

MEDICO-LEGAL**The Identification of Human Remains**WILLIAM J. DEADMAN, B.A., M.B.,* *Toronto***ABSTRACT**

The identification of human remains, especially if they have been mutilated or burnt, or occur in skeletal form, may pose a major problem for the forensic physician. It may involve the co-operation of coroner, police officer, forensic pathologist and forensic laboratory. It is first necessary to demonstrate that the remains are human, and that the tissue in question represents one, or more than one, body. A meticulous post-mortem examination by the forensic pathologist will reveal all anatomical peculiarities for study and record. Photographs, radiographs, dental charts, fingerprints and blood type all contribute materially to the solution of the problem.

SOMMAIRE

L'identification de restes humains, surtout s'ils ont été mutilés ou brûlés, ou s'ils se présentent sous forme de squelette, constitue parfois une tâche difficile pour le médecin légiste. Elle peut exiger la collaboration du coroner, de l'officier de police, du pathologiste légiste et du laboratoire d'anatomopathologie. Il importe avant tout d'établir qu'il s'agit bien de restes humains et que les tissus examinés appartiennent à un seul et même corps ou à plusieurs. L'examen post-mortem méticuleux effectué par le médecin légiste mettra à jour toutes les particularités anatomiques qui seront ensuite étudiées et enregistrées. Photographies, radiographies, disposition et particularités des dents, empreintes digitales et type sanguin sont autant d'éléments qui contribuent à résoudre le problème.

SINCE the days of the Norman Conquest, the death of a human being has been a matter of vital concern to civilized states. All deaths must be recorded, and the cause of death must be certified by a licensed physician. Deaths from natural causes, as certified by a physician, call for no further activity on the part of the state, but obscure, accidental or homicidal deaths call for further investigation. The coroner, or his counterpart, takes charge of the body or of the remains, if they are shown to be human, and of subsequent investigation into the circumstances pertaining to the death. In the investigation, he is assisted by police officials and by the forensic pathologist and the forensic laboratory.

The finding of what is, or may be, human remains presents certain specific problems to the investigating agencies. It must first be established that the remains are human. The time elapsed since death must be estimated, and, if possible, identification must be established. The coroner or the physician first called can (a) attest to the death, (b) give an opinion whether or not the remains are human, (c) estimate the time elapsed since death, and (d) try to establish identification.

Human remains may be encountered as a recently dead body, a decomposing body, a fetus or fetal remains, burnt or mutilated remains, or skeletal remains. Identification of the recently dead

body presents, as a rule, least difficulty, since the points to be observed in the postmortem examination are, to a large extent, those apparent during life. In the case of the decomposing body, the difficulty increases, since postmortem degeneration obscures some of the criteria normally apparent. The identification of a fetus or of fetal remains, as those pertaining to a particular mother, must depend largely on evidence other than that which the physician or forensic pathologist can supply. The identification of burnt or mutilated remains often presents great difficulty. The identification of skeletal remains, of more than 50 years' standing, is difficult and usually impossible.

I. THE COLLABORATING AGENCIES

Identification may call for intensive efforts on the part of (a) the coroner, (b) the investigating police officer, (c) the forensic pathologist and (d) the forensic laboratory. When a citizen comes upon what is or may be human remains, he, as a rule, calls the police, who in turn call the nearest coroner or a physician. If the efforts of the coroner and the investigating police official fail, the assistance of the forensic pathologist and the forensic laboratory must be sought. Each of the four agencies can play an important and, at times, indispensable part in the identification of human remains.

*Medical Examiner, Attorney-General's Laboratory, Province of Ontario.

The coroner, when called, takes complete charge of the remains and of the investigation. In the case of burnt, mutilated or skeletal remains, he will (if in his opinion they are human) turn them over to the forensic pathologist, who may enlist the services of the forensic laboratory. In the case of freshly dead bodies, he will when indicated take the body temperature and will note the presence or absence of rigor mortis, and, if the latter is present, its distribution. He will note any postmortem changes apparent. He will be able to form an opinion as to the time elapsed since death. He will note and record sex, race, apparent age, height, weight, body conformation, complexion, colour of hair and eyes, condition of pupils, and of teeth, and any skin abnormalities, such as moles, scarring, tattooing or abnormal pigmentation. He will note any external anatomical peculiarities and any occupational stigmata. Many of these observations will be confirmed by the forensic pathologist when he is called upon, but body temperature and extent of rigor mortis may change considerably before he sees the body.

