

1946

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### Recommended Citation

Milton Helpern, The Postmortem Examination in Cases of Suspected Homicide, 36 J. Crim. L. & Criminology 485 (1945-1946)

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# THE POSTMORTEM EXAMINATION IN CASES OF SUSPECTED HOMICIDE

Milton Helpern

A Deputy Chief Medical Examiner of New York City, a forensic pathologist of national note, has undertaken to explain how the specialized Medical Examiner conducts the investigation in a case of sudden death. In his functional account the author describes the chronological steps to be taken if valuable, and oftentimes, irretrievable evidence is not to be lost. His chronicle is a forceful argument for the need of forensic pathologists, and a model Medical Examiner's Law in the forty-two states which still cling to the antiquated Coroner's Office as the official means of investigating cases of suspicious or accidental death.

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The postmortem examination in cases of suspected homicide represents one of the most important applications of medicolegal science to the needs of the community. Its proper performance is of paramount concern to those agencies of government responsible for law enforcement and the effective administration of justice. In view of the desire of the medical and legal professions, increasingly evident in recent years, to improve the standards and quality of medicolegal practice throughout the country, it was considered timely and appropriate to review again the subject of the postmortem examination in cases of homicide, and to point out what is expected in the way of performance of the person entrusted with it. In a paper published several years ago, the author described and discussed the routine procedures necessary in such examinations.<sup>1</sup>

## *Inadequacies of Medicolegal Agencies and of the Statutes Pertaining to Them*

At present, in most sections of the country, the postmortem investigation of homicide is inexpertly and inadequately carried out. The chief reasons for this unsatisfactory performance are to be found in the faulty organization of official medicolegal agencies responsible for such investigation and in the lack of uniformity of statute laws which have established such agencies, and defined and limited their functions. The deficiencies inherent in government medicolegal departments have discouraged able physicians from specializing in legal medicine, thus permitting the practice of such an important

<sup>1</sup> Helpern, M.: Postmortem Examination in Homicides, *Am. J. Med. Jurisp.* 1: 165, 1938.

specialty to fall into the hands of untrained and unqualified medical persons. Legal medicine, as a specialized branch of medical science, has not kept pace with the progress made during recent years by the other specialties. There are only a few places in the country where it is practiced by trained specialists, and it is therefore not surprising that the postmortem examination in homicide cases is performed haphazardly and unsatisfactorily by untrained and inexperienced physicians. As long as the inadequate medicolegal systems now in force throughout the country are permitted to continue, the unsuspected homicide will escape detection and the obvious one will be inexpertly and improperly handled medically.

An examination of the statute laws pertaining to coroners and to medical examiners in the United States<sup>2</sup> reveals that, in most jurisdictions where the office of coroner exists, and also in some of the comparatively few localities where there is a medical examiner's system, the statutes provide only for the investigation of obviously violent and suspicious deaths. There does not appear to be any recognition of or provision for the important fact, so well known in medicolegal experience, that in many violent deaths there are not any externally obvious or suspicious signs of violence on the body of the deceased. Since the statutes in most instances do not provide for the routine official investigation of such cases, certain unsuspected homicidal and other types of violent death, not outwardly obvious or suspicious, necessarily escape detection.

In two States, namely Massachusetts and Rhode Island, where there is a medical examiner's system, permission for a medicolegal autopsy, which the medical examiner deems necessary, must first be obtained from some other authority, usually the prosecuting attorney, who is in a position to refuse such permission or to question the necessity for the autopsy. In those jurisdictions where there is a coroner, that official, even though not a physician, can decide whether or not a post-mortem examination is necessary.

*Desirable Features of Medical Examiner's System in New York City, Essex County (New Jersey), Nassau County (New York) and the State of Maryland*

The coroner's office in New York City was abolished, and a medical examiner's office established in its place, by an act of the State Legislature passed in 1915.<sup>3</sup> The law went into effect in 1918. A similar medical examiner's system was instituted in Essex County, New Jersey, which includes the city of

<sup>2</sup> Weinmann, G. H.: *Compendium of the Statute Law of Coroners and Medical Examiners in the United States*, National Research Council. Bull. No. 83, Washington, 1931.

<sup>3</sup> Laws of New York 1915, ch. 284.

Newark, in 1927, in Nassau County, New York, in 1938, and in the entire State of Maryland in 1939, by statutes almost identical with that which created the medical examiner's office in New York City. In these jurisdictions, the medical examiner's office functions entirely independently of other official agencies, and the responsibility for the entire medicolegal investigation rests with a trained medical personnel. The investigations of the medical examiners are in no way controlled or hindered by any other agency. In these offices, the law<sup>4</sup>

<sup>4</sup> New York City Charter 1901, sections 1570 and 1571, as added by L. 1915, ch. 284, section 2, relate to the Office of Chief Medical Examiner:

"Section 1570: Organization of Office, Officers and Employees.—There shall be established the Office of the Chief Medical Examiner of the City of New York. The head of the Office shall be called 'Chief Medical Examiner.' He shall be appointed by the Mayor from the Classified Service and be a doctor of medicine, and a skilled pathologist and microscopist.

"The Mayor may remove such officer upon stating in writing his reasons therefor, to be filed in the office of the Municipal Civil Service Commission and served upon such officer, and allowing him an opportunity of making a public explanation. The Chief Medical Examiner may appoint and remove such deputies, assistant medical examiners, scientific experts, officers and employees as may be provided for pursuant to law. Such deputy medical examiners and assistant medical examiners, as may be appointed, shall possess qualifications similar to those required in the appointment of the Chief Medical Examiner. The office shall be kept open every day in the year, including Sundays and holidays, with a clerk in constant attendance at all times during the day and night."

"Section 1571: Violent and Suspicious Deaths; Procedure.—When, in the City of New York, any person shall die from criminal violence, or by a casualty, or by suicide, or suddenly when in apparent health, or when unattended by a physician, or in prison, or in any suspicious or unusual manner, the officer in charge of the station house in the police precinct in which such person died shall immediately notify the Office of the Chief Medical Examiner of the known facts concerning the time, place, manner and circumstances of such death. Immediately upon receipt of such notification the chief medical examiner, or a deputy or assistant medical examiner, shall go to the dead body and take charge of the same. Such examiner shall fully investigate the essential facts concerning the circumstances of the death, taking the names and addresses of as many witnesses thereto as it may be practicable to obtain and, before leaving the premises, shall reduce all such facts to writing and file the same in his office. The police officer so detailed shall, in the absence of the next of kin of deceased person, take possession of all property of value found on such person, make an exact inventory thereof in his report, and deliver such property to the police department, which shall surrender the same to the person entitled to its custody or possession. Such examiner shall take possession of any portable objects which, in his opinion, may be useful in establishing the cause of death, and deliver them to the police department."

"Section 1571 a: Autopsies; Findings.—If the cause of such death shall be established beyond a reasonable doubt, the medical examiner in charge shall so report to his office. If, however, in the opinion of such medical examiner an autopsy is necessary, the same shall be performed by a medical examiner. A detailed description of the findings written during the progress of such autopsy and the conclusions drawn therefrom shall thereupon be filed in his office."

"Section 1571 b: Report of Deaths, Removal of Bodies.—It shall be the duty of any citizen who may become aware of the death of any such person to report such death forthwith to the Office of the Chief Medical Examiner and to a police officer, who shall forthwith notify the officer in charge of the station house in the police precinct in which such person died. Any person who shall wilfully neglect or refuse to report such death or who, without written order from the medical examiner shall wilfully touch, remove, or disturb the body of any such person, or wilfully touch, remove, or disturb the clothing, or any article upon or near such body, shall be guilty of a misdemeanor."

requires that all sudden, suspicious, unusual, and violent deaths, and deaths where there has not been any physician in attendance, must be reported to the medical examiner's office for investigation by a medical examiner, no matter how seemingly unsuspecting the death may be. It is only by the routine investigation of this great variety of deaths, that unsuspected homicides are discovered.

Other medicolegal systems concerned only with obviously violent and suspicious deaths permit certain unsuspected, not obviously violent homicidal cases to pass undetected. This is a fundamental defect in the medicolegal systems of most jurisdictions in the United States. This defect cannot be corrected merely by improving the quality and training of the medical personnel, but it will continue until the statutes are altered to require the prompt investigation, from the very beginning, by trained medical examiners, of all sudden and unusual, as well as suspicious and violent deaths.

Lay persons, whether private citizens, police officers, prosecuting attorneys, coroners, or physicians not trained to carry out medicolegal investigations, cannot decide the nature of sudden death, or of death where there has not been any medical attention, and they should not be burdened with that responsibility. Their opinion of any such death should not preclude an investigation by a medical examiner with the authority to decide upon the advisability and necessity of autopsy, and to perform such autopsy. The practice in most communities of referring only the obviously violent and suspicious cases to the medicolegal department for investigation is responsible for the too frequent embalming and burial of bodies, necessitating their subsequent exhumation for autopsy, because violence not being apparent was not suspected at the time of death. It follows that a certain number of cases of unsuspected

"Section 1571 c: Records.—It shall be the duty of the Office of the Chief Medical Examiner to keep full and complete records. Such records shall be kept in the office, properly indexed, stating the name, if known, of every such person, the place where the body was found and the date of death. To the record of each case shall be attached the original report of the medical examiner and the detailed findings of the autopsy, if any. The office shall promptly deliver to the appropriate district attorney copies of all records relating to every death as to which there is, in the judgment of the medical examiner in charge, any indication of criminality. All other records shall be open to public inspection as provided in section fifteen hundred and forty-five. The appropriate district attorney and the police commissioner of the city may require from such office such further records, and such daily information, as they may deem necessary."

"Section 1571 d: Oaths and Affidavits.—The Chief Medical Examiner, and all deputy or assistant medical examiners, may administer oaths and take affidavits, proofs and examinations as to any matter within the jurisdiction of the office."

See also revised New York City Charter 1938, ch. 39, sections 874 to 879. L. New Jersey 1927, ch. 106 and L. New York 1936, ch. 879 pertain to the Office of Chief Medical Examiner in Essex County and Nassau County, respectively; also L. Maryland 1939, ch. 369.

homicide remain buried and are never discovered, and it is not an exaggeration to say that a subtle murder may go uninvestigated and undiscovered.

In New York City, of a total of about 75,000 deaths each year, from 15,000 to 16,000, or roughly 20 per cent, are referred to the Office of the Chief Medical Examiner for routine investigation<sup>5</sup> because of the medical examiner's law. Of the referred cases, about 5,000 or one-third are violent deaths, and of these, about 350 are homicidal. Thus, homicides constitute approximately 2 per cent of the total number of deaths investigated each year.

