanisms by which cocaine could cause sudden death without leaving lesions visible at autopsy include cardiac arrhythmia or coronary spasm with myocardial ischemia from catecholamine excess, nonspecific myocardial disease from chronic ischemia, cardiac electrical conduction slowing from anesthetic effect in high doses, hyperthermia, and seizures. Methamphetamine is postulated to have similar effects (18). Eight of the cases reported herein had cocaine in their blood at the time that they lost consciousness while being restrained, and 3 had methamphetamine, and 1 had both methamphetamine and cocaine.

So-called "cocaine delirium" deaths have been reported to occur while in police custody much more commonly than other cocaine toxicity deaths (7,15,16,19,20). The stress of the struggle has been hypothesized to be a critical factor precipitating a lethal cardiac arrhythmia in these police encounters, but considerations of the timing of the lethal event coincident with restraint and respiratory compromise were not addressed. Although it is reasonable to attribute the disturbed mental state of excited delirium to cocaine or methamphetamine toxicity in this subset, it would seem that asphyxia

would be the likely immediate cause of death, because the sudden collapse that resulted in death occurred while the person was held in a position that would compromise breathing. Stimulant drug toxicity could be considered a contributory cause, because the drug probably precipitated the aberrant behavior that led to the encounter that resulted in death, and may also have sensitized the heart to an arrhythmia.

"Excited (agitated) delirium," loosely defined as a condition of extreme mental and motor excitement with confused and unconnected thoughts, could be interpreted as present in all but 3 of the 21 cases based on reports of behavior during the incident and knowledge of prior drug-induced or psychosis-associated delirious or delusional states. Others have postulated that sudden deaths in delirious individuals who used cocaine chronically are due to a cocaine-induced brain disorder similar to neuroleptic malignant syndrome (NMS), with abnormalities in the synaptic concentration and metabolism of the neurotransmitter dopamine proposed as mechanisms (19-22). Similarly, in hospitalized, agitated psychiatric patients who may or may not be taking phenothiazine medications, sudden deaths have been reported without significant autopsy findings to explain the cause (23). Various known as acute exhaustive mania, Bell's mania, lethal catatonia, or acute exhaustive psychosis, some postulate that such patient deaths are related to cardiac arrhythmias from catecholamine-mediated emotional stress, but the relation to restraint is unclear. NMS is defined as neuroleptic drug-induced hyperthermia with muscle rigidity and is thought to be produced by disruption of the dopamine-dependent thermoregulatory centers in the hypothalamus and basal ganglia. Death rates attributed to NMS have dropped from an estimated 30% of diagnosed cases to nearly zero with treatment. Autopsy findings are often minimal (24).

Two of the cases reported here had neuroleptic drugs present in their blood. Eight had medical histories of major psychoses. In 3 cases, the postmortem temperature was recorded, and in 1 case it was elevated. In 6 of the cases, sweating was noted. Interestingly, sweating was not noted in the 1 case with documented hyperthermia. Of course, perspiration is a normal physiologic response to vigorous physical activity, psychologic stresses, and warm environments; the first two factors were present in all 21 cases. Sweating does not equate with hyperthermia. Medical examiners and coroners could help clarify the role, if any, of hyperthermia in prone restraint deaths by promptly obtaining a post-

mortem temperature. None of the 21 death investigations indicated muscle rigidity. Given the temporal association of the restraint process to the terminal loss of consciousness in all 21 of the reported cases, it would seem reasonable to attribute these deaths to asphyxia during restraint rather than to agitated delirium. The agitated delirium and its associated stresses, whether or not drug induced, could reasonably be considered predisposing or contributing to death.

Chronic mental illness was present in 8 of the 21 deaths reported and was the probable explanation for these persons' agitated behavior. Three were schizophrenic, 1 had bipolar disorder, 1 had both diagnoses, 1 had undifferentiated psychosis, 1 was mentally retarded, and 1 had cerebral palsy with autism. Two of these persons also had cocaine in their blood at autopsy. Obviously, not all cases of agitation and delirium are cocaine induced.

Pepper spray containing oleoresin capsicum has been implicated in deaths in California by the American Civil Liberties Union (25). However, reviews of deaths where pepper spray was used fail to reveal convincing evidence of lethality (14,26). One case report of a custody death attributed to pepper spray indicated that the victim stopped struggling while handcuffed and being held prone (27), suggesting restraint asphyxia. Pepper spray was used in 7 of the 21 cases reported herein. In all cases, witnesses reported no significant effect caused by the spray. In all cases, the spraying was followed by minutes of voluntary physical activity and verbalization before loss of consciousness during restraint. In no cases were symptoms of respiratory difficulty following the spraying described, and in no cases were inflammatory changes of the respiratory mucosa noted at autopsy.