The investigating police officer makes a careful examination of clothing, personal effects, and of articles found on or near the body. He is responsible for the safe-keeping of exhibits and for their delivery to the appropriate agencies. He arranges for the taking of fingerprints, and for the necessary photographs of the remains and of its surroundings. He also carries out any follow-up investigation of a non-medical character. Labels and laundry marks on clothing, letters and cards, and rings and jewelry found on the body may all be of assistance in identification.

The forensic pathologist will, in the case of the recently dead or decomposing body, confirm the observations made by the coroner in his external examination. He will prepare a dental chart, if that is possible. He will, in the course of a thorough postmortem examination of the body, record all internal anatomical peculiarities. He will arrange for radiographic study of parts of the skeleton not studied at autopsy, and for photographs of lesions, when indicated. He will have the blood typed. Dental charts, fingerprints and blood typing are of great value, when antemortem records of these are available for comparison. In the case of fetal remains, it is necessary, if possible, to determine the fetal age. In the case of burnt or mutilated remains, the first task is to determine whether or not they are human, and this may call for special knowledge of anatomy, histology and serology. The precipitin test (see below) may settle the matter. In the case of skeletal remains, identification may call for a better than average knowledge of anthropology and osteology.

The forensic laboratory supplements the work of the forensic pathologist and of the investigating police officer. It brings to bear on the problems of identification the basic medical sciences, as well

as other natural sciences, in the examination of materials which may contribute to the solution of the problem.

II. CERTAIN CRITERIA ESSENTIAL FOR IDENTIFICATION

1. *Are the Remains Human?*

If burnt or mutilated remains include recognizable human tissue, identification is then a matter of anatomy. If, however, tissue is present which is unsuitable for anatomic identification, recourse must be had to the precipitin test for human serum. This test is carried out by submitting a saline or aqueous extract of the tissue to testing with an antiserum prepared by injecting human serum into a rabbit. If human serum is present in the extract, a precipitate will result. Burning or advanced postmortem decomposition of the tissue submitted may interfere with the test. The identification of skeletal remains as human presents little difficulty to the physician with an adequate knowledge of osteology.

2. *One or More Bodies?*

This question arises when mutilated or skeletal remains are submitted. A careful study of the tissue remnants, or a careful assembling of bones in their anatomical positions, will usually supply the answer.

3. *Sex*

In the case of adults or of children, or of a fetus beyond the fetal age of four months, the sex is easily determined on anatomical grounds. If burnt or mutilated remains include tissues with specific sex characteristics, determination of sex is not difficult. If the bones of the skull or of the pelvis are present or if long bones can be studied, sex may be determined.

4. *Race*

Where the body is entire and postmortem degeneration is not advanced, an opinion regarding race may be given. Where burnt or mutilated remains include skin, or scalp with hair, some evidence as to race may be obtained. Where burnt, mutilated, or skeletal remains include the skull and the jaws, a careful study of skull measurements, jaw angles, cheek bones, frontal prominences and of nasal and orbital apertures will be of great assistance in forming an opinion as to race.

5. *Stature*

Where an entire body or entire skeleton is presented, the determination of body length is not difficult. Where mutilated or partial skeletal remains are available, the approximate body length may be ascertained by the measurement of long bones and the use of a factor which has been

calculated. If long bones are missing but the vertebral column is complete, its length, multiplied by the appropriate factor, will give the body length within an inch or two.

6. The Dental Picture

The preparation of a chart recording the presence or absence of teeth, of fillings, of crown and bridge work or of dentures, is a *sine qua non*, when it can be prepared. It has its greatest value when a reasonably recent dental chart has been recorded and is available for comparison, but its preparation when possible should never be omitted.

7. Skeletal Radiograph

At autopsy, the forensic pathologist can note anatomical peculiarities of the skull, the ribs, the sternum, the pelvic bones, and, to some extent, the vertebral column. Past injuries or disease may leave tell-tale signs in bones not ordinarily inspected at autopsy. In the case of skeletal remains, radiographic study is not usually necessary.

8. The Blood Type

The typing of blood, where possible, is a routine procedure. An increasing number of persons have been typed, either as hospital patients or as blood donors. While typing alone can not establish identification, yet a comparison of the type with some previous record of blood type may serve to confirm or to negate identification based on other criteria. Determination of the ABO, the MN and the Rh types usually suffices.