A number of violent deaths, including some which are homicidal, are detected each year only by careful routine postmortem investigation, the cases having first been reported to the Medical Examiner's Office as non-suspicious. Such cases would not have been investigated and autopsied, and would have escaped detection in those jurisdictions where only obviously violent and suspicious deaths are reported to the authorities. If unsuspected violent deaths and homicides are to be detected, all sudden, unexpected and unusual deaths must be investigated routinely by an official medicolegal agency.

#### *Qualifications of Physician Performing Examination*

In every homicide and in every death where there is the slightest suspicion of homicide, a postmortem examination including a complete and accurate autopsy should be performed on the body of the deceased by a qualified and authorized physician. The person entrusted with this examination should be a pathologist<sup>6</sup> trained in that branch of legal medicine called *forensic pathology* and working in the official capacity of a medical examiner or coroner's physician. There should be adequate facilities at his disposal for the performance of an autopsy and for any other investigation along histological,<sup>7</sup>

<sup>5</sup> Annual Statistical Reports of the Chief Medical Examiner of the City of New York.

<sup>6</sup> *Pathologist*: A medical man who has specialized in the study of abnormal changes in bodily tissues or functions caused by diseases, toxins or poisons, and by any other species of traumatic stimuli. It is an interesting fact that most diseases or injuries produce a characteristic change in the gross or microscopic appearance of particular tissues, depending upon the organ primarily affected. By systematic study, which may also require the taking at postmortem examination small samples of tissue from the vital organs for the making of infinitesimally thin sections to be stained, mounted on slides and studied microscopically, the cause of death can usually be fixed. A *forensic pathologist* is a pathologist who has been specially trained in all the special techniques developed in recent years for the purpose of gaining as much evidence as possible about how, when, where and why the person in question came to his death. He is especially concerned with the problem of sudden, unexpected and violent death, and in connection with the last, whether violence was suicidal, accidental, homicidal or of indeterminate character.

<sup>7</sup> *Histological*: The study of the minute structure and composition of tissues by means of the magnification afforded by the microscope. As

chemical, bacteriological and serological<sup>8</sup> lines which are indicated by the nature of the case. The fallacious idea exists in the minds of many of the laity and some of the medical profession that any physician, because of eminent qualification in some other branch of medicine, or any pathologist without medicolegal training, is qualified to carry out this special type of postmortem investigation.

*Careless Performance and Misinterpretation of Autopsy*

In many cases of homicide, the inadequate postmortem examination by an incompetent or unqualified physician has been followed by a grossly erroneous interpretation of the findings. Many homicidal deaths have escaped detection because of the failure on the part of an inexperienced and careless investigator to recognize the more subtle anatomic evidences of criminal violence.

In obvious cases of homicide, in which only superficial postmortem examinations were thought necessary, the lack of detailed medical information has seriously handicapped the work of law-enforcement agencies. Thus, the police have been deprived of valuable clues which the complete postmortem examination would have revealed, and they have been hampered in their attempts to solve the crime. In other instances where a perpetrator has been apprehended and brought to trial, the prosecuting attorney has found himself at a serious disadvantage because of the lack of complete medical evidence necessary for the proper establishment of the corpus delicti.

There have also been deaths from purely natural causes which because of the circumstances were misinterpreted and attributed to homicidal violence, with the subsequent prosecution and conviction of an accused innocent person for a non-existent crime. The failure to understand the anatomic findings in a postmortem examination, and their misinterpretation, have not infrequently resulted in flagrant miscarriages of justice. Thus, artifacts,<sup>9</sup> some produced by the embalmer, also normal findings, natural disease processes and accidental and suicidal injuries have been erroneously considered evidence of homicidal violence.

The writer is aware of a case in which it was alleged that the deceased died after having been struck on the head with a slip-  
mentioned in the preceding footnote, the tissue to be studied is first specially prepared and stained to make the architectural features clearly visible.

<sup>8</sup> *Serological*: Pertaining to the study of blood serum or other body fluids from which among other things, the individual's blood group may be determined.

<sup>9</sup> *Artifact*: A tissue that has been mechanically altered after death from its natural state. The result may be to create an appearance macroscopically or microscopically which will lead the unwary or uninformed to think he has found evidence of disease or injury produced before death.

per. After an incomplete autopsy limited to the head of the embalmed body, a medical opinion was arrived at and testified to that death had resulted from the blow to the head. The brief autopsy report did not disclose any pathologic changes in the skull or brain attributable to trauma.<sup>10</sup> The cause of death was certainly not determined since the body was not opened nor was any chemical examination made of the brain for the presence of alcohol. This chemical test was precluded because the body had been embalmed before the incomplete autopsy was performed. Nevertheless, the accused person was convicted of homicide which was not proved medically.

#### *Postmortem Examination Commences at Scene*

The scope of the postmortem examination in a frank or suspected case of homicide extends beyond the mere determination of the cause of death and the means by which it was brought about. In homicidal cases where the deceased is found dead, the postmortem examination properly commences with a careful study by the medical examiner of the undisturbed dead body at the place where it was discovered. This scene may or may not be the place where death occurred and it is not necessarily the place where the violence which caused the death was inflicted.

Thus, the undisturbed dead body of a woman was found on the sidewalk at 2 o'clock in the morning. The circumstances under which it was found and the examination of the body revealed that it had been dead for some time and moved after death. Rigor mortis had disappeared and there were post mortem lividities on the front of the body as well as on the back. Death had been caused by strangulation. The solution of this case is described on pages 518-19, under the topical heading of Routine Blood Grouping Determinations.

In another case, the deceased was stabbed while on the street and then ran across the roadway, up two flights of stairs into his apartment where he locked himself in the bathroom and died. When examined by the police and the medical examiner, the undisturbed dead body was found seated on the toilet. The cause of death was a stabwound through the heart.

It is extremely important to learn the circumstances surrounding the death. While it is true that in the majority of homicides, even a superficial postmortem examination will establish the homicidal nature of the death, there are certain types of homicide in which the evidences of violence are super-

<sup>10</sup> *Trauma*: A wound or injury.



ficially lacking and it is only the careful study of the undisturbed body at the scene and the circumstances surrounding the case, which arouse suspicion that the death may be homicidal. Such a body removed from the scene may show nothing externally to suggest a violent death and thus might escape the close scrutiny and careful necropsy which would certainly be indicated if it were examined in its original surroundings by a trained medical observer. The practice required by law in the City of New York of having a medical examiner visit all dead bodies at the places where they are found has minimized the possibility of the unsuspected homicide passing unnoticed.

The types of homicide which may readily escape suspicion and detection if the scenes are not visited include deaths from manual and ligature strangulation, smothering, carbon monoxide poisoning, certain deaths caused by concealed stab wounds and bullet wounds and also some deaths from criminal abortion.

There are many cases in which a complete and careful necropsy indicates that death resulted from violence, but cannot establish that the death was necessarily by homicidal means. The necropsy findings in certain cases of drowning, carbon monoxide and other types of poisoning, blunt force injuries, especially those resulting from falls from a height, may be consistent with homicidal, suicidal or accidental death. Only a careful investigation of the circumstances surrounding the death will enable the medical examiner to classify the case correctly. The classification of a certain number of violent deaths must remain undetermined. This is especially true of drowning cases, in which the bodies are recovered after long periods of submersion, and cases of poisoning in which the clinical course was of long duration and the diagnosis unrecognized during life.

Experience with the many ordinary and bizarre forms of violent death is of the greatest value to the medical examiner in helping him decide the homicidal, suicidal or accidental nature of any given case. The experienced observer is quick to recognize the suicide which has been tampered with in the attempt to create the impression of a homicide, usually for purposes of collecting insurance, or the homicidal case which has been altered to make it resemble a suicidal, accidental or natural death.

#### *Examples*

Many examples can be given to illustrate the importance of the examination of the body at the scene by the medical exam-

iner in helping to determine the homicidal, suicidal or accidental nature of a violent death.<sup>11</sup>

The body of a young negress was discovered at the foot of a long flight of stairs, lying on its back, the head resting on the first step, the legs sharply flexed under the thighs. The handle and part of the blade of a new long single-bladed jack knife were plainly visible protruding from a fatal stab wound of the chest. At necropsy,<sup>12</sup> the point of the knife was found to have penetrated an intercostal space,<sup>13</sup> the pericardium<sup>14</sup> and the pulmonary artery,<sup>15</sup> death having resulted from an intrapericardial hemorrhage.<sup>16</sup>

The unusual position of the body and the weapon at first aroused the suspicion of homicide but investigation at the scene disclosed that the deceased had purchased the knife on the previous day, and that a short time before her death, had visited her estranged husband who was living in the apartment at the top of the stairs. After an unsuccessful attempt to effect a reconciliation, the deceased left the apartment in a depressed mental state mumbling something as she passed through the door. On the landing outside the door, she was seen to slump to her knees. The witness who saw this ran back into the apartment for help but when she returned to the landing, the deceased had already staggered or slid down the full length of the flight of steps to the place where her body was discovered. Her purse and several drops of blood were found on the tiled floor of the upper landing near the apartment door. The necropsy revealed that the track of the stab wound was a short one and could readily have been self-inflicted with the use of slight

<sup>11</sup> Photographs of the undisturbed dead body at the scene in the first two of the following examples were reproduced in Helpers, M. *op. cit. supra*, f.n.1, p. 167.

<sup>12</sup> *Necropsy*: Same as autopsy; a systematic external and internal examination of the dead body including a study of all organs and tissues. Its purpose is to determine what is abnormal and what is normal, and the abnormalities (lesions) which are the result of disease (natural causes) and those which are the result of violence including poison, also those abnormalities which have caused death.

<sup>13</sup> *Intercostal space*: The space between two ribs.

<sup>14</sup> *Pericardium*: The membranous sac which contains the heart. The smooth inner layer is continuous with the smooth outer surface of the heart or the epicardium. The outer layer of the pericardial sac is made up of fibrous tissue. The heart is suspended in the pericardial sac and the smooth opposing surfaces glide smoothly over each other.

<sup>15</sup> *Pulmonary artery*: The large artery leading from the right ventricle of the heart to the lungs through which venous blood is carried to the lungs for restoration of its oxygen supply.

<sup>16</sup> *Intrapericardial hemorrhage*: Escape of blood into the pericardial cavity or space within the pericardial sac which normally is occupied by the beating heart. The pressure of this blood constricts the heart and prevents it from beating properly. The heart is unable to fill with blood. This condition of *cardiac tamponade* will cause death rapidly unless some circumstance prevents the intrapericardial pressure from being built up. When there is a large stab wound or tear in the pericardium, bleeding takes place through it into the chest and cardiac tamponade does not occur. Such cases die from exsanguination into the chest cavity. Surgical intervention if prompt may occasionally stop hemorrhage.

force. Needless to say, the husband and others in the apartment were subjected to a thorough questioning, and it was learned from them and from other reliable sources that the deceased had been despondent and had threatened suicide.

