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Restraint asphyxia in in-custody deaths Medical examiner's role in prevention of deaths

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Abstract

In the United States, the office of the Medical Examiner-Coroner is responsible for investigating all sudden and unexpected deaths and deaths by violence. Its jurisdiction includes deaths during the arrest procedures and deaths in police custody. Police officers are sometimes required to subdue and restrain an individual who is violent, often irrational and resisting arrest. This procedure may cause harm to the subject and to the arresting officers. This article deals with our experiences in Los Angeles and reviews the policies and procedures for investigating and determining the cause and manner of death in such cases. We have taken a "quality improvement approach" to the study of these deaths due to restraint asphyxia and related officer involved deaths, Since 1999, through interagency coordination with law enforcement agencies similar to the hospital healthcare quality improvement meeting program, detailed information related to the sequence of events in these cases and ideas for improvements to prevent such deaths are discussed.

Keywords: Restraint asphyxia; Positional asphyxia; Custody death; Hogtying restraints; Forensic medicine; Medical examiner-coroner

1. Introduction

In California, by State law, the Department of Medical Examiner-Coroner is an independent investigative agency responsible for the official investigation of all sudden and unexpected deaths, deaths by violence or deaths under suspicious circumstances. Many states have laws extending jurisdiction to investigate deaths due to infectious diseases that constitute a public health hazard, deaths during therapeutic and diagnostic procedures, and case review before cremation. The medical examiner also has jurisdiction to investigate deaths during custody of law enforcement and justice agencies. Although the medical examiner in the United States is an independent agency, we work with law enforcement agencies in the investigating of homicide cases, including officer involved deaths and deaths while under custody.

In 1988, Reay et al. [1] first reported on an experimental study on the detrimental physiological effects associated with the "four point restraint" procedure, commonly known as hogtying or hobble restraint. In a subsequent paper in 1992, Reay et al. [2] reported on three cases of deaths from positional asphyxia after the victims had been placed in a prone position in the rear compartment of a police patrol car. O'Halloran et al. in 1993 [3] reported on eleven cases of sudden death of men restrained in a prone position by police officers. Nine of the men had been hogtied, one had been tied to a hospital gurney, and one was manually held prone. All subjects were in an excited delirious state when restrained. Three were psychotic, and the others were acutely delirious from drugs (six from cocaine, one from methamphetamine, and one from LSD). In a second paper [4] O'Halloran reported on two additional cases of deaths of psychotic patients under restraint.

In the Los Angeles cases reported in 1995 by Stratton et al. [5] two unexpected deaths occurred in restrained (hogtied) agitated individuals while they were being

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transported by advanced life support ambulances. Law enforcement personnel had placed both patients in hobble restraints. Toxicological analysis revealed non-lethal levels of amphetamines in one patient and non-lethal levels of ethanol, cocaine, and amphetamines in the other. Stratton et al. in 2001 [6] reported on 18 other cases of such deaths witnessed by emergency medical service (EMS) personnel. In all 18 cases, the individuals had been restrained with the wrists and ankles bound and tied together behind the back. Associated with all these sudden death cases was struggle by the victims against the forced restraint, followed by cessation of struggling with labored or agonal breathing immediately before cardiopulmonary arrest. Also associated were stimulant drug use, chronic disease, and obesity. The report noted that unexpected sudden death when excited delirium victims are restrained in the out-of-hospital setting is not infrequent and can be associated with multiple predictable, but usually uncontrollable, factors.

2. Death investigation – policy and procedure

In Los Angeles, the following standards, policy and procedure were established for investigation of such deaths: 1. Investigative aspect, 2. Autopsy and specimen analyses, 3. Management of cases, 4. Cause and effect analyses with the aim of prevention.

2.1. Investigative aspect

In-custody deaths include deaths that occur during apprehension by police officers, and deaths while the subject is detained or incarcerated in a public institution. When death occurs under these circumstances, it is the duty of the Medical Examiner-Coroner staff to respond to the scene, take charge of the body, and investigate the circumstances surrounding the death. These situations often trigger accusations and emotional outbursts by the family members and community activists, and can also lead to litigation. Investigations into the cause and manner of these deaths, therefore, require sensitive, timely and thorough processing, since it is expected that scrutiny by investigative agencies, the media, and the pubic as well as the families will follow. In Los Angeles County, the team approach is used in handling these cases. Such deaths raise the question of the use of excessive force, procedures which are illegal, or have high risk of causing injury or even death, so the inquiry extends into the possibility of illegal acts of commission or omission of the police department in restraining the arrestee, resulting in death.