III. ILLUSTRATIVE CASES

1. The Case of the Burnt Body

In a suburb of a large city, a frame residence burned to the ground. The burnt remains of a human body were found in the ashes. The body and its clothing were so badly burned that identification seemed impossible. Arson was suspected and an inquest was ordered. The investigation by the coroner and by the police failed to establish identity. Most of the criteria upon which identification is usually based had vanished. Fingerprints could not be studied and a dental chart could not be made. In the ashes near the remains, a metal charm, said to resemble one worn by the individual who had lived in the house, was found. Detailed examination of the remains revealed (a) that they were those of a human female, Caucasian in type, (b) that the stature was about 5' 4", (c) that the age was between 40 and 50 years, and (d) imbedded in the swollen burned flesh of the ring finger was found a ring, inside of which were the individual's initials. The ring was identified by a relative as one worn by the deceased. Identification appeared to have been satisfactorily established.

2. The Case of the Torso

Some years ago, in a neighbouring city, the headless, armless, legless body of a man was discovered in a

shallow grave covered with dead leaves. The first problem was one of identification, and this presented considerable difficulty. Most of the criteria usually relied upon were not available. The colour of eyes and of hair and the type of complexion were not apparent. No fingerprints were available, and no dental chart could be prepared. No clothing or personal effects were found with or around the body. Rigor mortis was not present. The torso was kept under refrigeration for a few days but was not identified. The coroner then ordered an autopsy which, it was hoped, might assist in the identification of the body. As a result, the following points were established:

(a) Rigor mortis had passed off and a very early postmortem change was noted in the stomach and duodenum. In consideration of the April temperatures, it was estimated that death had occurred between 10 and 12 days prior to the finding of the torso.

(b) The clear texture of the skin, and the finding of a half-dozen black hairs on the chest, led to the conclusion that the individual was a brunette, with dark hair and dark eyes.

(c) The length of the spinal column, multiplied by the appropriate factor, gave a height of about 5' 10".

(d) From the degree of calcification of the costochondral cartilages and the character of the bones generally, the age was estimated to be 40 to 45 years.

(e) Anatomical peculiarities noted were an undescended left testicle, an inflamed pilonidal cyst, and a healed fracture of two lumbar vertebrae.

(f) Based on hospital autopsy experience, the weight was estimated at about 185 lb.

A few days later, a gentleman who said that his nephew had been missing came to view the torso. With no knowledge of the postmortem findings, he stated that: (a) his nephew was a brunette with dark hair and dark eyes; (b) he was 5' 9" in height and weighed about 190 lb.; (c) he was 45 years of age; (d) he had an undescended left testicle; (e) a few years earlier, he had fallen off a roof and injured his back, and he spent some weeks in a cast in a neighbouring hospital; (f) in the course of employment he was occasionally off work with a "sore behind"; (g) he recognized the torso from having seen his nephew occasionally in the shower; and (h) that he was last seen alive 11 days before the date of the finding of the torso.

His employer verified his absence from duty for 11 days prior to the finding of the body, said that he was periodically off duty with a "sore behind". The records of the hospital concerned verified the story of his back injury, and a radiograph and report showed injury to the two vertebrae found in a fused and healed state at autopsy. There seemed to be no doubt of the identification in this case.

3. The Case of the Bones and Spectacles

Some years ago, a police officer brought to the laboratory parts of a human skeleton, and with it, articles of clothing, personal effects, toilet articles, a sewing kit, and two pairs of spectacles. These had been found on a farm in the northern part of the province. Forty-eight of the 206 bones of the human skeleton

were present, including the skull, jaws, pelvic bones, arm and leg bones, and a number of vertebrae. The personal effects appeared to be those of a woman. Careful examination of the skeletal remains showed that (a) they represented one body only, (b) they were those of a female of Caucasian type, about 5' 5" in height and about 40 years of age, (c) she had had good dental care, (d) four of the thoracic vertebrae showed lipping indicative of past osteoarthritis, and (e) five to 10 years had elapsed since death.

In the meantime, the police officer on the case had carried out a meticulous examination of the personal effects, and had discovered, on the plastic arm of one of the pairs of spectacles some scratches, which, after appropriate laboratory study, revealed a name, foreign in type. A search through the city directory turned up one name corresponding to that on the arm of the spectacles. This individual was located and interviewed. He stated that his wife had been missing for a little over five years. He identified some of the personal effects as those of his wife. He said that, a year prior to her disappearance, she had spent some weeks in a local hospital. A survey of the hospital chart showed that she was a European, 5' 5" in height, and 45 years of age. A dental chart, prepared at that time, showed exact correspondence with the dental picture as found in the jaws. A radiograph of her vertebral column showed a lipping of the four vertebrae, as it appeared in the skeletal remains. Identification had apparently been successfully accomplished.