In another case a suicidal shooting at first had aroused suspicion of homicide. The body of the deceased scantily clad was found lying on the bed. There was a contact bullet wound of entrance above the left breast, and a corresponding exit wound on the back of the left side of the chest. The bullet was found embedded in the wall behind the bed. A revolver was found near the edge of the bed under the right hand of the deceased, but it had evidently been tampered with after the shooting, by someone who removed the discharged cartridge shell from the cylinder chamber and substituted for it a single, undischarged cartridge. There was reason to believe that this had been done by the common-law husband who owned the pistol and who ignorantly believed that the substitution would remove any suspicion that he might have shot the deceased. Fortunately, the case was clarified by a suicide note in the deceased's handwriting.

In another case<sup>17</sup> investigated by Dr. Morgan Vance, the homicidal character of a smothering was suggested to him by the position of the undisturbed dead body of a young woman sprawled out in a prone position on the bed with the face buried in a pillow. There were no external or other evidences of injury, only the signs of asphyxia (suffocation). The male companion of the victim was apprehended and confessed that he smothered her while trying to stifle her screams. If the medical examiner who performed the autopsy had not first examined the body at the scene the homicidal character of death could not have been established nor would it have been suggested from the autopsy alone.

#### *Procedure in Suspicious Deaths*

When a dead body is discovered in New York City, and the indications definitely point to homicide or are suspicious of homicide, the police who are the first in authority to arrive at the scene, immediately notify the Office of the Chief Medical Examiner of the death and a medical examiner is promptly dispatched to the scene of the death. Such cases take precedence over non-suspicious deaths. In regard to the latter, it has already been emphasized that an apparently non-suspicious death may be homicidal. It therefore behooves the medical examiner to be on the alert in the investigation of every case if the unsuspected homicide is to be discovered.

<sup>17</sup> For the photograph of the undisturbed dead body at the scene in this case, see Gonzales, T. A.; Vance, M. and Helpern, M.: *Legal Medicine and Toxicology*, New York, D. Appleton-Century Co., 1940, p. 277.

There must be no delay in the visit of the medical examiner to the scene, no matter what time of the day or night the case is discovered. The body and its surroundings may not be disturbed until after the medical examiner has arrived and completed his preliminary investigation.

The preliminary examination by the medical examiner is carried out in cooperation with members of the Police Department including detectives especially trained for investigation of homicidal cases. In addition to the experience which these detectives receive in the field, handling the many cases assigned to them, the New York City Police Academy for many years has conducted systematic courses for detectives in which they are taught the essentials of the medical indications of crime. These courses are given by members of the medical staff of the Office of the Chief Medical Examiner who utilize for the purpose a very extensive collection of lantern slides, illustrating actual cases of the ordinary and extraordinary types of homicidal, suicidal and accidental death. Significant details revealed by the study of the dead body at the scene are especially emphasized in these courses. Needless to say, this teaching has been enthusiastically received and has proved most valuable in bringing about an intelligent and sympathetic cooperation between members of the Police Department and the medical examiners in their investigations of violent deaths.

#### *Independent Character of Medical Examiner's Investigation*

The medical examiner conducts his investigation independently of other law enforcement agencies. His functions do not fall under the jurisdiction of the police authorities or prosecuting agencies. Nevertheless, he cooperates fully with these other departments, informing them of the probable nature of the case, offering useful suggestions and supplying them with whatever information is revealed by his examination at the scene and by the subsequent necropsy. He should be entirely unbiased in his study of any case and must not venture any opinion which he cannot justify by the findings in his examination. He must bear in mind that he is an investigator and not a prosecutor and if his investigation clearly discloses that there are no medical indications of crime in a suspicious or a violent death, or that the findings are not necessarily indicative of homicidal violence, he must be prepared to give such an opinion. If the medical findings definitely point to criminality, the examiner must be firm in his opinion even though the outward appearance of the case at first did not suggest such a possibility.

#### *Steps in Investigation At Scene*

Upon his arrival at the scene of a suspicious or frankly homicidal death, the medical examiner records the time and place

of his arrival and examination, and inquires into the circumstances under which the body was found. He determines how, when and by whom the body was first discovered and if possible by whom and when the deceased was last seen alive. He obtains the name and shield number of the first police officer, usually a patrolman, to arrive at the scene and a statement from him as to the time he was notified about the finding of the body, the name of the person who notified him and the time he first saw the body.

The medical examiner also inquires of the patrolman, or of the first person who found the body, as to its original position and whether or not the body had been moved from its original position after it was found. Such might be the case if the deceased was still alive or thought to have been alive when first discovered. Any attempts at resuscitation necessitating movement of the body, disarrangement of the clothing, the application of tourniquets, bandages or towels to bleeding wounds, should be recorded, also the name of any ambulance surgeon who might have treated or moved the deceased or pronounced him dead.

In cases where attempts at resuscitation have been made, the medical examiner should instruct the patrolman and the ambulance surgeon to record promptly and fully the original condition and position of the deceased when first seen by them. Frequently hospital surgeons called upon to treat wounded persons, have neglected to describe accurately the patient's wounds, omitting mention of their exact nature, number, size and location.

In many homicidal cases, not immediately fatal, the descriptions of the wounds in the hospital records are inadequate. It must be remembered that the original appearance of a fatal wound may be obliterated by a surgical operation, performed in the attempt to save the patient's life. Should the patient die later, the medical examiner may be unable to recognize and describe the characteristics of the original wound. This information can only be furnished by the surgeon who first saw and treated the patient. It is therefore important that every surgeon should be familiar with the detailed characteristics of penetrating and non-penetrating wounds, which might result from homicidal violence. There is a regrettable lack of interest and knowledge among many practicing physicians and surgeons concerning the interpretation and recognition of the various types of bullet and stab wounds, lacerated wounds and blunt-force injuries which they may be called upon to treat, and about which they may be called later to testify in a criminal action. Through carelessness or ignorance, many important details of wounds are overlooked, details which may have

considerable medicolegal importance in subsequent criminal proceedings.

#### *Identification of Body by Police Officer*

The body of the deceased with its clothing is identified to the medical examiner by the first patrolman who saw it. If such identification is not made at the scene, the police officer must report to the mortuary and there identify the body and clothing to the medical examiner. The identification by the police officer is necessary in every homicidal case and especially in those cases in which the deceased did not die immediately but survived for a variable period of time in a hospital, for in such instances the medical examiner would not have seen the deceased at the scene of the crime. The police identification is an indispensable link in the chain of evidence necessary to connect the dead body, autopsied by the medical examiner, with the particular crime of which the perpetrator is accused.

The time and place of the police identification must be carefully recorded. It is not sufficient for the patrolman to simply come to the morgue and look at the dead body; he must identify it to the medical examiner or to some other available and responsible person who in turn will see or has seen the body in the presence of the medical examiner handling the case. Whenever possible, it is also advisable to have the identification made to any other medical examiners present at the autopsy. This identification to another medical examiner will enable him to testify to the autopsy findings and cause of death in the event of the enforced absence from the trial of the medical examiner who performed the autopsy.

#### *Photographing the Scene*

Prior to the handling of the body and before disturbing any of the surroundings at the scene, as many photographs should be taken as are necessary to show all the details. These photographs are best taken by a Police Department photographer equipped with a view camera having a wide-angle lens and capable of taking a fairly large size, usually an 8x10 inch, picture. Photo-flash bulbs are used as a source of illumination, permitting the photographs to be taken in any kind of light. The medical examiner may also take photographs and should make a diagrammatic sketch of the scene, indicating the size and shape of the room, the arrangement of the furniture, doors, and windows and the position and location of the body, blood stains, weapons, discharged bullets and cartridge shells, also any other noteworthy findings.<sup>18</sup>

<sup>18</sup> See, in this symposium series, the contribution by Scott, Charles C.: *Medicolegal Photography*.

### Signs of Death

He then proceeds to an examination of the body, paying particular attention to the signs of death.<sup>19</sup> He carefully notes and records the extent of rigor mortis,<sup>20</sup> the degree of cooling of the body and in this connection the amount of clothing or covering on the body and the temperature of the room. The color, location and amount of the postmortem suffusions or lividity<sup>21</sup> and the presence of any other postmortem changes, such as putrefaction,<sup>22</sup> mummification,<sup>23</sup> adipocere formation,<sup>24</sup> and destructive marks on the body, caused by insects, such as ants, and blowfly larvae, or by rodents and larger animals, should be noted; also any attempts at dismemberment and disposal of the body. Putrefactive changes and postmortem mutilations by animals should not be confused with antemortem wounds.

The careful study of the signs of death enables the trained investigator to form some estimate of the probable postmortem interval. Such estimates are the more accurate, the shorter the interval. At best, only a guarded opinion should be given concerning the postmortem interval, because the onset, progress and duration of rigor mortis and the rate of cooling of the dead body may show great variation, being dependent upon many factors.

The position of the body with reference to the location and

<sup>19</sup> For a more detailed description and discussion of the signs of death, see Gonzales, Vance and Helpern, *id.* pp. 49 to 65.

Glaister, J.: *Medical Jurisprudence and Toxicology*, ed. 7, Baltimore, Williams and Wilkins Co., 1942.

Herzog, A. W.: *Medical Jurisprudence*, Indianapolis, The Bobbs-Merrill Co., 1931.

Smith, Sydney: *Forensic Medicine*, ed. 4, London, J. & A. Churchill, Ltd., 1934.

Smith, Sydney and Cook, W. G. H.: *Taylor's Principles and Practice of Medical Jurisprudence*, ed. 9, London, J. & A. Churchill, Ltd., 1934, vol. 1, pp. 195 to 263.

Strassman, George: *F. Strassman's Lehrbuch der Gerichtlichen Medizin*, ed. 2, Stuttgart, Ferdinand Enke, 1931.

<sup>20</sup> *Rigor mortis*: The rigidity or stiffness of the muscles which follows death, due to coagulation of the muscle substance. The onset of rigor mortis is variable and the time it takes for completion varies with the degree of muscular development and antemortem activity. After it has developed completely, it persists for a variable time and gradually disappears.

<sup>21</sup> *Postmortem Suffusions or Lividity*: Discoloration of tissues especially the skin after death by gravitation of the blood into the vessels of the dependent or lowermost parts of the body. The color and distribution of the lividities are important.

<sup>22</sup> *Putrefaction*: The decomposition of animal or vegetable matter effected largely by the agency of micro-organisms, especially bacteria, and resulting in the production of various solid, liquid and gaseous matters, some of which have a foul odor. Putrefactive gases cause the body to swell and to become discolored. The changes may render the body unrecognizable. The process takes place rapidly in warm surroundings.

<sup>23</sup> *Mummification*: Drying up and shriveling of a dead body. It is more apt to occur in cool dry air where the ventilation is good.