The police department is often concerned about undue lawsuits against the department and criminal prosecution of the involved police officer. The Medical Examiner's role in these cases is to handle them with sound, thorough investigation by a systematic process of observing, recording, gathering and preserving evidence and information and by subsequent analyses of the data with the goal of rendering a cause and manner of death, and to communicate with the police department to elucidate the cause and mechanism of death, and provide the key information for prevention of similar deaths in the future.

2.2. The standard autopsy procedures

A well-qualified forensic pathologist is assigned to conduct such autopsies. The external examination should be meticulous. The pathologist should note and record even faint subtle bruises and abrasions. They may later become important, correlating circumstantial investigative findings with injuries, particularly the time of injuries. The direction of force of abrasion may become a crucial issue. Equal importance should be placed on any absence of injury on the head, neck, upper extremities as well as the lower extremities and the genitals. If there is any evidence of physical contact to the decedent, it is presumed that the contact may be the lethal act and all caution should be taken to properly document it. For the examination of the neck, it is important to look for petechial hemorrhages in the conjunctivae and the buccal mucosa in conjunction with hemorrhages in the neck. It should be noted that any injury or existing natural disease could act in concert with or be contributory to the cause of death. Complete and thorough detailed documentation of all findings is essential as the basis of assigning the proximate cause of death. Special procedures to be followed for reducing the chance of missing important findings include:

(i) Multiple photographs should be taken to document each injury with a ruler.
(ii) To compare the pattern, photographs should be taken at vertical angle.
(iii) Photographs should include whole body/all aspects.
(iv) Photographs may need to be enlarged to see the details, so use fine grain negative film with adequate lighting, so that magnification can be done without loss of resolution.
(v) The medical examiner should collect samples of hair, fingernail clippings, oral/genital swabs and preserve clothing and other articles that may be related to the death. These items should be placed in properly aerated containers to prevent decomposition of the biological evidence.
(vi) X-ray of the neck should be taken, even if externally negative. For further detailed study, postmortem vertebral artery perfusion is recommended.
(vii) Save adequate specimens and conduct toxicology studies including carboxyhemoglobin, volatiles, and drugs of abuse as indicated
(viii) Where indicated, microscopic studies on heart, lung, liver, and kidneys should be conducted to assess existing disease.
(ix) Specific attention should be directed to injury areas to estimate time of injury. Meticulous documentation and correlation of the injury should be included.

(x) For assessment of finer neuropathologic changes, the brain and spinal cord should be fixed and examined by a neuropathology consultant as warranted.

In cases of death in prison or jail, in order to understand the incident better, it may be necessary to obtain information from the victims custodian and other inmates. Prison riots and gang activity may also result in deaths in prison custody and are important factors in coming to a conclusion.

2.3. Management of the case

For overall management of the investigation with focus on the search for reliable information and rendering a reasonable conclusion, a number of points need to be understood. There may be pitfalls in in-custody death investigation. The final conclusion may have a great impact on the community and agency policy making, so it is important to use caution in recognizing injury as the primary or contributory cause of death. If injury contributes to death, the death is assignable to the injury event, regardless of the nature and extent of an existing primary natural disease. Careful assessment to evaluate whether events are coincidental or related must be on "the scale" used to assess the death. Premature and inappropriate release of information to a suspicious public may result in suspicion of unwarranted and inappropriate conduct by authorities. At the same time, it is more harmful not to release information that may often be interpreted as concealment of misconduct. Before release of information, all work and evaluation should be completed, but it must be in a timely fashion. Conclusions must be circumspect.

In Los Angeles County, when the manner of death is classified as homicide, this only means that a person died as a result of a direct action of another person. It means the death was at the hands of another. Further note that the term murder is a legal classification that should only be used by charging authorities, i.e., the district attorney.

2.4. Cause and effect analysis and special consideration

Assignment: The in-custody death investigative team is assigned to investigate such cases at scene. The Chief Medical Examiner-Coroner and the Chief of Forensic Medicine Division will conduct the final reviews. In order to review those cases, it is necessary to be able to reconstruct the scene.

Necessary documentation: At-scene investigation of the undisturbed body is necessary. If paramedics have removed the body for emergency care, it is necessary for the medical examiner to review all photographs and descriptions of the scene taken and provided by the investigating agencies. All available preliminary information is taken into consideration before the autopsy is performed, but all information must eventually be confirmed. The records of the police agency are reviewed, including all statements of persons who witnessed the event and persons who were in proximity to the scene of death.

