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CASE REPORT

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"Homicide by Heart Attack" Revisited*

ABSTRACT: The sudden death of a person caused by an arrhythmia that is induced by physical and/or emotional stress provoked by the criminal activity of another person is sometimes referred to as "homicide by heart attack." Published criteria for such an event relate to situations where no physical contact occurs between the perpetrator and the victim. Situations involving physical contact, but with absence of lethal injuries, are frequently treated in a similar fashion by forensic pathologists. Herein, we propose a set of modified criteria, which include cases where physical contact has occurred. Five examples of so-called "homicide by heart attack" are presented, including a 40-year-old man who was struck in the head with a wooden statue, a 74-year-old man who was punched in the jaw by a robber, a 66-year-old woman who was startled awake by a home-intruder, a 67-year-old woman who struggled with a would-be purse-snatcher in a parking lot, and a 52-year-old man who was in a physical altercation with a younger man. In each instance, autopsy revealed the presence of severe, underlying heart disease, as well as absence of lethal injuries. In each case, investigative information was such that the emotional and/or physical stress associated with the criminal activity of another individual was deemed contributory to the death. The presumed mechanism of death in each case was a cardiac dysrhythmia related to underlying heart disease, but initiated by the emotional and/or physical stress.

KEYWORDS: forensic science, homicide, heart attack, manner of death

The term "homicide by heart attack" is used by some persons to describe sudden death due to underlying cardiac disease with an arrhythmia precipitated by the physical and/or emotional stress associated with the criminal activity of another person. Physical contact and/or injury may or may not occur in such scenarios. "Homicide" is an acceptable and appropriate manner-of-death ruling in such cases. Davis has published a set of criteria for pathologists to use when attempting to establish cause-of-death and manner-of-death rulings in cases where physical injury or contact does not occur (1). Although Davis' criteria specifically deal with cases in which there is no physical contact or injury, the authors apply similar criteria to all cases where sudden death due to heart disease is precipitated by the stress associated with another person's criminal activity, whether or not physical contact or injury occurs. In this report, a series of five cases of "homicide by heart attack" are presented.

Case Reports

Case 1—A 40-year-old male was arguing with his girlfriend outside of his apartment when she started to strike him with a 2–3 ft long, light-weight, carved wooden statue. He was reportedly struck multiple times in the head prior to his escape into the apartment, where he locked the door. Witnesses immediately called 911. Emergency Medical Services (EMS) personnel responded within minutes, broke into the apartment through a window, and found him dead, in a chair in the living room. Autopsy revealed multiple superficial abrasions of the face and chest, along with a left periorbital contusion and two small lip lacerations. No skull, brain, neck or other internal organ injuries were identified. Other significant findings at autopsy included cardiomegaly (685 grams) with left ventricular hypertrophy, moderate coronary artery atherosclerosis, severe nephrosclerosis, and a remote pontine infarct. Toxicology tests revealed the presence of cocaine and its metabolites (0.14 mg/L cocaine, 0.96 mg/L ecgonine methyl ester, 5.6 mg/L benzoylecgonine). The cause of death (COD) was as follows: Part I: Cardiac arrest associated with stress and physical assault; Part II: Cardiomyopathy; end stage renal disease; cocaine abuse; remote pontine infarct. Despite the fact that cocaine likely contributed to death, the fact that the physical assault also contributed to death resulted in a manner of death (MOD) ruling of homicide. There has been no adjudication in this case.

Case 2—The wife of a 74-year-old man arrived at his place of business just as an intruder was fleeing from the location after having robbed and assaulted the man. The man had sustained a punch to the jaw and was noticeably shaken, but refused transportation to the hospital via ambulance because he felt his injuries were limited to his jaw, which he presumed was broken. He went into the bathroom to clean-up and was then found unresponsive by his wife. She summoned EMS, who transported him to the emergency department, where he was pronounced dead. Autopsy revealed a fractured mandible, but no intracranial injury. Anterior and posterior neck dissections revealed no injuries. The heart, which weighed 350 g, had mild to severe coronary artery atherosclerosis, with near-complete occlusion of the right coronary artery. Toxicology was negative for

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drugs of abuse. The COD was blunt force head injuries associated with coronary artery disease. The MOD was homicide. A suspect was apprehended, charged, and convicted of aggravated robbery with bodily injury. He received a 90-year prison sentence.