<sup>24</sup> *Adipocere formation*: Adipocere is a peculiar waxy substance formed from the subcutaneous fat during the decomposition of animal bodies, and seen especially in human bodies buried in moist places. It consists principally of saturated fatty acids and their salts.

color of the suggillations is of great importance in determining whether or not the body has been moved after death. In this connection, it must be realized that if the body is moved immediately after death, before the suggillations have appeared, such movement will not be detected by a study of the lividity when the body is found. Estimates as to the probable post-mortem interval can only be made if the body is visited at the scene, and are impossible if it is examined for the first time on the following day, after it has been moved and chilled in the refrigerator over night. Reliable information as to the probable postmortem interval is of considerable value to the police in their investigations and in their attempts to trace the movements of the deceased prior to death, and to check any alibis which may be offered by a suspected perpetrator.

The color of the postmortem suggillations is significant to the trained medical observer in that it may reveal the cause of death. The cherry red color of the lividity in carbon monoxide poisoning is easily recognized. It is also important not to mistake deep blue suggillations for antemortem bruises, an error which the inexperienced observer may make.

#### *Preliminary Examination for Wounds*

The body is then examined for obvious wounds but a final opinion as to their exact nature and number should not be ventured on the basis of this preliminary examination at the scene. The nature of many wounds is self-evident. In shooting cases, it is helpful to the police if, in addition to the entrance wounds, obvious exit wounds are found with corresponding holes of exit of bullets in the clothing. A search of the premises may then reveal a bullet. In some instances, a bullet, in passing through the body, may carry with it a strand of hair or a fragment of bone or soft tissue. At times, a bullet may be felt just beneath the skin and may be easily removed by a small skin incision. The character and calibre of such a bullet may show whether it was fired from a revolver or automatic pistol. If fired from the latter type of weapon, an ejected cartridge shell should be searched for and if found would indicate that the deceased had probably been shot at the place where the body was found.

The detailed examination of bullet and knife wounds is best made at the time of the necropsy, when the wounds can be carefully washed and studied. The presence of considerable extravasated blood may obscure their finer details at the scene. In assaults with blunt weapons, the pattern and extent of a wound may suggest the type of weapon that should be sought for by the police, but again the finer detail of the pattern will be more readily detected at the necropsy, after the surface of



the wound is cleansed of blood and other material which may obscure it.

The hands of the deceased should be carefully examined for the presence of defense wounds, powder burns and residues, blood stains, various objects such as strands of cloth and hair and fragments under the fingernails.

#### *Collection and Preservation of Evidential Material*

It is the responsibility of the medical examiner to preserve all objects found on or in the body of the deceased, which may have anything to do with the cause of death, or which may furnish clues useful in the apprehension and conviction of the assailant. Thus, the clothing of the deceased, strands of hair, cloth fragments, bullets, slugs, broken-off knife blades, or other penetrating weapons, blood stains and stains of body discharges such as semen should be carefully preserved. Small loose objects which might be lost during the transfer of the body from the scene to the morgue, should be carefully preserved in labelled containers for subsequent study.

In one interesting case, the deceased was found lying dead on the roof of a tenement house, with a bullet wound through the head. A button and a torn piece of fabric to which it was attached, were found in the clenched hand of the victim. These articles were quietly removed by the police officer, who subsequently made it his business to attend the wake which was held over the body of the deceased. One of the visitors to the wake, who came ostensibly to mourn, was observed by the police officer to be wearing an overcoat of the very same fabric as that found in the hand of the deceased and with a button missing, which had evidently been torn out. He was arrested by the police officer and when confronted with the button and fabric found in the hand of the deceased, which fitted exactly the torn area in his overcoat, confessed the murder.

In another case the body of an elderly woman who had been murdered was found in the rear of her small delicatessen store. The victim's throat had been cut deeply in several places. There were defense cuts on one hand and other evidences of a struggle. Several strands of hair were found in the hands of the deceased and removed by the medical examiner at the scene for examination later. All but one of these hairs were long and gray and similar to those on the victim's head. A single short dark brown hair was also found which microscopically was similar in color and in cross section to the scalp hairs of the assailant who was taken into custody later and confessed the crime.

The medical examiner also supervises and directs the preservation of implements, utensils, weapons, wearing apparel,

furnishings, suspicious stains, blood stains, body discharges, food, drink, medicines and chemicals, which he thinks may have some bearing on the case. All such objects should be carefully labelled and wrapped for delivery by a police officer to the laboratories of the toxicologist, the serologist, or to the technical laboratory of the Police Department, for whatever examinations may be indicated. In handling and collecting such material, precautions must be taken not to mar fingerprints or to add fingerprints on weapons and smooth-surfaced objects. Firearms, bullets and cartridge shells, found at the scene, are gathered up by the police, examined for fingerprints and then removed for study and tests by ballistics experts.

After the medical examiner has completed his preliminary examination and has reduced all his findings to writing in a report as required by law, the police officer in charge of the case searches the clothing of the deceased for personal belongings, and subsequently delivers them to the custody of the property clerk at Police Headquarters. The personal belongings frequently reveal the identity, the occupation, habits and associations of the deceased.

If the identity of the deceased is unknown and there is reason to believe that he has a criminal record, fingerprints may be taken at the scene for purposes of identification, but not until the medical examiner has had an opportunity to examine the body. Fingerprinting of the deceased at the scene should not be done in cases that may require an examination of the fingernail scrapings. Examination of such scrapings is indicated in cases of assault in which the victim may have struggled with and scratched the assailant. Fragments of skin, hairs, cloth fibers, blood and other substances which may prove important as clues and as evidence may be obtained in this way. It is better procedure, if the deceased is known, to postpone fingerprinting until after the external examination of the body has been completed by the medical examiner at the time of the necropsy. Fingerprints of the deceased, however, should be taken in every homicide.

The medical examiner then orders the removal of the body to the mortuary for necropsy. Care must be exercised during the transportation of the body, that it is not mutilated and that nothing is done to interfere with the anatomical lesions which are present on the surface. Rough handling of the dead body may produce confusing postmortem injuries. The clothing of the deceased, which must be carefully described in connection with the necropsy, must not be destroyed or unnecessarily soiled with extraneous dirt or with the body discharges of the deceased. A police identification tag filled out at the scene by the patrolman assigned to the case is sent along with the body.

*Necropsy*

In a homicidal case, the necropsy should be performed as promptly as possible, preferably by the medical examiner who saw the body and investigated the case at the scene where it was found. Whenever possible, the necropsy should be witnessed by another medical examiner, and this fact should be noted in the protocol.

*Police and Personal Identification of Body to Medical Examiner, Fingerprinting of Deceased*

In addition to the police identification, which has already been discussed, the identity of the deceased is established by relatives or friends, who must also identify the body to the medical examiner who performs or who has witnessed the necropsy. The personal identification must be sworn to in an affidavit by the person who makes it. Mistakes in identification both deliberate and unintentional have been made and should be guarded against. The persons making the identification should be questioned carefully as to their relationship to the deceased, the duration of their acquaintanceship, and the last time and the circumstances under which they saw the deceased alive. In doubtful cases, the person making the identification should be required to state the physical characteristics of the deceased including any distinguishing marks, deformities and scars on the body. A deliberate false identification of a dead body is a misdemeanor and is punishable by law.

Whenever possible, more than one personal identification should be taken and preferably by persons who will be available to testify, should the case come to trial. Identification by persons living in distant cities may create difficulties for the prosecuting attorney, should he find it necessary to subpoena them as identifying witnesses at the trial.

Fingerprints are taken routinely by the Bureau of Identification of the Police Department, of all persons who die by homicide. Such prints frequently prove valuable in helping to establish the identity and also the criminal record, if any, of a deceased person. The fingerprints are also useful for comparison with finger impressions found on the scene. In this connection it would be helpful to have on file the fingerprints of the medical examiner who may unwittingly deposit fingerprints during his investigation at the scene.

*Body Should Not Be Embalmed Before Necropsy*

Under no circumstances should the body be embalmed before the necropsy, as the embalming process vitiates many chemical tests which may subsequently be found necessary. The formaldehyde in the embalming fluid renders the detec-

tion of alcohol and cyanide in the organs difficult if not impossible. Besides interfering with the proper toxicological examination of the organs, embalming also produces confusing artifacts in the body. The trocar<sup>25</sup> punctures throughout the thorax and abdomen may cause considerable mutilation of the various organs and make difficult the interpretation of blunt force injuries of the hollow and solid organs and also the tracing of the exact course of a penetrating wound.

It is only when a body has to be exhumed for a belated necropsy not originally performed because homicide was not suspected, that embalming has proved useful because of its preservative effect on the tissues. The necropsy on an exhumed embalmed body has all the limitations of one performed on a freshly embalmed body. In addition the postmortem decomposition may be considerable despite the embalming.

#### *Recording of Findings During Progress of Necropsy*

A well equipped necropsy room should be available, with good light and necessary instruments for the performance of the necropsy, which should be done carefully and completely. During the progress of the necropsy, the positive and also the negative findings are dictated to a stenographer. The inclusion of significant negative findings in the record indicates that the necropsy was performed understandingly and thoroughly. The value of carefully recording the negative findings in the necropsy is appreciated readily by any medicolegal pathologist who has had occasion to testify in court under cross-examination. The defense counsel in a criminal action may ask the medical examiner many questions about the necropsy. If the negative findings are not mentioned in the autopsy report, the opposing counsel may succeed in his attempt to create the impression that the necropsy was carelessly done and that certain details were perhaps overlooked.

A necropsy can be performed properly only once, and one poorly performed is perhaps worse than none at all. The curious notion that it can be satisfactorily done over and over again exists in the minds of many, judging from the frequent reports in the newspapers, of bodies inadequately examined the first time, being exhumed for a second and even a third necropsy.

#### *External Examination of Dead Body*

The dead body should be carefully undressed and the clothing carefully laid aside for examination after the necropsy. In removing the clothes, care must be taken not to obliterate

<sup>25</sup> *Trocar*: A sharp-pointed instrument used during the embalming process for tapping or piercing a cavity wall in order to remove liquids and to inject preserving fluid. It is thrust into the body cavities many times and punctures the viscera.

any cuts or bullet perforations or to soil them unnecessarily with blood or body discharges. The body is then weighed on accurate scales provided for the purpose, and its height measured. A large pair of wooden calipers is useful for the latter purpose and also for measuring the location of wounds on the body, with reference to their distance from the heel.

The external surface of the body is examined very carefully and described in considerable detail. The sex, color, approximate age, nutritional state, the skeletal and muscular development, the color, length, amount and distribution of hair, the appearance of the corneae<sup>26</sup> and conjunctivae,<sup>27</sup> the color of the irides,<sup>28</sup> the appearance of the nose, ears, mouth, lips, gums and teeth should all be noted.

The extent of rigor mortis, the distribution and color of the postmortem lividity, any evidences of putrefaction, mummification and adipocere formation, postmortem mutilation and dismemberment by human agencies, postmortem injuries by insects, crustacea and larger animals, and by mechanical, physical or chemical agents are carefully described; also tattoo marks, scars of old wounds, needle puncture scars of drug addiction, amputations, surgical scars, and the condition of the genitalia.