Electrical shocking devices (stun guns and tasers) intended to immobilize people are frequently used by law enforcement officers, and stun guns are legally available to the public for self-defense in many areas. They are generally not considered lethal weapons, and the few reports of fatalities associated with their use have identified other more likely causes of death (3,28-31). A taser was used in 1 of our reported cases. Several minutes of purposeful activity and verbalization followed the shocks and preceded the death during restraint.

Significant physical exertion was present in most cases before restraint and in all cases during restraint. Officials involved in restraining these people often described the persons as unusually strong and persistent in their struggle. Increased oxygen demand from such physical activity could increase

susceptibility to asphyxiation during restraint with pressure on the chest.

Asystole was the presenting cardiac arrhythmia found in 15 of the 20 cases reported that had paramedic response. Five others presented with agonal rhythms, described as pulseless electrical activity in 3, and idioventricular rhythm and fine ventricular fibrillation in the other 2 cases. Preexisting heart disease was considered by the certifier of death as a contributory factor in 4 of the 21 cases. Microscopic fibrosis was seen in 3 hearts, and 1 heart was listed as having hypertrophic cardiomyopathy. In both cases that had hearts more than 2 standard deviations above the body weight- and gender-adjusted mean (6), the cardiomegaly was not mentioned on the death certificate.

Obesity has been mentioned as a possible risk factor for death from positional asphyxia during hogtying (1,9). Obesity could contribute to asphyxia when excessive body weight makes chest wall movement more difficult while prone and when excessive abdominal fat limits diaphragmatic motion (14). Similarly, obesity has been thought to be a possible risk factor for death during cocaine-induced excited delirium by contributing to body insulation and predisposing to hyperthermia (19). Fifteen of the 21 cases reported were overweight or obese, defined as having a BMI (body weight in kilograms/height in meters squared) greater than 25 (32), supporting an association between obesity and these deaths.

Other possible mechanisms of asphyxia in addition to restricted breathing from chest/abdominal compression were present in several cases. Pathologists described the presence of soft tissue hemorrhage in the neck musculature in 5 cases, suggesting the possibility of neck compression during the restraint process. In 2 of those 5 cases, the evidence was compelling enough for "neck compression" or "strangulation" to be mentioned on the death certificate. However, in no case did the participants or witnesses describe neck holds. In 1 case with neck hemorrhage, a towel was held around the face, and in another case, a mask was placed over the nose and mouth. All but 1 person received extensive resuscitation efforts, including intubation, possibly explaining some of the injuries noted. In a series of 50 patients intubated in the field by paramedics, 14% had incidental hemorrhages in the strap muscles of the neck found at autopsy (33).

Ten of the 21 cases had ocular petechial hemorrhages described at autopsy, and 2 more had intrathoracic petechial hemorrhages which were con-

sidered inconsistent and nonspecific indicators of asphyxia (34). Two other persons proclaimed that they could not breathe shortly before they lost consciousness and died. These observations support an asphyxial mechanism of death.

Asphyxia or a similar term was used on the death certificate in only 13 of the 21 cases, indicating the difficulty in recognizing restraint-associated deaths and the difficulty in diagnosing asphyxia through autopsy findings alone. In many cases the medical examiner or coroner did not have detailed statements from witnesses or dispatch logs that established the association between the restraint and the loss of consciousness that lead to death. In all cases in which the persons were not fully hogtied when they lost consciousness, weight was being applied to the chest area when movement ceased and loss of consciousness was noticed. In the 4 cases that were hogtied when loss of consciousness was noticed and in the 1 person who was restrained lying on his side, the persons had been restrained with weight on their backs while held prone moments before. No statements by witnesses indicated conscious activity by any of the persons following completion of the hogtying, suggesting that loss of consciousness may have occurred during the application of restraints. Table 1 indicates the wide range of cause of death designations given for these remarkably similar deaths.

