DETERMINATION OF THE CAUSE OF DEATH

By HOWARD C. HOPPS

DETERMINATION of the cause of death is always an important medicolegal problem. There is little difficulty in the case of a person who dies after an illness of several days, or longer, who has been attended by a physician. As a rule, analysis of the patient's symptoms, signs, and laboratory data has led to a reliable diagnosis. But sudden death of an unattended person is quite another matter. There is no account of symptoms nor is there the evidence of altered bodily function provided from physical examination during life. There is always much to be learned from an autopsy and such a study is desirable even though the patient's diagnosis was known during life. When a person dies unattended, and the diagnosis is not known, then autopsy is *essential* if there is to be satisfactory answer to the following questions:

1. Was death from unnatural cause and if so was it
   a) accidental?—in which case does it represent a hazard to public health?
   b) deliberate?—in which case was it
      1) self-inflicted, i.e. SUICIDE?
      2) inflicted by another person or persons, i.e. HOMICIDE?
2. In unnatural deaths can the circumstances in which death occurred be reconstructed?
3. In the case of homicide, can evidence be provided to determine the identity of the assailant and help to establish his guilt or to protect the unjustly accused?

Sometimes there are other difficult questions to be answered, too, questions such as, —what is the identity of the body or part thereof—but this does not directly concern the problem of cause of death.

Even with careful autopsy, skillfully performed, applying histologic, chemical, bacteriologic, and toxicologic methods, determination of cause of death in those who die suddenly is no easy matter.

An important and often very difficult problem is differential evaluation between the PRECIPITATING or IMMEDIATE cause of death and the PREDISPOSING or INITIATING cause of death. Many times it is not possible to find an absolute solution, and numerous conscientious, qualified, medical experts may argue violently with each other for days without seeming accomplishment. Even when the chain of circumstances is clear, proper evaluation of responsibility may seem to be very difficult—at least to the physician. In a case recently studied, an obese female was deliberately pushed off of the porch by her husband. She fell on her knees and broke both patellae (knee caps). Several days later these fractures were repaired surgically, at which time the patient appeared to be in good condition. A few days later she died rather suddenly. Autopsy revealed the cause of her death to be fat embolism (many tiny globules of fat had entered the blood stream, traveled to and become lodged in the capillaries of the lungs, obstructing the flow of blood through the lungs). This was in large measure an effect of the operative procedure and of course not the *direct* result of the injury.

Another case which posed a more difficult problem was that of the drunk who got into a fight with a "friend" and who suffered the usual moderate injuries which included a black eye, bruised cheek, and several bruises over his chest. This occurred in the winter time and, since the fight took place in the open, exposure to cold was a factor. The individual in question did not appear to have suffered serious injury although he lay where he was knocked down, on the cold sidewalk, for approximately 15 minutes. After this he got up, walked to his rooming house and went to bed. He didn't get up the next day, but this was not considered unusual by his landlady who said that when he came home drunk he often stayed in bed all the next day. However, on the following day he complained of not feeling well. A physician was called who found the patient to have severe pneumonia. He died as the result of pneumonia, on the third day after the fight. There are at least three predisposing factors to be considered here: 1) acute alcoholism; 2) exposure to cold, in large measure an indirect effect of the fight; and 3) traumatic injury, as a direct effect of the fight.

Cases of this sort are common. In a large proportion of human deaths, the precipitating cause of death is quite different from the major disease affecting the patient. Consider deaths from cancer, for instance; the immediate or predisposing cause of death is most often pneumonia, or hemorrhage, or uremia, or pulmonary embolism, or any of dozens of other conditions which are not cancer *per se*.

Let's turn from problems of *evaluating several* possible causes of death in a single individual to the problem of *finding one* cause of death in a given case. This may be difficult indeed and sometimes the most careful and skilled studies, by experts, will fail to disclose the cause of death. I have divided problem cases of this sort into three categories. First, *those causes of death which produce but slight structural changes in the body and which may depend upon laboratory studies for solution of the problem.* One example is asphyxia which, in some instances, may be impossible to recognize. A case of this sort occurred when a frozen-food locker employee took home with him a dozen bottles of beer and fifty pounds of dry ice one very hot Saturday afternoon. He closed all the windows and doors to his room so that he would enjoy the cool comfort of air conditioning while he drank his beer. As the carbon dioxide was released from the "dry ice," it gradually replaced the oxygen in the room and produced death by asphyxia. Then there are various poisons which may kill and leave very little morphologic evidence, and these fall in this same category. Ordinary ethyl alcohol is one of the most important of such poisons and is responsible for many deaths each year.

So-called neurogenic mechanisms may cause death from sudden cessation of heart action and this can result from rather minor trauma, e.g. entrance of a hypodermic needle in the pleural cavity. There is good evidence that even severe fright may initiate such a mechanism.