Evidence of bleeding from any of the orifices such as the nose, ears, mouth, and genitals or anus is noted; also, the presence and location of any small dark blue postmortem hemorrhages known as Tardieu spots, petechial hemorrhages,<sup>29</sup> purpuric spots,<sup>30</sup> cyanosis,<sup>31</sup> or pallor of the skin or mucous membranes,<sup>32</sup> subcutaneous emphysema,<sup>33</sup> edema<sup>34</sup> and icterus.<sup>35</sup>

<sup>26</sup> *Cornea*: The clear transparent circular window in the front of the eye.

<sup>27</sup> *Conjunctiva*: The delicate membrane that lines the eyelids and covers the eyeball in front.

<sup>28</sup> *Irides*: Plural of iris, the circular pigmented membrane in the eye with a central opening known as the pupil in which light enters the eye; it lies behind the cornea and is made up of circular muscular fibers and bands of radially placed fibers which constrict and dilate the pupil.

<sup>29</sup> *Petechial hemorrhage*: Minute dot-like hemorrhage occurring in the skin, and also seen in the conjunctiva, lining of the mouth and internal organs.

<sup>30</sup> *Purpuric Spots*: Small blotchy hemorrhages in the skin and mucous membranes appearing purplish in color. They occur in certain diseases notably purpura hemorrhagica, a blood disease, and in fulminating meningitis. The purpuric spots may coalesce and simulate a lividity.

<sup>31</sup> *Cyanosis*: Blueness of the skin produced by congestion of the blood vessels with poorly oxygenated blood. It can occur in diseases of the heart or lungs or in certain types of asphyxiation whether due to disease or violence and also in certain types of poisoning.

<sup>32</sup> *Mucous membrane*: A delicate epithelium that lines the alimentary canal and its branches, the respiratory tract and its connections, and the genito-urinary tract.

<sup>33</sup> *Subcutaneous emphysema*: The presence of gas or air in the connective tissue underlying the skin.

<sup>34</sup> *Edema*: Swelling due to the presence of abnormally large amounts of fluid in the intercellular tissue spaces of the body.

<sup>35</sup> *Icterus*: Jaundice or yellowish coloration of the skin in certain conditions or diseases due to deposition of bile pigment in the skin and mucous membranes.

The hands are carefully examined and described, noting the development and the presence or absence of any wounds or unusual stains. The condition of the fingernails should be noted, and scrapings taken from under the fingernails for subsequent microscopic examination in certain cases. The size, location and condition of any surgical operation wounds are also described.

#### *Examination and Description of Wounds*

The exact location, size, character and probable age of all wounds, even the most minute, should be recorded, and the presence of any vital reaction in and about any of the wounds should be noted; thus, the changed or faded color of a contusion,<sup>36</sup> and any evidence of infection or inflammation in a lacerated, incised, stab or bullet wound, would indicate that it was inflicted some time before death. Old or recent wounds may be found on the same body, along with fresh wounds, and these must be carefully differentiated and evaluated. A microscopic examination of tissue from a recent wound will show a characteristic inflammatory reaction, not to be found in a wound inflicted just before or at the time of death.

A correct estimation of the age of a wound is often difficult and may require a careful gross and microscopic examination. It is especially important in cases of violent death in which the deceased is found dead, or dies shortly after being found, of injuries sustained previously which were not immediately fatal. In many cases of fatal blunt force injury to the head or to the abdominal viscera,<sup>37</sup> death is delayed; there may be no suspicion of an injury until the necropsy is performed. If a satisfactory investigation is to be made by the police in such cases, the medical examiner must not mislead them with a careless, arbitrary and inaccurate estimate of the age of the injury. The correct estimate may exonerate some person who is being held wrongfully as a suspect and direct the police investigation along successful lines.

#### *Photography, Drawing and Diagramming of Wounds*

Wounds, especially when they are multiple or patterned, or in any way unusual, should be photographed. These photographs should reveal all the finer details of the wounds which show up best if the surrounding skin is washed clean of blood and then carefully dried. Extraneous objects should not be included in the photographs. With close-up bullet wounds, care must be taken not to wipe away powder residues

<sup>36</sup> *Contusion*: A bruise.

<sup>37</sup> *Viscera*: A viscus is any large interior organ in any one of the four great cavities of the body. Some viscera like the spleen, liver and kidneys are solid; others like the stomach, intestines or bladder are hollow.

too vigorously. When there is much smoke deposit on the skin, this should be photographed first and then carefully washed off to permit accurate delineation of the bullet perforation, the powder burn and the embedded powder grains. The smokeless powders now loaded into most pistol cartridges produce very little smoke deposit on the skin.

If possible the medical examiner should learn to take his own photographs and develop and print his own pictures, so that he may offer them in evidence at a subsequent criminal proceeding. If such photographs are taken or finished by a professional photographer, it will be necessary, if they are to be offered in evidence, to produce the photographer to testify that he made them. Drawings also serve a useful purpose; these may be diagrammatic. The diagrammatic representation of wounds is made easy if a large printed outline drawing of the front, back and side views of the body is available. These can easily be filled in and labelled to correspond to the description of the wounds in the protocol.

#### *Measurements*

The location of wounds should be indicated by accurate and easily interpreted measurements of their distance from common fixed landmarks on the surface of the body. It must be borne in mind that the nature and location of wounds must be made understandable to non-medical persons; for example, to the presiding judge, the counsellors and jury at a trial. The direction and length of the track of every penetrating laceration, stab or bullet wound, and the structures and organs through which the track of such wound passes, must be recorded.

It is practical to express measurement of distance in inches, as well as in centimeters, and weight in pounds and ounces, as well as in grams. This will prove useful when testimony is subsequently given in court, when the pathological findings have to be translated to an assemblage of lay persons, who may be unfamiliar with the metric system of measurement.

#### *What the Necropsy Must Reveal to Indicate Homicide*

The unsuspected, the possible and the obvious homicide are definitely established by the necropsy, which is the most important part of the postmortem examination. The necropsy, to establish death by homicide, must reveal a cause of death consistent with such an interpretation. A wound or combination of wounds of sufficient severity to produce an immediate or delayed fatal effect on the body must be demonstrated together with the effects produced.<sup>38</sup> The fatal effects,

<sup>38</sup> For a discussion of trauma and its complications, and for examples of medical examiners' findings in homicidal, suicidal and accidental

or complications resulting from the wound or wounds may be shock (when the wounds are very severe),<sup>39</sup> hemorrhage, asphyxia, infection, thrombosis<sup>40</sup> or embolism,<sup>41</sup> occurring singly or in combination. But whatever the fatal complication may be, it must be directly related to and caused by the primary wound or injury which must also be demonstrable. The fatal complication or effect is designated as the immediate cause of death. The wound or injury causing the complication is the primary cause of death. The relationship of the fatal complication to the primary wound must not be equivocal but definite, to establish that the death was caused by violence.<sup>42</sup>

In a case of poisoning, the presence of poison in the body and its deleterious effects on the organs must be determined. In this connection certain poisons may be eliminated from the body before the victim dies of their deleterious effects. At necropsy, only the effects and not the poison will be found. In such cases it is important to learn whether any poison was detected in the patient during life. If it was not demonstrated in the patient, the findings at autopsy would be diffi-

deaths, the reader is referred to Gonzales, T. A.; Vance, M. and Helpert, M., *op. cit. supra*, f.n. 7, pp. 88 to 370.

Martland, H. S.: *Medical Examiners' Findings in Deaths from Shooting, Stabbing, Cutting and Asphyxia*, Symposium on the Medico-legal Necropsy, Baltimore, the Williams and Wilkins Co., 1934, pp. 66 to 160.

Moritz, A. R.: *The Pathology of Trauma*, Philadelphia, Lea & Febiger, 1942.

Smith, Sydney, *op. cit. supra*, f.n. 8.

Gettler, A. O.: *Toxicology in the Medico-legal Necropsy*, Symposium on the Medico-legal Necropsy, Baltimore, the Williams and Wilkins Co., 1934, pp. 50 to 66.

<sup>39</sup> Shock: "That state of general collapse which follows two, three or four hours after a severe tissue injury is variously spoken of as *wound, traumatic, surgical, or secondary shock*. It is a condition quite distinct from the so-called *primary shock* which supervenes immediately upon receipt of an injury. Primary shock has a nervous basis, pain and psychic factors, through their effect upon the vascular (circulatory) system, playing a prominent role."

"Secondary, or surgical shock is characterized by a profound fall of blood pressure; pallor and coldness of the skin; cyanosis (bluish coloration) of the fingertips and lobes of the ears; sweating; fall in body temperature and of the metabolic rate; rapid, shallow breathing; small, rapid pulse; apathy; and other manifestations of collapse." Best, C. H. and Taylor, N. B.: *The Physiological Basis of Medical Practice*, Baltimore, the Williams and Wilkins Co., 1940, 2nd ed. at p. 424. Such surgical shock is caused not only by direct blood loss but by the fact that the capillaries in the body of the injured person develop an increased permeability permitting a consequent leakage of blood into the tissues—viscera, muscles and skin.

<sup>40</sup> Thrombosis: The clotting or coagulation of the blood in the blood vessels during life. The clot is called a thrombus.

<sup>41</sup> Embolism: An embolus is a clot or other plug brought by the blood current from a distant vessel and forced into a smaller one so as to obstruct the circulation. By cutting off the blood supply to a particular tissue, the obstructing embolus may cause localized destruction of tissue or even death.

<sup>42</sup> See, in this Symposium series, a paper by Perkins, R.: *The Law of Homicide*, this issue of the *Journal of Criminal Law and Criminology*. See, also, Bauer, R. S.: *Fundamental Principles of the Law of Damages in Respect to Medico-legal Cases*, *Tenn. L. Rev.* (April, 1946).



cult to use as proof of poisoning in the absence of poison in the tissues.<sup>43</sup>

Any natural disease process revealed by the necropsy must be evaluated as to whether it has contributed to the cause of death or has been entirely unrelated to it. Occasionally the necropsy in a suspected case of homicide will disclose that death was not caused by violent means, but entirely or in great part by natural causes. Before attributing the death to disease in the latter type of case, a complete necropsy should be performed, including an examination of the skull and brain, the organs of the neck, and the spine and spinal cord, despite the absence of any outward indications of violence to these regions. If the necropsy does not reveal any evidence of physical violence or of obvious disease, the organs should be saved for chemical examination to determine whether or not poisoning has occurred, and pieces of tissue from the organs should be taken for histological examination to determine whether or not a disease process existed, which was not evident on gross examination.