Case 3—A 66-year-old woman with a history of remote coronary artery bypass graft (CABG) surgery was suddenly awakened from sleep by an intruder, who had broken into her home and was demanding money. After the woman became emotionally upset, the burglar fled. The victim was able to phone for help before she collapsed. She did not mention if the intruder had assaulted her. At autopsy, the decedent had multiple areas of senile purpura on her arms, as well as contusions of the right chest and left temple. No other injuries were identified. All resuscitative efforts failed. Autopsy also confirmed the presence of severe coronary artery atherosclerosis, with remote CABG surgery. Her heart weighed 510 g. The COD was cardiac dysrhythmia due to atherosclerotic cardiovascular disease during an emotionally-stressful event (victim of robbery). The MOD was homicide. As no intruder was ever apprehended, there has been no adjudication in this case.

Case 4—A 67-year-old woman was walking in a parking lot on her way from her car to the grocery store, when she was stopped by a teenage male, who demanded her purse. She refused, and the boy struggled with her for the purse, threatening to kill her if she did not comply. She was able to break away from him, run into the store, and relate to others what had happened to her prior to collapsing to the floor. All resuscitative efforts failed. At autopsy, there was no evidence of acute injury other than that which was considered related to resuscitative efforts. Other findings included hypertensive and atherosclerotic cardiovascular disease, with cardiomegaly (565 g), severe coronary artery atherosclerosis, and a remote anterior left ventricular myocardial infarct. The COD was cardiac dysrhthymia due to hypertensive and atherosclerotic cardiovascular disease during an emotionally stressful event (victim of robbery attempt). The MOD was homicide. The teenager was charged with, tried for, and convicted of theft, injury to an elderly person, and aggravated robbery of an elderly person. He received an 8-year prison sentence, with a 10-year probation term.

Case 5—An obese, 52-year-old, diabetic man was involved in a physical altercation with a younger man. During the fight, the older man "acted as if he was having a heart attack." He subsequently fled from the other man and attempted to drive himself to the hospital, but was so debilitated, that he stopped his car and had to ask for assistance. EMS responded and transferred him to the Emergency Department, where resuscitative efforts continued but eventually failed. Death occurred 30 min after EMS initiated treatment. Autopsy revealed rare superficial abrasions of the face, hemorrhage of the left sclera, and a small occipital scalp contusion, but no other injuries. Hypertensive and atherosclerotic cardiovascular disease was present, with marked cardiomegaly (660 g), severe coronary artery atherosclerosis, and histologic evidence of remote, subacute, and acute myocardial infarcts. Well-developed coagulation necrosis with associated neutrophils was present focally. The COD was listed as follows: Part I: Myocardial infarct due to hypertensive and atherosclerotic cardiovascular disease; Part II: Obesity, diabetes mellitus, and stress associated with a physical altercation. The MOD was homicide. There has been no adjudication in this case.

Discussion

Cardiac deaths precipitated by physical and/or emotional stress occur frequently and are occasionally the subject of reports within the medical literature (2,3). When the stress is precipitated by criminal activity or other acts of aggression directed against the victim by another person, it is appropriate to consider these deaths as homicides. In order to appropriately certify such deaths, strict criteria, such as those set forth by Davis, should be satisfied (1). The Davis criteria are as follows:

1) The criminal act should be of such severity and have sufficient elements of intent to kill or maim, either in fact or statute, so as to lead logically to a charge of homicide in the event that physical injury had ensued.
2) The victim should have realized that the threat to personal safety was implicit. A logical corollary would be a feared threatening act against a loved one or friend.
3) The circumstances should be of such a nature as to be commonly accepted as highly emotional.
4) The collapse and death must occur during the emotional response period, even if the criminal act had already ceased.
5) The demonstration of an organic cardiac disease process of a type commonly associated with a predisposition to lethal cardiac arrhythmia is desirable (1).

While Davis' criteria specifically deal with situations where no physical injury occurs, a modified criteria may be applied to cases where physical contact and/or injury occurs. In the recently produced, National Association of Medical Examiners "A Guide for Manner of Death Classification," death resulting from fear or fright that is caused by verbal assault, threats of physical harm, or via acts of aggression intended to instill fear may be classified as homicide, as long as there is a close temporal relationship between the incident and the death (4).