Information on restraints in detail: If physical restraint was used, a detailed description of the method of restraint is necessary. The description should include: (a) what type of restraint, (b) what period of time, (c) position of victim when the restraint was applied and during the restraint period, the final resting position, (d) any use of arms, shackles, handcuffs, flexcuffs, choke hold, the use of taser, pepper spray or any additional restraints, such as hogtying.

Approach in investigation of in-custody deaths: The Los Angeles Office looks at the types of restraint measures used, which can include the use of pepper spray, taser, swarm techniques, baton use, handcuffing, ankle restraint, four point restraint or hog-tying, etc. Investigation looks into whether or not these restraining procedures were applied separately, intermittently, or together. It is important for us to also know how many officers were involved in apprehending or subduing a suspect who required restraint or use of force. We then look at how long and what types of restraint measures were applied. We gather independent observations regarding the consciousness, mobility, and actions of the suspect during this process. When a victim had been taken to a hospital, we evaluate the paramedic report, the medical treatment and the hospital toxicology reports, and include obtaining the hospital blood for further toxicological analyses. The autopsy is most comprehensive for these types of cases and includes fluoroscopy and X-rays as needed. Neuropathology studies and microscopic studies are generally performed/supervised by one of our full time, Board Certified staff pathologists. During autopsy, we also look for injuries, preexisting medical conditions, and drug intoxication.

3. Medical examiner's role in prevention of death

The critical aspect in each case is the chronology of events. We rely heavily on independent observations, as well as the internal review process by the law enforcement agency. Paramedics should be reminded to take body temperature as part of their evaluation. In the past we have experienced difficulties in acquiring information due to the fact that officers involved in the apprehensions often exercised their Fifth Amendment rights against self-incrimination guaranteed by the U.S. Constitution. Typically, we experienced the following types of cases: During a "swarming" technique, several officers try to handcuff an unusually heavyset large suspect and apply ankle restraints. Oftentimes a baton is used to bring down the suspect and usually the suspect ends in a face down position often with officers kneeling on or sitting on the arrestee. Even though the actual "hog-tying" procedure may or may not have been a factor, multiple officers sitting on the back of an obese person can restrict his/her respiration. Hence the term, "restraint asphyxia," is used to described the cause of death in these cases. The role of the Medical Examiner is not only to determine the cause and manner of deaths, but also to take

action in informing the appropriate agencies to reduce unnecessary deaths and suggest appropriate actions for correction.

In Los Angeles County, the Chief Medical Examiner-Coroner (CME-C), noting these cases of deaths during or following police arrest procedures, communicated with an official letter to the Office of the City Attorney (Sathyavagiswaran, personal communication), informing them of the Coroner's Office procedures and findings, suggesting that the district attorney's office and/or the city attorney's office should institute an independent investigation or field a response team to check into the police arrest procedures resulting in these deaths. Further suggestion was made that in these situations paramedics should also be summoned at the same time as the police, so medical assessment of the individual disturbing the peace can be made immediately. These individuals are often under the influence of drugs and/or have preexisting medical conditions.

It was strongly suggested that these incidents be videotaped in entirety whenever possible. Videotaping is very useful for studying the activities of the victim before apprehension and the effect of the restraint maneuvers used. When restraint is used, it advised that apprehended suspects be placed in the lateral decubitus or sitting position and to avoid placing them in a face down position, placing weight on their back, and hogtying them. At the first sign of physical difficulty, take him/her to a hospital where specialists are available to evaluate and clear the person before he/she is taken to a jail facility.

Finally, the Medical Examiner suggested a multi-disciplinary team conference to evaluate the sequence of events, so there is consistency in information provided. A strong message was sent to the City Attorney's Office by the CME-C that hog-tying compromises lung volume and respiratory function and recommended the use of alternative restraint maneuver. In response to a grand jury recommendation, since October 1999 in Los Angeles County a multi-disciplinary team composed of representatives from the police departments, the sheriff's office, the district attorney's office and the Medical Examiner have met regularly in a forum to freely exchange information and ideas to address areas of mutual concern and improve the arrest procedure to reduce injury and prevent deaths.