#### *Homicidal Asphyxiation*

In many cases of homicidal asphyxiation, external signs of injury may be absent from the neck, and the cause of death is only revealed after the exposure, removal and careful dissection of the organs of the throat and neck, especially the larynx,<sup>44</sup> which may show evidence of injury or obstruction. In ligature strangulation and in choking, injuries of the larynx, such as occur with manual strangulation are usually absent, the ligature or gag found in position on the body of the deceased together with the signs of asphyxiation indicating the nature of the case.

In smothering, the necropsy may only reveal evidence of asphyxiation, the suspicion of homicide arising from the investigation of the dead body at the scene<sup>17</sup> and the surrounding circumstances. In cases of manual strangulation, the grouped abrasions on the neck produced by the fingers or fingernails of the assailant are not always present, especially in cases of "mugging" in which the assailant, approaching from behind, uses his forearm to compress the victim's neck.

<sup>43</sup> For a detailed consideration of the problems of proof in cases of suspected poisoning, see in the Symposium series "Scientific Proof and Relations of Law and Medicine" (1st Series, April, 1943) the following studies: Wigmore, John H.: Circumstantial Evidence in Poisoning Cases, *Boston University L. Rev.* 23: 277, 1943; Walker, J. T.: Scientific Evidence in Poisoning Cases, *Boston University L. Rev.* 23: 292, 1943.

<sup>44</sup> *Larynx*: The organ of voice, is a cartilaginous, box-like structure situated at the top of the trachea (windpipe) and below the root of the tongue.

*Fatal Wounds Without External Evidence of Trauma*

Fatal wounds of the skull and brain such as penetrating stab wounds and non-penetrating blunt force injuries can occur with little or no external evidence of injury.<sup>45</sup> In one case, for instance, the small size and inconspicuous appearance of a fatal ice pick stab wound of the scalp might well have led the superficial examiner to overlook its presence or its responsibility for causing death. The wound was originally concealed by hair. The weapon perforated the skull and brain. Injuries of the cervical spine or spinal cord may remain undetected unless the spinal canal is explored and the cord removed and examined. The application of a blunt force, such as a kick, or a blow with a stick to the abdomen, may cause a rupture or laceration of a hollow or solid viscus (organ), without any external evidence of wounding. In several fatal shooting cases, the bullet perforated the orbit between the open eyelids. With the eyelids closed, the wound was not evident. In two of these the bullet passed through the inner canthus<sup>46</sup> of the eye medial<sup>47</sup> to the eyeball. In a third case, the bullet perforated a spectacle lens and then passed through the eyeball. When this body was found lying prone on the ground, the eye wound was not recognized and it was first thought that the deceased had died of natural causes and had sustained the abrasions<sup>48</sup> on the face by falling. The eyeglasses of the deceased were found near the body; one lens was missing, the right one was still in place and was perforated and blood-stained. The homicidal nature of the case was then apparent. At necropsy, the bullet which had perforated the spectacle lens and then passed between the eyelids and through the eyeball, was found in the brain.

*Disposal of Bodies by Dismemberment and Burning*

The mutilation and dismemberment of a murdered body may destroy all possibility of identification and determination of the cause of death. In many cases, however, the cause of death can be determined despite extensive mutilation of the murdered body by dismemberment, burning or by chemical agents.

In one case the head and all four dismembered extremities of a murdered body were recovered. Two blunt weapon wounds were visible on the top and back of the head and

<sup>45</sup> Helpern, M.: Unusual Fatal Stab Wounds of Head and Neck, *Am. J. Surg.* 26: 53, 1934.

<sup>46</sup> *Canthus*: The angle at either end of the slit between the eyelids. The inner canthus is the one situated on the same side as the nose.

<sup>47</sup> *Medial*: This is a term used anatomically to locate the relative position of structures. Medial means toward the midline. The medial side of the eyeball would be that nearest to the midline of the body.

<sup>48</sup> *Abrasion*: A spot rubbed bare of skin.

there were blunt weapon defense wounds on the right hand. The four extremities were found tightly packed in a wooden box in the entrance way to a store; the head rolled out of the back of a garbage truck making collections of refuse in the same neighborhood. Subsequently the hips and thighs were found, but not the upper part of the torso. The skull was fractured and the brain lacerated. The larynx was also fractured.

Bodies found burned in conflagrations should always be examined with the possibility that the deceased had been murdered and then incinerated to destroy evidence of the crime. It is wise to examine the blood chemically for the presence of carbon monoxide, the absence of which would indicate that the deceased was dead before the body was burned.<sup>49</sup> There are several homicide cases recorded in the files of the Office of the Chief Medical Examiner of New York City in which charred bodies of persons at first thought to have been accidentally burned to death in conflagrations, were found at necropsy to have died of depressed fractures of the skull.

In a case investigated by Dr. Thomas A. Gonzales, Chief Medical Examiner of New York City, the charred dismembered head and torso and the charred segments of the lower extremities of the body of a negro were found among the embers of a bonfire in a vacant lot. Despite extensive incineration of the tissues, a comminuted depressed fracture<sup>50</sup> was found in the occipital portion of the skull.<sup>51</sup> That the deceased was dead when placed in the fire was corroborated by the absence of carbon monoxide from the blood. The perpetrator was apprehended and confessed that he had bludgeoned the victim to death, dismembered the body and tried to dispose of it by incineration in the bonfire.

### *Submerged Bodies*

In homicidal cases in which the body has been submerged for a variable length of time, in addition to the anatomical evidences of drowning and wounding, a chemical test for chlorides should be carried out on samples of blood removed from the right and left sides of the heart according to the method devised by Gettler.<sup>52</sup> The inhalation of salt water

<sup>49</sup> During any fire carbon monoxide gas is generated and will be inhaled by any live person trapped in the fire. The absence of carbon monoxide in a burned body indicates that the person was not breathing and therefore dead before the conflagration started.

<sup>50</sup> *Comminuted depressed fracture*: A comminuted fracture is one in which the bone is broken into many small fragments. If it is also depressed this means that certain of the fragments have been projected inward, oftentimes against or into the brain substance.

<sup>51</sup> *Occipital portion of the skull*: The back part of the head.

<sup>52</sup> Gettler, A. O.: *A Method for the Determination of Death by Drowning*, J.A.M.A. 77: 1650, 1921.

into the lungs is indicated by a higher concentration of chloride (salt) in the blood drawn from the left side of the heart; the inhalation of fresh water produces a lower concentration of chloride on the left side by diluting the concentration of salt normally present in the circulating blood. The test is vitiated by a patent foramen ovale<sup>53</sup> and cannot be carried out in decomposed bodies in which the putrefactive gases have forced the blood out of the heart.

Penetrating stab wounds and bullet wounds and non-penetrating blunt force injuries are occasionally found in bodies recovered after varying periods of submersion. Suicidal injuries such as incised wounds of the throat and wrists are not infrequently encountered. Submerged bodies, especially those recovered from rivers and harbors in which there is a heavy shipping traffic, frequently show postmortem injuries which may be confusing even to the experienced observer.

An example of such postmortem injuries is illustrated by the case of a decomposed torso found floating in the Hudson River. Two days later, the right lower extremity with the distal half of the leg missing was found in the East River about five miles away. The next day, the corresponding left lower extremity was found floating in the Hudson River about two miles away. The torso and the extremities were obviously parts of the same body. By means of the cleaning and laundry marks in the clothing found on the left extremity, the body was identified as that of a 60-year old white man who one week before committed suicide by jumping off the back of a ferry boat into the Hudson River. Prior to jumping he swallowed the contents of a bottle of poison which he purchased in a drug store earlier the same day. The body was probably dismembered by the propeller blades of the ferry boat. The identification definitely established the suicidal character of the death and the fact that the dismemberment occurred postmortem after submission.

#### *Procedure in Poisoning Cases*

In cases in which there is a definite indication or suspicion of poisoning, the organs such as the brain, liver, kidneys, stomach and its contents, lungs and bones, and the blood and urine, should be saved for chemical examination. These should be carefully weighed and measured, placed in clean labelled containers without contamination, and promptly delivered and properly identified as to source, to the toxicologist. The care-

<sup>53</sup> *Patent foramen ovale*: A congenital persistent opening in the partition (interatrial septum) which separates the right and left auricles. This abnormal condition, if extreme, allows the venous blood returned by the veins to the right side of the heart to mix with the oxygenated blood which has returned from the lung to the left side of the heart.

ful examination of the organs for evidences of disease or traumatic injury should not be neglected, and pieces of tissue should be saved for microscopic examination. Many poisons produce characteristic histologic alterations,<sup>54</sup> and certain disease processes, not visible grossly, and which clinically simulate the action of poison, may become apparent.

Where the necropsy findings definitely point to a certain poison or group of poisons, the toxicologist should be so informed in order that he may directly test for the suspected substance. In the absence of such leading information, considerable time may elapse before the routine systematic analysis for all poisons will reveal the substance present. This delay may hamper the investigation of the case by the police authorities.

#### *Details of Necropsy Requiring Special Consideration*

The necropsy in a homicidal case involves much more than the mere determination of the cause of death. A considerable amount of information must be obtained in anticipation of questions which may subsequently arise in connection with it.

#### *Shooting Cases*

The description of bullet wounds should include those details which help to indicate the distance from the body, of the weapon used in firing the shot. A contact bullet wound is produced when the gun is fired with its muzzle held against the skin and its appearance is fairly characteristic. The skin surrounding the perforation does not contain any embedded powder grains because the full effect of the discharge is blown into the track of the wound, which may be blackened and burned for a variable distance. The perforation in the skin varies in size and is often large and irregularly lacerated. However it is sometimes small and regular in appearance. In some contact wounds, a distinctive abraded impression of the muzzle of the weapon is found on the skin.

A close-up wound is produced when the weapon is fired at close range and characteristically reveals the effects on the skin of the powder grains and flame of the discharge in addition to the bullet perforation. The distribution and appearance of the embedded powder grains, the extent of the burn and smoke deposit, and their relation to the bullet perforation should be carefully noted.

In a distant shot, the muzzle of the gun is held beyond the reach of the flame and powder grains of the discharge; the sur-

<sup>54</sup> *Histologic Alterations*: Alterations in the architecture of bodily tissue due to injury or disease and detectable by microscopic study of specially prepared and stained tissue sections.

face wound consists only of the bullet perforation and varies in appearance according to the angle at which the bullet strikes.

A valid opinion as to the distance from which a shot was fired to cause a wound on a clothed part of the body can only be given after an examination of the clothing. The powder grains, flame and smoke of the discharge in a close-up shot are deposited on the clothes and only the bullet may reach the skin, as in a distant shot.<sup>55</sup>

#### *Preservation of Bullets and Other Objects Recovered at Necropsy*

All bullets and bullet fragments, shotgun pellets and slugs must be recovered from the body. In contact wounds inflicted with a shotgun, the felt wads of the cartridge may also be found. The bullets removed at the necropsy are an important part of the corpus delicti, and by their composition, caliber and rifling marks may be traced to one or more weapons used in the commission of the crime. Occasionally, bullets of different caliber are recovered from the same body, indicating that more than one weapon was used in the shooting.