The modified Davis criteria, as set-forth in the accompanying table, expands on Davis' criteria, and incorporates elements of the NAME guidelines, to include all such cases, whether or not physical contact occurred. In Davis' 4th criteria, the collapse *and death* are required to occur during the emotional response period (1). It is conceivable that, in certain cases, death may be delayed as a result of medical intervention. In such cases, it is important to rule-out a superceding, intervening event that would break the chain from collapse to death. In other words, should the victim of the collapse recover to their normal level of function, and then decompensate and die from their heart disease, it would be inappropriate to rule the death a homicide, related to the initial collapse. On the other hand, if the victim was relatively functional prior to the incident

TABLE 1—*Criteria for Homicide by Heart Attack (Modified Davis Criteria).*

The action of the perpetrator toward the victim should be of such severity and have sufficient elements of intent to frighten, injure or kill, either in fact or statute, so as to lead logically to a charge of homicide in the event that death resulted from physical injury.
The victim should have realized that the threat to personal safety was implicit. A logical corollary would be a feared threatening act against a loved one or friend.
The circumstances should be of such a nature as to be commonly accepted as highly emotional.
The collapse (and subsequent death, in most cases) must occur during the emotional response period, even if the criminal act had already ceased. In certain instances, death may be delayed, typically via medical intervention.
Autopsy should demonstrate an organic cardiac disease process of a type commonly associated with a predisposition to lethal cardiac arrhythmia. In the absence of a grossly or microscopically identifiable organic cardiac disease, the case may involve a functional cardiac disorder (such as a conduction system disorder) that has no anatomic correlation.

and collapse, but survived in the intensive care unit for several days prior to death, it would be appropriate to rule the death a homicide, so long as all of the other criteria are fulfilled. Defining the "emotional response period" (as discussed by Davis) or the "close temporal relationship" (as described in the NAME guidelines) is not as simple as providing a specific time limit following an event, since each instance is a unique event, and different people respond to stressful situations in different ways, and in varying amounts of time. Consequently, it is extremely important in these cases to review the timing of the collapse in relation to the stressful event. So long as the collapse occurs during the event, or shortly afterwards, during the time when the victim remains noticeably stressed by the situation, then it is appropriate to implicate the criminal activity as contributing to death.

Davis implies in his 5th criteria that autopsy-demonstrable organic cardiac disease, while desirable, is not necessary to rule such cases as homicides (1). In such circumstances, all of the other criteria must be met, and no other gross, microscopic, or toxicologic explanation for death should exist. The underlying predisposition to cardiac dysrhythmia is presumably a condition with no anatomic correlate, such as a conduction system defect. In all cases, it is desirable to obtain emergency medical heart rhythm recordings, as well as historical information concerning previously-recognized arrhythmias.

In each of the cases presented in this series, the modified Davis criteria were fulfilled. In most of the cases, physical contact definitely occurred, although in some, no injury was inflicted, and in none were the inflicted injuries considered life threatening in and of themselves. Case 3 is the best example in the series of a case where no definite physical contact occurred between the assailant and the victim. Although she had some minor injuries, none could be clearly associated with the criminal activity. In each case, the victims clearly feared for their safety, and the events were of a highly emotional nature. Also, in each case, the collapse and subsequent death occurred shortly after the initiating event, but it occurred during the emotionally volatile period of time immediately following the event. Finally, autopsy revealed significant underlying cardiac pathology in each victim, such that each was a prime candidate for experiencing a stress-induced cardiac dysrhythmia.

The five cases in this series provide various examples of how such deaths may be appropriately certified. The stressful event related to criminal activity can be described in various ways, on its own (in Part I or Part II of the death certificate), or with other factors (in Part I or Part II).

In cases of suspected "homicide by heart attack," complete autopsy, including histologic examination and toxicology, coupled with detailed reconstruction of the events with particular attention paid to their timing, is essential in order to appropriately certify such deaths. Applying established criteria (see accompanying table) for the proper certification of these deaths is encouraged. Appropriate certification may lead to successful prosecution of criminals. Failure to properly certify these deaths may result in failure to appropriately adjudicate such cases.

References

1. Davis JH. Can sudden cardiac death be murder? J Forensic Sci 1978;23(2):384–7. [PubMed]
2. Malik MAO. Emotional stress as a precipitating factor in sudden deaths due to coronary insufficiency. J Forensic Sci 1973;18(1):47–52. [PubMed]
3. Lecomte D, Fornes P, Nicolas G. Stressful events as a trigger of sudden death: a study of 43 medico-legal autopsy cases [comment]. Forensic Sci Int 1997;85(2):159–60. [PubMed]
4. Hanzlick R, Hunsaker JH, Davis GJ. A guide for manner of death classification. St. Louis, MO: National Association of Medical Examiners, 2001.

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