Sudden Death in Individuals in Hobble Restraints During Paramedic Transport

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For patient and personnel safety, agitated and violent individuals are sometimes physically restrained during out-of-hospital ambulance transport. We report two cases of unexpected death in restrained, agitated individuals while they were being trans-ported by advanced life support ambulance. Both patients had been placed in hobble restraints by law enforcement. At autopsy, toxicologic analysis revealed nonlethal levels of amphetamines in one patient and nonlethal levels of ethanol, cocaine, and amphetamines in the other. In both cases the cause of death was determined to be positional asphyxiation during restraint for excited delirium. Physicians and emergency service personnel should be aware of the potential complications of using physical restraints for control of agitated patients.

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INTRODUCTION

Encounters with violent, agitated individuals are not uncommon for emergency medical services and law enforcement personnel. When a person's behavior represents an immediate danger to himself or to others, it is reasonable to use physical restraints if these are believed to be the best alternative.[1] We present two cases of young men who died unexpectedly during advanced life support (ALS) transport while restrained in hobble—sometimes called hogtie—restraints. These restraints were applied by law enforcement officers and involved handcuffing or binding the wrists behind the back, binding the ankles, and then attaching the bound wrists to both bound ankles.

CASE REPORTS

Patient 1 A 35-year-old, agitated, combative man was found rolling in the street. Police were called; because of

his combative state, the man was handcuffed with his hands behind his back. He remained uncontrollable and was placed in hobble restraints. Paramedics were summoned and reported an agitated, combative man without evidence of injury who communicated only with unintelligible sounds.

While in hobble restraints, the patient was placed in a prone position and transported with a cardiac monitor attached. During transport, his pulse dropped from 136 to 60, then increased to 102, with subsequent development of asystole within 1 minute. The restraints were removed, and resuscitation was unsuccessfully attempted with standard ALS procedures.

Postmortem toxicology tests revealed nonlethal blood levels of methamphetamine (1.42 μg/mL) and amphetamine (.25 μg/mL) and were negative for other toxins, including cocaine and alcohol. Autopsy revealed crusted needle puncture sites in both antecubital fossa but no major traumatic injury, evidence of infectious disease, or other contributory cause for death. The cause of death was determined to be the combined effects of methamphetamine intoxication and restraint maneuvers for bizarre behavior.

Patient 2 A 30-year-old man who was riding his bicycle erratically in and out of traffic was stopped and handcuffed by police. He had bleeding from his mouth but no other evidence of injury. The man immediately tried to kick and to spit blood at law enforcement officers, who placed him in hobble restraints after other restraint procedures failed. An ambulance was summoned to transport him for medical evaluation. Paramedics initially reported an agitated man who screamed but did not communicate.

During transport in the prone position with hobble restraints, the patient was initially combative; attempts to obtain vital signs and establish venous access were unsuccessful. Within 6 minutes of the start of transport, the patient suddenly became unresponsive. Restraints were released. With the use of quick-look cardiac monitor paddles, the patient was found to be in an agonal rhythm that progressed to asystole after 3 minutes. The patient's ventilation was assisted with 100% oxygen, and he was intubated endotracheally and given 2 mg IM naloxone. Resuscitative attempts with hyperventilation and IV epinephrine and atropine were unsuccessful.

Postmortem toxicologic blood tests were positive for ethanol (1.0 mg/mL) and nonlethal levels of cocaine (.28 μg/mL), benzoylecgonine (.24 μg/mL), and cocaethylene (.05 μg/mL). Urine toxicologic tests were positive for amphetamine (.02 μg/mL) and methamphetamine (.14 μg/mL). Autopsy revealed pulmonary edema and congestion with slight-to-moderate myocardial interstitial fibrosis and no significant trauma, evidence of infectious disease, or other contributory cause for death. After the coroner's investigation, the cause of death was determined to be positional asphyxiation during restraint for excited delirium.

DISCUSSION

Although there have been reports of sudden, unexpected death in persons in hobble restraints during law enforcement transport, we believe these cases are the first reports of sudden death in patients in these restraints during transport by medical personnel.[2] The two cases reported are of particular concern because the deaths occurred without successful resuscitation despite equipped and trained ALS personnel witnessing the cardiopulmonary arrests.

The patients described in this report were found to have nonlethal toxicologic evidence of cocaine and/or amphetamines. Autopsies on both individuals were nonspecific in defining the causes of death. It is important to note that both restrained men were placed face down, on their abdomens, during the initial phase of ALS transport.

In a person with the wrists and ankles tied tightly behind the back and placed in a prone position, there is potential for restriction of motion of the diaphragm and chest. Such positioning can lead to asphyxia.[3] Position asphyxia occurs when a person's body position causes inability to breathe or airway obstruction. This phenomenon has been described in detail in recent forensic literature.[2,3]

Position asphyxia causes nonspecific postmortem changes, and the diagnosis is based on three criteria. First, the victim must have gone into arrest in a position that interferes with pulmonary gas exchange. Second, the victim must not have been able to escape from the restrictive position. Third, other causes of death, both natural and unnatural, must be ruled out with reasonable certainty by a thorough autopsy.[3] In addition to positional asphyxia, a further consideration for asphyxiation as a cause of death in the two cases we describe is asphyxia resulting from respiratory muscle fatigue. This asphyxia results from extreme energy expenditure from exertion and struggle against restraints.[4]

The two reported patients suffered rapid asystolic arrest. Reflex bradycardia resulting from blood pressure increase and asystole have been reported with the use of cocaine and amphetamines, but the drug's main effects are sympathomimetic cardiac and central nervous system stimulation.[5-10] Rapid asystolic, as opposed to fibrillation or tachycardic, arrest suggests death resulting

from asphyxia. Further study is necessary to determine whether the use of hobble restraints alone or in combination with stimulant drugs or other unrecognized causes of delirium have the potential to cause death.

In determining methods to avoid position asphyxia of the restrained individual, it is important to consider the contribution of the chest wall and abdomen to the process of ventilation. Breathing requires development of a negative intrathoracic pressure by the expansion of the rib cage or by downward contraction of the diaphragm.[11,12] Positioning a restrained person on the abdomen, as was done in our two cases, physically interferes with diaphragmatic motion by restricting downward displacement of the abdominal contents.[2] Furthermore, hyperextension of the chest wall, as occurs in the hobble position, limits the ability to expand the rib cage.[2]

Considering this physiologic information, methods to avoid possible asphyxia should include placing a restrained individual in the lateral or supine position rather than in the prone position. When hobble-type techniques are used, there should be slack in the restraints to allow for ventilatory motion of the chest wall muscles. The patient must also be monitored closely, with immediately available means of releasing the restraints and providing ALS.

CONCLUSION

We present two cases of cardiopulmonary arrest in agitated, hobble-restrained individuals during ALS out-of-hospital transport. In the first patient, toxicologic tests were positive for nonlethal levels of amphetamines, and in the second patient for nonlethal levels of ethanol, cocaine, and amphetamines. After thorough autopsy, the causes of death were determined to be the result of positional asphyxiation during excited delirium. Restraint of agitated patients with the hobble technique is a high-risk procedure that requires measures to avoid positional asphyxia.

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