The bullets removed from the body must be carefully described and marked by the medical examiner for purposes of identification. Care must be taken during the removal and marking of a bullet not to mar any of the distinctive rifling marks on the sides of the missile because these marks are used for purposes of comparison with test bullets fired from the pistol believed to have been used in the crime. The bullets should be safely stored in a locked container until they are delivered for testing to a member of the Ballistics Bureau of the Police Department, who will furnish a receipt for them; upon their return from the ballistics department, the medical examiner will give a receipt acknowledging the fact. These precautions are necessary in order that the bullets may be introduced properly by the medical examiner as evidence at any subsequent criminal proceeding.<sup>56</sup>

Similarly, in stabbing cases, the broken-off fragment of any weapon, such as a knife blade, ice pick or scissors blade, found in the body should be carefully preserved as evidence and for future comparison with a weapon from which it may have been derived.

If a broken-off knife blade is found embedded in bone which it has perforated, a block of the bone containing the blade can

<sup>55</sup> The reader's attention is invited to the following article which appears in the present Symposium series: Moritz, A. R. and Dutra, F. R.: Scientific Evidence in Cases of Injury by Gunfire, *N. C. Law Rev.* (April, 1946).

<sup>56</sup> See, in this Symposium series, the following paper: Common Sources of Errors in the Examination and Interpretation of Ballistics Evidence, *Boston University Law Rev.* (April, 1946).

be removed with a saw or chisel and preserved as an exhibit which can be offered later in evidence to show the weapon and the extent of its penetration. In one such case, the deceased, a 17-year old boy, after being stabbed in the head, ran a block after his assailant and attempted to strike him before collapsing. Death occurred rapidly because of the large subdural hemorrhage<sup>57</sup> from the cut vessels on the surface of the brain. There was no bleeding along the track of the wound in the brain tissue.

In other cases of stab wounds of the brain, the injured brain tissue may bleed slightly at first and the victim remain conscious for a variable period of time during which the nature and seriousness of his injury are not recognized. The entrance wound may be small. The sudden onset of secondary bleeding in the injured brain tissue causes rapid unconsciousness and death. In one case of this type, the victim was stabbed through the forehead with a pair of scissors; only a small entrance wound was produced. He remained conscious and walked into the accident room of a hospital where he suddenly became unconscious and died two days later. A pair of broken-off closed scissors blades which had perforated the right frontal bone<sup>58</sup> was found piercing the frontal lobe<sup>59</sup> of the brain; the base of the blades was firmly stuck in the bone. The injury caused a large hemorrhage in the brain, the formation of which was delayed. A portion of the skull containing the blades was removed at necropsy and presented as evidence at the trial.

Occasionally, a broken-off piece of a blunt instrument is found in a penetrating wound. Metallic fragments such as radiator ornaments, door handles and button fasteners, and glass fragments may be found in the body of a person fatally injured by an automobile. Such objects are important for purposes of comparison with the suspected damaged vehicle in "hit-and-run" automobile cases and should always be saved.

### *Examination of Spine*

If there is any indication that the spine or spinal cord may have been injured in the track of a bullet or stab wound, such injuries must be definitely established by the necropsy. Aside from the relation of a spinal cord injury to the cause of death,

<sup>57</sup> *Subdural hemorrhage*: The brain is invested by three membranes, these being from without inward, the dura (lining the skull), the arachnoid and the pia, the latter being closely adherent to the brain surface. Subdural hemorrhage indicates bleeding under the dura, that is, between the dura and the arachnoid.

<sup>58</sup> *Frontal bone*: The bone forming the forepart of the cranium. There is a right and a left frontal bone, which in adults are normally fused into one.

<sup>59</sup> *Frontal lobe*: The brain is divided into right and left hemispheres; the anterior part of each, situated roughly behind the forehead, is called the frontal lobe.

the finding of such an injury may have considerable significance should the question subsequently arise as to whether or not the deceased could have walked after having received his wounds.

### *Sexual Assaults*

In homicidal cases, in which there is suspicion or evidence that a sexual assault, such as rape or sodomy, was committed on the deceased, the necropsy must include a careful examination of the genitalia and anal region to determine the presence of injury. Fresh and stained smears of secretions taken from the vagina and anal region and of any seminal deposits and stains on the pubic hairs and skin surrounding the vulva and suspicious stains on the undergarments should be examined for spermatozoa.<sup>60</sup> Ultra-violet light is helpful in rendering seminal stains on certain types of cloth more visible. If many suspicious stains are found, the Florence test<sup>61</sup> may first be carried out and only those stains reacting positively need be examined further for spermatozoa.

An attempt should be made to determine the group specificity of the seminal stains. The latter procedure should be carried out by a competent serologist. The organs of the deceased, especially the brain, should be examined chemically for the presence of poisons which might have been administered to the deceased to overcome resistance during the commission of the crime, and which might have caused the death.

### *Examination of Stomach Contents*

In homicidal cases, the contents and the degree of digestion of any food in the stomach and intestines should be carefully noted. The presence of certain recognizable particles of food and the degree of digestion may suggest whether or not the deceased had recently eaten and in connection with other information may help in the determination of the postmortem interval and also in the identification of the deceased. The length of time that food remains in the stomach before passing into the intestine varies considerably and any opinion based on the necropsy stating the time before death that food was eaten should be guarded. In injured and comatose<sup>62</sup> persons ingested food may remain in the stomach for days.

<sup>60</sup> Gonzales, T. A.; Vance, M. and Helpern, M., *op. cit. supra*, f.n. 7, pp. 359 to 370.

Pollak, O. J.: Semen and Seminal Stains, *Arch. Path.* 35: 140-196, 1943.

<sup>61</sup> *Florence test* (For seminal fluid): To the suspected substance one adds a strong aqueous solution of iodine and potassium iodide. If spermatic fluid is present, brown plates or needles will be formed.

<sup>62</sup> *Comatose*: A person in a state of coma in which there is complete loss of consciousness from which the patient cannot be aroused even by the most powerful stimulation.



*Toxicological Examinations*

A quantitative chemical examination of the brain to determine the presence of ethyl<sup>63</sup> and methyl alcohol<sup>64</sup> should be carried out routinely in all cases of homicide in which the deceased has been found dead or has survived for less than 24 hours in the hospital after having received his injuries. If the survival period is longer than 24 hours, any ethyl alcohol present in the tissues will have disappeared by oxidation although methyl alcohol may persist for a longer time. The presence of alcohol in the brain indicates that the deceased had consumed it during the 24-hour period prior to death.

The amounts of alcohol recovered quantitatively in the brain are expressed by Gettler and Tiber, in terms of plus amounts and are designated as: a trace, 1+, 2+, 3+ and 4+.<sup>65</sup> These designations correspond to amounts of alcohol as follows:

trace	—	0.005	to	0.02	per cent.
1+	—	0.03	to	0.10	per cent.
2+	—	0.11	to	0.25	per cent.
3+	—	0.26	to	0.40	per cent.
4+	—	0.41	to	0.60	per cent.

Amounts of alcohol above 0.25 per cent are considered indicative of "intoxication." The amount of alcohol recovered from the brain does not necessarily indicate the amount consumed. Persons addicted to alcohol are able to oxidize it more rapidly than those who are not and, therefore, may consume more and have less residual alcohol in the brain after a certain period of time. In estimating the probable state of intoxication from the amount of alcohol recovered from the brain, the period of time that the deceased has survived since the last ingestion of alcohol must be considered. The amount of alcohol recovered at necropsy is not significantly altered by the post-mortem interval.<sup>66</sup>

Chemical examination for other poisons should be made in certain types of cases. Depressant poisons such as chloral, barbiturate compounds, morphine and hyosine, chloroform and other anesthetic compounds, should be tested for in homicidal cases associated with robbery, sexual assault and criminal abor-

<sup>63</sup> *Ethyl alcohol*:  $C_2H_5OH$ , also known as grain alcohol, a colorless volatile liquid of aromatic odor, the main ingredient of alcoholic beverages; also used medicinally.

<sup>64</sup> *Methyl alcohol*:  $CH_3OH$ , or wood alcohol; it is poisonous and when ingested may cause blindness or death.

<sup>65</sup> Gettler, A. O. and Tiber, A.: Quantitative Determination of Ethyl Alcohol in Human Tissues, *Arch. Path.* 3: 75, 1927; Alcoholic Content of the Human Brain, *Arch. Path.* 3: 218, 1927.

<sup>66</sup> See, in the Symposium series "Scientific Proof and Relations of Law and Medicine (1st series, April, 1943) the following paper: Jetter, W. W.: When Can it Be Said that Acute Alcoholism Caused or Contributed to Death, *Clinics* 1: (April, 1943).

tion where the deceased is found dead in the home or in a doctor's or midwife's office. In such cases, a routine systematic analysis for all poisons should be carried out on the organs.

#### *Examination of Fingernail Scrapings and Hair*

The scrapings from under the fingernails, and the hands of the deceased, should be carefully examined for minute fragments of skin, strands of hair and cloth fibers which the deceased may have removed from the assailant during a struggle. This procedure should be carried out in cases of homicidal strangulation, smothering and choking and in deaths from homicidal assault with blunt or sharp weapons.

It is useful to remove small tufts of hair from the scalp and other parts of the body of the deceased and to save them for future comparison with hairs found on subsequently confiscated weapons. Hairs from the deceased should be saved in homicidal cases where death has been caused by injuries of the head inflicted with blunt weapons and also in cases of death by "hit-and-run" automobiles in which some of the deceased's hairs may have been torn out and remained attached to various parts of the vehicle such as the bumper, fender or headlight. Vance has described the technic and pointed out the medicolegal applications of hair examinations.<sup>67</sup>

#### *Routine Blood Grouping of Deceased*

The blood group of the deceased should be determined in all cases of homicide. This information may prove very significant, in the event that a blood stain found on the clothing of a suspect is of the same group as the blood of the deceased and different from the suspect's own blood group; in such a case, there would be strong presumption as to the origin of the stain.

Blood stains on the clothing, suspected of belonging to the assailant and not to the deceased, should be grouped if possible, and the group compared with that of the deceased's blood and also with that of the suspect.

Wiener<sup>68</sup> has shown that by utilizing the four major blood groups O, A, B and AB of Landsteiner, the subgroups of A and AB discovered by von Dungern and Hirsfeld in 1910, the three blood types M, N and MN, and type P, determined by the factors M and N, and P which were discovered by Land-

<sup>67</sup> Vance, B. M.: *The Medicolegal Examination of Hairs*, *New Eng. J. Med.* 218: 22, 914-918, 1938.

<sup>68</sup> Wiener, A. S.: *Blood Groups and Blood Transfusion*, ed. 3, Springfield, Ill., Charles C. Thomas, 1943.