4. Manner of death

Concerning classification for the manner of death, Los Angeles County Coroner's Office established the following standards for determining whether or not deaths following a hog tying incident should be determined as homicide or undetermined. In a joint meeting with the DA and police chiefs, the CME-C indicated that if the following combination of multiple factors is involved, the manner of death is classified as undetermined. The factors are (1) obesity and enlargement of the heart, (2) laboratory tests show drugs in the system, (3) psychiatric history and psychotic reaction, (4) high risk (unsafe) arrest procedure, (5) insufficient information to explain the sequence of events, (6) either insufficient information or conflicting information which affects the Medical Examiner's ability to make a final determination. The Medical Examiner may determine the manner of death as undetermined as a signal to law enforcement that the case warrants more in-depth investigation to try to answer some of the questions surrounding the death. Undetermined is also used by the Department of Coroner when the autopsy findings do not establish any specific cause of death, such as the case of a young person without heart disease or other existing diseases, no drug in the system, yet dying following the restraint procedure. When the manner of death is determined to be homicide, it simply means the death was at the hands of another.

5. Discussion

5.1. Mechanism of death

There has been much discussion as to whether or not the prone position per se would cause death of a hog-tied individual. Reay et al. in 1988 [1] reported on the effects of positional restraint on oxygen saturation and heart rate, and noted that positional "hog-tie" restraint induced prolonged recovery time. He concluded that persons placed prone, handcuffed, and "hog-tied" expire as a result of the physiological effects produced by positional restraints and reported deaths of hog tied individuals were due to "positional asphyxia." Other reported cases of deaths of hog-tied individuals [2] all indicated that the hog-tied persons had been placed prone (face down) on a surface.

A Los Angeles County Coroner study (Rogers C, Russell MA, Eckstein M, Mallon W, Aguilar G, unpublished observations) monitored the heart rate and blood oxygen saturation of 10 subjects in four-point restraint in the hyper extended position, and compared this with restraint using two commercially manufactured restraint devices. Positional differences were studied. The subjects were placed in the prone and left lateral decubitus positions. Recovery of heart rate after exercise was significantly better with the limbs partly extended on the left side (left lateral decubitus position). Most subjects did not experience significant oxygen desaturation during restraint, although desaturation did occur in some subjects. The authors emphasized that four-point restraint in the hyper extended position is associated with potentially dangerous physiologic changes. The use of restraining devices that do not hyperextend the limbs was recommended.

Chan et al. [7] determined whether the "hobble" or "hogtie" restraint position results in clinically relevant respiratory dysfunction and concluded that, in a population of healthy subjects, the restraint position resulted in a restrictive pulmonary function pattern but did not result in clinically relevant changes in oxygenation or ventilation, although a small restrictive pulmonary function pattern by

pulmonary function test parameters was found in subjects who were placed in the restraint position.

Parkes [8] measured the effects of restraint positions on recovery rate from exercise in healthy individuals and concluded that physiological effects produced by positional restraints should be recognized in these deaths.

In a more recent study Chan et al. [9] reported that the prone maximum restraint position with and without 25 and 50 pounds of weight force resulted in a restrictive pulmonary function pattern, but no evidence of hypoxia or hypoventilation was noted.

In experimental studies, it is difficult to simulate the real police arrest situation and experimental studies done on healthy individual surely cannot reproduce the real situation. There is no disputing the fact that there have been a number of deaths reported of unusually agitated individuals enduring restraint by hogtying procedure in police custody. There are certain characteristics that distinguished these individuals, who died while hogtied in police custody. It goes without saying that hogtying is used by the police in controlling unmanageable irrational and violent individuals who may cause harm to themselves as well as to others.

Stratton et al. [6] delineated the factors associated with the sudden deaths of agitated individuals who are placed under restraint for excited delirium. These are the individuals who are often subjected to hogtying when a family member calls the police to help control the person.

1. ''Associated with all sudden death cases was struggle by the victim with forced restraint and cessation of struggling with labored or agonal breathing immediately before cardiopulmonary arrest.
2. The findings were also associated with stimulant drug use (78%), chronic disease (58%), and obesity (56%).
3. The primary cardiac arrest rhythm of ventricular tachycardia was found in 1 of 13 victims with confirmed initial cardiac rhythms, with none found in ventricular fibrillation.
4. Authors indicate that unexpected sudden death when excited delirium victims are restrained in the out-of-hospital setting is not infrequent and can be associated with multiple predictable but usually uncontrollable factors.''

Deaths of hogtied individuals are not attributable simply to hogtying. Multiple factors are involved. These individuals are already compromised by drug use and/or mental aberrations triggering other physical disabilities. Their uncontrollable actions force family members to call the police for help and the responding police use their training and procedures to subdue and control these individuals.