SUMMARY

The identification of human remains calls for teamwork on the part of coroner, police official, forensic pathologist, and forensic laboratory, particularly in the case of burnt, mutilated, or skeletal remains. It must first be established that the remains are human. The presence of parts of one or of more than one body must then be determined. Sex, race, stature, age, and time elapsed since death must, if possible, be ascertained. A dental chart, a skeletal radiograph, and the blood type are extremely valuable aids in the solution of the problem of identification. In the case of skeletal remains found in Ontario, the services of the Attorney-General's Laboratory are available. (The Medical Director of the Ontario laboratory, Dr. Noble Sharpe, is one of Canada's leading experts in the identification of skeletal remains.) If such remains are of less than 50 years' standing, identification is often possible, but in the case of those of longer standing, identification as to sex, race, age and stature can usually be made, but identification as those of a stated individual is usually impossible.

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PAGES OUT OF THE PAST: FROM THE JOURNAL OF FIFTY YEARS AGO

TRANSIENT BLINDNESS IN HEART DISEASE

A lady, aged thirty-five, was first seen in 1910, suffering from mitral and aortic disease of long standing. The heart was much enlarged, and there had been many failures of compensation. Within the last four years the patient has suffered about thirty attacks of transient blindness in one eye, usually the right, occasionally the left. These "blind turns" have always occurred at night, awakening the patient suddenly from sleep with a sensation of alarm, and of a "queer feeling" in the head. She then discovers, in the faintly lighted room, that she is more or less completely blind in one eye. The loss of vision varies in different attacks from a general dimness of the whole field in the affected eye to complete functional loss. Vision gradually returns in from two to ten minutes, on an average. At first a central red glow of light appears, which gradually widens and pales in colour until the normal field of vision is regained. The recovery can always be hastened by the administration of a rapidly acting nitrite, and as soon as the pulse (which has been found small and firm on several occasions) has relaxed under the drug, any residual blurring of the vision field is promptly cleared up. On one occasion only was the writer able to observe the fundi during the brief period of unilateral blindness. The right fundus was markedly pale and blanched as compared with the left, and the branches of the retinal arteries that could be hastily noted were narrowed and threadlike, contrasting strikingly with apparently normal vessels on the opposite side. As vision became normal the rosy hue of the fundus gradually returned, and soon assumed the same appearance as its fellow.

Similar cases with a more precise description of the phenomena have been recorded by Priestley Smith, Osler, R. Lundie, of Edinburgh, and other observers. In Lundie's case he observed the gradual return of the blood column

into the constricted vessels by a series of peristaltic-like movements.

The patient here referred to has also suffered from other symptoms of which transient vascular spasm appears the most plausible explanation. Thus, at times the left hand and arm will feel numb and cold and will tingle; the hand may be felt to be colder than its fellow, and the radial artery has been noted to be temporarily smaller and more thready than the other. Nitroglycerine will promptly remove the symptoms. Again, the occasional headaches from which the patient suffers are characterized by a feeling of constriction in one or the other side of the head; they yield most promptly to vaso-dilators, and strongly suggest a localized spastic condition of the cerebral vessels as the underlying cause. Attacks of what may have been oesophagismus have been noted on two or three occasions. All these types of "vascular crises" tend to occur chiefly at or near the menstrual periods. The chronic congestion of the liver existent in this case, with probable impairment of its disintoxicating power, must be borne in mind when considering the underlying causes.

Such cases as the above are interesting because the fundus oculi is the only place where we can see spasm of the arteries, associated with loss of function. They have afforded valuable evidence in favour of a definite vasomotor supply to the cerebral vessels, evidence confirmed by the work of Morison and of Gulland, although it is generally believed that the vasomotor control is a relatively feeble one. In this case the accessible vessels were apparently healthy. The usual systolic pressure was about 115 mm., but during one attack of numbness and tingling of the left arm with complaints of "tightness" in the head, the pressure was noted at 150 mm. in the left brachial. Prompt relief of symptoms, with the relaxation of the artery and fall of pressure under nitrites was obtained.—A. Birt, *Canad. Med. Ass. J.*, 4: 859, 1914.