The term "restraint asphyxia (asphyxiation)" was first proposed in 1993 to refer to the sudden deaths of people who were hogtied or restrained in the prone position with weight on their backs in which the evidence suggests an asphyxial death (3). Previously, in cases involving deaths discovered during hogtying by police, the term "positional asphyxia" had been used (1). "Mechanical asphyxia" or "traumatic asphyxia" are other accepted terms that could have been used. In the field of forensic pathology, positional asphyxia has usually referred to deaths in which a victim, often compromised by alcohol or drugs, cannot escape from a position that inhibits pulmonary gas exchange and in which other causes of death have been excluded by a thorough autopsy (35). Use of the term "positional asphyxia" has led to some confusion when applied to deaths that occur in hogtied persons, because positional asphyxia has usually implied accidental, passive entrapment. The same confusion applies to deaths that occur from asphyxia produced by other people restricting a person's ability to breathe during restraint. When the nose and mouth are blocked, "suffocation" or "smothering" are accepted terms. When the neck is compressed, "choking" or "strangulation" are

commonly used. Reay has discussed hogtying and prone restraint deaths with chest compression in the context of law enforcement take-downs, referring to them as restraint asphyxia, and has also discussed the biomechanics of such deaths (14). A recent court decision rested, in part, on a confusing interplay between the terms "hogtie" and "positional asphyxia" (36). We suggest that the term "restraint asphyxia" be used to describe deaths during restraint that appear to be the result of chest compression or hogtying. Alternatively, more descriptive terms such as "asphyxia by chest compression" or "asphyxia during hogtying" could be used. The major advantage of using a single term for death certification is the increased accuracy in death certificate coding and vital statistics-based research.

The manner of death designations in these 21 cases included 14 accident, 4 homicide, 2 natural, and 1 undetermined. Given the variation in terms used to describe the causes of these deaths, it is not surprising to see variation in the manner of death also. Because restraint asphyxia deaths are "deaths at the hands of another," it has been argued that they should be considered homicides (37). Conversely, it has been argued that because death by restraint asphyxia was not recognized until recently and information regarding its potential lethality has not been circulated widely, it is reasonable to classify them as accidental deaths (3,38). Considering the amount of discussion during the past decade in the forensic pathology, emergency medicine, and law enforcement literature regarding the risks of death during hogtying, the argument for classification as accident becomes weaker. Little has been written in first-responder literature regarding the danger of death in delirious persons restrained in the prone position without the use of arms or legs for support and with sustained pressure applied to the back—the circumstance in most of the cases reported herein. Finally, if one believes sudden death during agitated delirium is a natural consequence of endogenous psychiatric illness, and if no restraint asphyxial component of the death is recognized, then a determination of death by natural causes is understandable.

The magnitude of the problem of sudden death during prone restraint in the United States remains unclear. In Ventura County, California, which has a mostly suburban population averaging 720,000 persons, 8 deaths from restraint asphyxia have occurred during the last 14 years. This translates to a rate of 0.8 deaths/million/year. This would extrapolate to >200 deaths/million/year in the United States, but the numbers are too low and the popu-

lation too restricted for more than a crude projection. A study from the province of Ontario, Canada (5), which had an average population of 11 million during the years 1988 to 1995, identified 18 cases of sudden death during prone restraint in excited delirious persons, producing a rate of 0.2 deaths/million/year. We know of no reports regarding the frequency of death during prone maximal restraint, with or without actual hogtying, in any law enforcement population.

### CONCLUSIONS

Despite efforts by law enforcement agencies to limit hogtying, asphyxial deaths still occur when suspects are held prone with their arms and legs restrained and weight applied to their backs for minutes. The term "restraint asphyxia" is proposed for such asphyxial deaths involving prone restraint and/or hogtying. Such deaths are not unique to law enforcement. Persons with mental disorders, especially drug-induced or psychotic illness-induced agitated delirious states, seem to be at greater risk. It is not clear whether the delirious state itself or its tendency to precipitate violent encounters with police put them at risk. Physical exhaustion, preexisting heart disease, and obesity may also increase risk of death in this situation.

As is the case with many other forms of asphyxial death, the autopsy findings in restraint asphyxia can be subtle and nonspecific. Each case must be evaluated on its own merits and alternative explanations for the death considered. Accurate diagnosis depends on both a thorough autopsy and a thorough investigation of the circumstances of the death. Pointed interviews with witnesses and participants in the restraint, focusing on the mechanics of the restraint, the length of time involved, and the moment when loss of consciousness occurred, should be conducted soon after the event while memories are still fresh. Identifying the timing of the sudden loss of consciousness while the person was restrained in a position that compromises the ability to breathe is essential for establishing a cause-and-effect relation between restraint and death.

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