5.2. Innovative investigation technique

O'Halloran [4] presented an innovative approach by reenactment of the restraint procedure using the actual restrainer. Within a day of the autopsy the restrainer participates in reenactments of the restraint process, utilizing live volunteers as subjects. The re-enactment is videotaped. Deaths associated with restraint often have non-specific autopsy findings. Timely reenactment of the circumstances of deaths associated with restraint can help death investigators to more accurately determine the probable cause of deaths in such difficult cases. Such cooperative studies on the step by step effect of the restraint process which led to the death can be educational and help to elucidate what should be avoided to prevent such deaths, similar to the quality improvement program for patient care in the hospitals. In Los Angeles County, videotaping is used during actual arrest procedures. In case of death, the video is made available for evaluation of the mechanism of death. The CME-C and chiefs of police are in regular contact, sharing pertinent information to effectively prevent repeated deaths by similar means.

5.3. Quality improvement approach to prevention of death

Because of the litigious atmosphere here, the police agency is often reluctant to provide the medical examiner with pertinent information related to the sequence of events leading to the death of a person under its custody. We propose that a new team approach be set up to prevention of similar deaths. Earlier, for decades a similar blaming atmosphere confronted the healthcare providers and facilities and doctors and hospitals faced repeated malpractice litigation that prevented more earnest exchange of information and setting up a program for improvement. Beginning in the mid-1970's in California, concerned physicians formed a multi-disciplinary team to evaluate the causes of preventable deaths, and made a concerted multi-pronged effort in improvement in the quality of patient care by implementation of quality assurance and setting up improvement forums for earnest exchange of fact finding and open discussion of problems without fear of information being used to harm doctors' and/or hospitals' reputation. This concept was found to provide the most effective way to prevent repeated similar complications and deaths. Any documentation under this provision will not be the subject of discovery for legal action.

5.4. Manner of death

So far, we do not have any national consensus on the manner of death in these specific types of police-involved deaths. Reay [10] recommended accidental classification. Hirsch in New York City [11] recommended homicidal classification when the restraint position constitutes use of a ''potentially lethal force.'' However, most of the reported cases have involved young men in a state of ''excited'' or agitated delirium as a result of intoxication from recreational drugs or psychiatric illness. In addition, these individuals had often suffered traumatic injuries before placement in the restraint position. In Los Angeles we would use the undetermined classification for those restraint deaths with multiple contributing factors. In

California, O'Halloran [12] recommended certifying these cases as accident or, if a disease was the main factor, then certifying as natural. Many medical examiners determine the manner of such deaths to be accident, meaning that the event happened by chance, or unexpectedly; taking place not according to usual course of events. An accident results from an act that is lawful and lawfully done under a reasonable belief that no harm is possible.

References

[1] Reay DT, Howard JD, Fligner CL, Ward RJ. Effects of positional restraint on oxygen saturation and heart rate following exercise. Am J Forensic Med Pathol 1988;9(1):16–8.
[2] Reay DT, Fligner CL, Stilwell AD, Arnold J. Positional asphyxia during law enforcement transport. Am J Forensic Med Pathol 1992;13(2):90–7.
[3] O'Halloran RL, Lewman LV. Restraint asphyxiation in excited delirium. Am J Forensic Med Pathol 1993;14(4):289–95.
[4] O'Halloran RL. Reenactment of circumstances in deaths related to restraint. Am J Forensic Med Pathol 2004;25(3):190–3.
[5] Stratton SJ, Rogers C, Green K. Sudden death in individuals in hobble restraints during paramedic transport. Ann Emerg Med 1995;25(5):710–2.
[6] Stratton SJ, Rogers C, Brickett K, Gruzinski G. Factors associated with sudden death of individuals requiring restraint for excited delirium. Am J Emerg Med 2001;19(3):187–91.
[7] Chan TC, Vilke GM, Neuman T, Clausen JL. Restraint position and positional asphyxia. Ann Emerg Med 1997;30(5):578–86.
[8] Parkes J. Sudden death during restraint: A study to measure the effect of restraint positions on the rate of recovery from exercise. Med Sci Law 2000;40(1):39–44.
[9] Chan TC, Neuman T, Clausen J, Eisele J, Vilke GM. Weight force during prone restraint and respiratory function. Am J Forensic Med Pathol 2004;25(3):185–9.
[10] Reay DC. Death in custody. Clin Lab Med 1998;18(1):1–22.
[11] Hirsch CS. Restraint asphyxiation [letter]. Am J Forensic Med Pathol 1994;15(3):266.
[12] O'Halloran RL, Lewman LV. The author's response [letter]. Am J Forensic Med Pathol 1994;15(4):348.