Wiener, A. S.: *The Rh Blood Types and Some of Their Applications*, *Am. J. Clin. Path.* 15: 106, 1945.

Wiener, A. S.: *Rh Factors in Clinical Medicine*, *J. Lab. and Clin. Med.* 30: 957, 1945.

steiner and Levine in 1928 and which are independent of the major groups, and the eight Rh blood types which have been evolved from the recent discovery of the Rh factor by Landsteiner and Wiener in 1937, it is now possible to distinguish 288 different kinds of human blood instead of the original four groups. The major blood groups and subgroups in all furnish six groups, O, A<sub>1</sub>, A<sub>2</sub>, B, A<sub>1</sub>B, A<sub>2</sub>B, there are the three independent blood types M, N, MN and two types determined by the presence or absence of factor P; the eight Rh blood types which are independent of the major groups and subgroups and of the types M, N, MN and of P, have been designated by Wiener as RH<sub>0</sub>, RH<sub>1</sub>, RH<sub>2</sub>, RH<sub>1</sub>RH<sub>2</sub>, RH, RH<sup>1</sup>, RH<sup>2</sup>, RH<sup>1</sup>RH<sup>2</sup>. By multiplying together the number of subdivisions in each of the above four categories, namely 6x3x2x8, the product of 288 different combinations or kinds of human blood is obtained.

The following homicide case recently investigated by the Office of Chief Medical Examiner, the Police Department and the District Attorney's Office of New York County (Borough of Manhattan) is an excellent example of the value of group determinations in scientific crime detection.<sup>69</sup>

At 2 o'clock in the morning, in the dim-out, a watchman of a building saw the figure of a man dragging a large object down the steps of an adjacent tenement house stoop and deposit it on the sidewalk a short distance away. The man then walked away. The watchman investigated the object and found it to be the body of a dead woman. While waiting for a police officer to arrive he observed the man who had carried the body return to the house and a few minutes later he saw him coming out again. The suspect was arrested but when confronted with the body stated that he had never seen it before. At the time of his arrest, he was carrying an almost empty wine bottle wrapped in newspaper under his arm; he admitted purchasing the bottle of wine in a neighborhood liquor store.

The examination of the body and subsequent necropsy by Dr. Morgan Vance, Deputy Chief Medical Examiner, revealed that death had resulted from strangulation. There were abrasions and a ligature mark on the neck. The distribution of the postmortem lividities indicated that the body had been moved after death and the disappearance of rigor mortis indicated that it had been dead for some time. A large amount of alcohol was found in the brain.

When the body was found the left shoe and stocking and the hat of the deceased were missing. Near the head there was a rolled up brown paper bag which contained the missing stock-

<sup>69</sup> Assistant District Attorney Louis A. Pagnucco of the New York County District Attorney's office supervised an investigation of this case and I am indebted to him for the interesting details.

ing. Several blocks away a package was found in a refuse can; it contained two men's shirts, a woman's hat and a left shoe similar to the right shoe of the deceased, and two men's handkerchiefs knotted together with several wisps of hair entangled in the knots. In the suspect's room a shiny dry stain was found near the bed on the oilcloth floor covering and a blood stain on the bed sheet. At the request of the District Attorney investigating the case, the suspect consented to have his blood typed. The oilcloth covered with the shiny stain, the blood-stained bed sheet and the shirts and handkerchiefs found with the deceased's hat and shoe were sent to the serological laboratory of the Medical Examiner's Office for examination.

The following results were obtained by Dr. Alexander S. Wiener, Serologist of the Medical Examiner's Office. The deceased's blood was group A and tests on her tissues proved her to be a secretor of group A substance. The suspect was group B. The blood stain on the bed sheet by chemical and precipitin tests<sup>70</sup> was proved to be human blood but there was not enough material for a group determination. The dry stain on the floor was found to contain albumin,<sup>71</sup> nasal epithelial cells<sup>72</sup> and also group A substance, the group being similar to that of the deceased. The shirts and handkerchiefs found in the package with the deceased's hat and shoe, contained group B substance which had been secreted in the sweat and nasal discharge of the person who had used them. The group substance in the shirts and handkerchiefs was therefore the same as that of the suspect. The hairs found in the knotted handkerchiefs were similar to those on the deceased's head. The brown paper bag containing the stocking, found near the head of the deceased, was traced to the liquor store where the suspect admitted he had bought the bottle of wine he was carrying when arrested. The wine had been wrapped in such a bag when it was sold.

The suspect at first denied any connection with the crime and was held as a material witness. When the significance of the incriminating scientific circumstantial evidence was explained to him, he confessed the murder, stating that he had manually strangled the deceased on the bed in his room, about twenty-four hours before removing her body to the sidewalk. He claimed that he strangled the victim because she had become drunk and noisy and had refused to leave his room after

<sup>70</sup> *Precipitin test*: An immunological procedure by which minute amounts of protein can be detected and the source identified. See, in this Symposium series, the study by Dr. William C. Boyd entitled "Forensic Immunology" published in the present issue of the *Journal of Criminal Law and Criminology*.

<sup>71</sup> *Albumin*: A protein found in nearly every animal and in many vegetable tissues, and characterized by being soluble in water and coagulable by heat.

<sup>72</sup> *Epithelial cells*: Cells of varying form and arrangement which make up the covering of the skin and mucous membranes.

drinking most of his wine. After the murder he had placed the body face down on the floor during which time the secretion from the nose and mouth drained out on the oil cloth to produce the stain which contained the group A substance. He had used his soiled handkerchiefs as a ligature to keep the deceased's mouth closed. After having carried the deceased's body from his room, he had gone back and wrapped the soiled handkerchiefs and his shirts and the deceased's hat and left shoe in the package which he discarded in a refuse can several blocks away. When he returned again to the room, he found that he had overlooked a stocking and put it in the brown paper bag. He had this bag containing the stocking in his pocket when he was arrested but managed to drop it unnoticed near the head of the victim when he was asked to view the body.

#### *Examination of Clothing as Part of Corpus Delicti*

The clothing of the deceased in a homicide case is an important part of the corpus delicti and must be carefully described and marked for identification by the medical examiner. Blood stains, and cuts and perforations produced by weapons and missiles are noted, as well as their location in relation to the wounds on the body. The examination of the clothing, as already pointed out, is most important in shooting cases, enabling the examiner to determine whether a certain wound on a covered portion of the body resulted from a close-up or distant shot. The clothes are also helpful in determining the direction of a bullet track, in cases where the bullet has passed completely through the body, producing entrance and exit wounds which are not readily differentiated. In such cases, the bullet may pass out of the skin through the exit wound but not completely through the clothing, which circumstance will indicate the direction of the bullet.

In a recent murder trial in New Jersey<sup>73</sup> presided over by Judge Egbert Rosecrans, the defendant admitted the fatal shooting but claimed that he did it in self-defense and there seemed to be strong corroborative evidence that this was so. The fatal bullet had passed completely through the body. The victim was operated upon and during this procedure a bullet wound on the front of the abdomen was obliterated. A bullet perforation on the back was interpreted as an entrance wound by the physician who performed the necropsy. Because of this interpretation, the self-defense plea of the perpetrator was not believed and he was indicted and tried for the murder.

Upon inquiry it was learned that the clothing worn by the deceased when he was shot, had not been examined. Fortu-

<sup>73</sup> *State of New Jersey v. Frank Pulsinelli*, Warren County Court of Oyer and Terminer, December Term, 1940.

nately it had been saved and was examined during the trial. The fatal bullet had perforated all the garments in front but not in the back, indicating clearly that the bullet entered through the front of the body, a fact consistent with the claim of self-defense. The defendant was acquitted.

#### *Other Examinations Connected With Necropsy*

A careful examination should also be made of any ligatures, gags or wads that may be found around the neck or mouth, or in the mouth and throat of the deceased, in cases of homicidal strangulation by ligature, and choking. Ropes, wires or any improvised ligature found on the extremities or body of a deceased person are described and saved.

#### *Preservation of Evidential Material*

The clothing of the deceased and other evidential material, such as ligatures and gags, are carefully preserved and delivered by the identifying police officer to the prosecuting attorney for use in any subsequent criminal prosecution of the case. The clothing of the deceased person must not be returned to the family. In those cases where the deceased dies in the hospital some time after he has received his injuries, the hospital authorities must be instructed not to deliver the clothing of the deceased to members of the family, but to save it for subsequent examination by the medical examiner at the time of the necropsy.

#### *Postmortem Findings and Conclusions Reported to Police and Prosecuting Attorney*

Upon the completion of the investigation and necropsy by the medical examiner in a case of homicidal death, the police authorities should be notified promptly of the findings in order to help them in their investigation of the crime. It is important to report cases of unsuspected violent death discovered at necropsy which are definitely or possibly homicidal. If the necropsy in an apparently suspicious case already under investigation by the police, does not reveal any evidence of criminal violence the police should also be informed of the findings.

The medical examiner's report is carefully corrected and a copy delivered to the prosecuting attorney. It is not permissible to divulge the findings in a homicidal case to any one else. Permission to inspect the postmortem records may be granted only by the district attorney.

In those cases which subsequently come to trial, the medical examiner is an important witness for the prosecution. However, he must always remember that he is not a prosecuting

witness and must not be biased. His opinions should always be warranted by the findings in his investigation and necropsy. He should consider himself *amicus curiae*.

### *Summary*

Inadequacies in the statutes pertaining to the Office of Coroner and Medical Examiner and in the organization and function of these medicolegal agencies are responsible for unsatisfactory postmortem investigation of homicide in most jurisdictions in the United States.

A fundamental defect in the statutes is the failure to recognize and provide for the fact that in many violent deaths there are not any externally obvious or suspicious signs of violence on the body of the deceased.

It is only by the routine investigation from the very beginning, of all sudden and unusual as well as suspicious and violent deaths, that unsuspected homicides will be detected. Paradoxically, those medicolegal systems which are concerned only with criminal deaths or obviously suspicious and violent ones fail most often to detect unlabelled homicides.

The medical examiner's system in New York City, Essex County (New Jersey), Nassau County (New York), and the State of Maryland which was established in these four places by almost identical statutes, possesses certain desirable features. It provides for the investigation of all violent, sudden, suspicious and unusual deaths and of deaths which have occurred without benefit of medical attention. It functions independently of other government agencies insofar as the medical investigations are concerned and it places upon the medical examiner alone the responsibility and the authority for the necessity and the performance of the necropsy in any medical examiner's case. Every stage of the medical examiner's investigation is carried out by trained specialists in legal medicine.

The postmortem examination in a case of homicide properly commences with the investigation by the medical examiner, or other authorized and qualified medical person, of the dead body at the scene where it is found. A complete and careful necropsy is subsequently performed on the body of the deceased by the medical examiner to determine the cause of death. The necropsy should include certain routine and special examinations, not necessarily connected with the cause of death, but which may subsequently prove important in the development of the case.