Many causes of death which may be evident upon careful examination by the expert are almost certain to be overlooked if examination is casual or inexpert. Recent

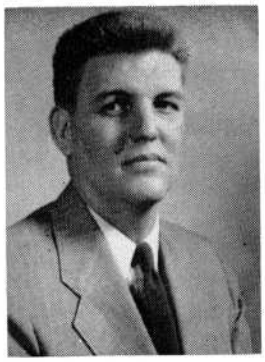
occlusion of a coronary artery falls into this category, as does also thrombotic pulmonary embolism—that is the condition which results when a blood clot which has formed in a large vein, most often a vein of the leg, becomes dislodged and travels through the venous system to the heart and through it, to occlude the major artery which supplies the lung. It would seem that such a condition would be very obvious, but it is not. In the course of autopsy, when the heart is severed from the lungs, such a thrombus may drop out amidst much blood and escape notice. Even if it is noticed, it may be misinterpreted as a clot that formed after death. The problem is much more difficult if the body has been embalmed before autopsy.

Second, *those causes of death which tend to be masked by subsequent changes, e.g. postmortem degeneration, burning or mutilation.* Often fire is used in attempt to cover up homicide. This subterfuge is usually easy to detect simply by determining the carbon monoxide content of the blood. It is virtually impossible for a person to die as a result of conflagration without inhaling enough carbon monoxide to produce a high concentration of this substance in the blood. Hence a body which is badly burned will be found to have a high blood carbon monoxide content if the individual was alive during the fire.

Third, *those causes of death which are overshadowed by striking changes which seem to be more important than they actually are.* Some time ago we studied the case of a young man who had apparently been thrown from a moving automobile and who was quite battered as a result. None of his injuries appeared sufficient to explain his death. Furthermore, upon microscopic analysis, the patient's tissues gave no evidence of reaction to his numerous injuries, which indicated that he was dead at the time when he received them. Blood chemical determinations revealed considerable alcohol and a level of carbon monoxide well within the lethal range. It was learned subsequently that he was one of a party of two couples who had been drinking heavily in the course of a petting party carried on in a car. This was in midwinter. Though the car was parked, the motor was running to provide warmth. The patient had become sleepy and had lain down on the floor of the back seat and covered himself with a blanket to keep warm. Later, as the group was driving along, they tried to rouse him. Finding him to be dead, they simply opened the door, pushed him out, and drove on. The car was an old one; the muffler had numerous leaks, and there were open cracks in the floor board.

Many other examples could be given to illustrate difficulties in determining the cause of death, but perhaps more important is a consideration of how this is to be accomplished in our state. In many states, as in Oklahoma, the responsibility for medicolegal examination rests not with specially trained personnel, but with a Justice of the Peace whose training and experience is usually in law. This system is the relic of a bygone age, dating back to the early history of England when the coroner (Crown's man—representative of the King) served to protect the King's interest in the recovery of buried treasure, in the matter of game poaching, fines levied and collected for miscellaneous crimes including murder, in collecting property in the case of suicide, etc. Quoting from Gradwohl's famous essay on the Office of Coroner: "Thus we have at present an officer known as a coroner, created by statute or constitution, a quasi-magistrate, a conservator of the peace throughout his county, holding inquests in sudden deaths, issuing subpoenas, administering oaths to jurors, acting as marshal or sheriff when such officers cannot act, conducting postmortem examinations himself or designating some other person to do so, making chemical and microscopic examinations of parts of the bodies of deceased individuals, or causing someone else equally skilled or unskilled, as the case may be, to do the same; in short, performing the duties of judge, advocate, physician, pathologist, bacteriologist, toxicologist! The system is absurd on the face of it. Since the time of Erasmus, we have had no pantologists; therefore it is easy to understand that the incumbent of this office is never qualified to perform all the duties for which he is elected by the people and charged by the constitution of the state to carry out."

In addition to those many cases concerned with criminal acts, there are numerous cases of civil liability in which accurate determination of the cause of death is important. These, too, could be more efficiently and much more judiciously handled with a properly functioning medical examiners system. Under the present conditions in Oklahoma, a medicolegal autopsy to determine the cause and manner of death is a costly procedure, often difficult to arrange, and often quite delayed in its performance. As a result, this special service is used to very limited extent, principally by corporations and insurance companies in cases where it will be of primary benefit to them. Furthermore, the evidence so procured may be obtained and evaluated in somewhat prejudiced fashion. Every individual, regardless of his legal knowledge and financial status, should have opportunity to secure the complex medical evidence and the objective unprejudiced expert medical analysis which would come about as a matter of course with a proper medical examiners system. And so I conclude my discussion of problems in determining the cause of death with a suggestion as to the way that these problems should be met.



ABOUT THE AUTHOR

Dr. Hopps graduated from the University of Oklahoma School of Medicine in 1937. *He was a graduate student at the University of Chicago,* 1939-41, *and was Assistant Professor of Pathology at Chicago when he joined the faculty of the School of Medicine as Professor of Pathology in* 1944. *This paper is a summary of the talk which Dr. Hopps made at the Medicolegal Institute, held July* 8, 1954, *in Norman.*

* * * * *

TIME FOR A CHANGE

"When I first arrived in America Mr. John Quincy Adams was President, and it was impossible to doubt, even from the statement of his enemies, that he was every way calculated to do honour to the office. All I ever heard against him was, that 'he was too much of a gentleman'; but a new candidate must be set up, and Mr. Adams was out-voted for no other reason, that I could learn, but because it was 'best to change'."

Frances Trollope *Domestic Manners of the Americans* (1832). Ed. by Donald Smalley. N. Y., Alfred A. Knopf. 1949, p. 205.