

Autopsy: The Changing Trends

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Abstract

Investigative dissection of a dead body primarily to find out cause of death is known as post mortem examination or Necropsy. Medicolegal autopsy or Forensic autopsy is performed following instructions of legal authority in sudden, suspicious, obscure, unnatural or criminal deaths. Autopsies are of two types i.e. Medico legal autopsy and Pathological or Hospital autopsy. Traditional procedures of autopsy need extensive dissection, which lead to mutilation of the dead body. As such, it has been unpopular amongst various religions and communities. To overcome this, many other variants of autopsies have developed over the years. Though many consider the autopsy to be an antiquated procedure, many changes have already occurred in the procedure. This paper attempts to explain various types of autopsies, the changing trends and analyses the advantages and disadvantages associated with them.

Key words: Digital autopsy, needle autopsy, molecular autopsy, endoscopic autopsy.

Introduction

Postmortem examination is a statutory requirement in all sudden, violent, unexplained, suspicious and litigious deaths. A meticulous autopsy includes external examination, internal examination that includes both gross and histopathological examination and / or toxicological examination. A properly conducted autopsy aided by modern methods is not only an essential part of an undergraduate and postgraduate teaching programme but also plays an important role in investigation of both natural and unnatural deaths.

Autopsy is a general term, which is derived from the word “autopsia”, meaning is to see for oneself. The

word autopsy is used to denote a scientific postmortem examination of the deceased to determine cause and manner of death. Autopsies are of two types i.e. Medico legal autopsy and pathological autopsy. The most essential features of medico legal autopsy are that it must be proper and complete. Apart from determining cause of death (which may be the simplest, least controversial part of investigation) the Pathologist must be able to recognise, interpret and preserve evidence, whereas in hospital autopsy, it can be limited where the primary objective is to determine cause and mechanism of death.

Procedure of autopsy is often found to be crude, involves mutilation of the body and unpopular amongst many religions. With passage of time various

techniques have been developed and sophisticated instruments used in order to minimise the mutilation of the dead body. The present article analyses various types of autopsies available, the changing trends and the advantages and disadvantages associated with them.

Historical aspects:

Evolution of Forensic Medicine dates back to 4000 – 3000 B.C. when medicolegal practice was guided by the Hammurabi's Code. The concept of postmortem examination began around 100B.C when Antistius examined the body of Julius Caesar detecting twenty-three injuries. However, first medicolegal autopsy was conducted in 1302 A.D. at Bologna, Italy. In 1374, Pope gave the permission for autopsy examination. During 16th and 17th century the Caroline Code recognised essentiality of medicolegal autopsy and during this period autopsy was made obligatory. In India, it is reported that Dr. Buckeley held the medicolegal postmortem examination in August 1693 at Madras and Dr Hamilton at Calcutta in 1725. [1]

Discussion

Autopsy or Postmortem examination in a medicolegal case is an important duty and responsibility of the Pathologist. Without this, no investigation of death could be considered complete and satisfactory. [2]. During the autopsy procedure, the Forensic pathologist not only determines the cause and manner of death, but also collects physical evidence which would undergo further examination by Forensic scientists. These findings are then interpreted by testimony in a Court of law. In short, this scientific examination is carried out under the laws of state mainly for the protection of

its citizen and to assist in prosecution of the guilty. Before commencement of Medico legal autopsy, an authorization from an appropriate authority must be presented. The authority may be the police or magistrate or the coroner depending upon the case or country, where the investigation is held.

On the other hand, when death occurs due to natural causes but to know the exact cause, or to know regarding the spread of the disease, the postmortem examination that is performed is known as "*Pathological or Clinical autopsy*". In this type of postmortem examination, requisition from law keeping authority is not required, but consent from the next of the kin or relatives are essential to perform autopsy. [3]. In certain cases, relatives may give consent for removal of specific organ with permission specifying only to draw incision on the required section (Thoracic /Abdominal/ Cervical/ Head) of the body. [4]. This type of autopsy is called "*Partial or restrictive autopsy*". In many religions and in the minds of many people, autopsy is considered to be a procedure that leads to disfigurement and thought to be a disgraceful act towards the dead body. This partial and limited autopsy is useful in relation to pathological or clinical autopsy where there is no litigation. Moreover, it expresses due respect to the body that concerns the family members. There is another variant of this, called "*Selective autopsy*" where only selected organs like heart, brain, etc are allowed to be examined. Reopening the surgical wound called "Autopsy through surgical wound" can perform sometimes autopsy. In this one advantage is that there is no additional disfigurement done to the body. The body or the regions are opened through the existing surgical incision drawn prior to death, thus avoiding any additional incision. Another variant, where autopsies done through anus or vagina are only of historic interest. [4]

The procedure followed in “*Fetal or Pediatric autopsy*” is almost similar to adult autopsy. Apart from determining cause of death, in fetal autopsy Forensic Pathologist need to determine, whether child was still born or dead born, attained viability or not, whether the child was born alive or not and if born alive, how long did the child survive? If on Autopsy, the newborn is found to be not viable or immature than the charge of infanticide stands withdrawn. To determine viability, ossification centers of various bones like sternum, lower end of femur, upper end of tibia, calcaneum, talus and cuboid are sectioned on a wooden board with a cartilage knife. Ossification centers in various parts of the skeleton, in particular the bones of the hand and feet can be determined by X-ray. This is a much less invasive method of approach and provides evidence similar to that of dissection. [5] For the removal of the viscera en masse technique is adopted [6]. For opening of the skull, windows are cut into parietal bone, which is known as “Beneke’s technique”. [4] To know about live birth, hydrostatic test is performed. While doing fetal autopsy, the autopsy surgeon must not forget to rule out any violence involved in the death of the fetus or infant.

Sometimes the autopsy surgeon may have to hold postmortem examination on the mutilated or fragmentary human remains or some skeletal remains. After the invention of DNA-Fingerprinting method, it has becomes much easier for identification of mutilated or fragmentary human remains. Now a days suicide human bomb are commonly used during terrorist attack, and due to that autopsies on fragmentary human remains have increased. By the use of DNA-fingerprinting, the investigating agency not only identifies the innocent victim but also able to identify the suicide bomber. DNA – typing is now replacing precipitin or antiglobulin inhibition test

for the identification. If only skull is available with mutilation for examination, instead of traditional superimposition technique, recently developed computerised video-superimposition technique is used with digital image processing technology. Recently computer software has been developed in India in which laser scanner is utilized for computer graphic superimposition technique. [7] In autopsy of fragmented human remains, meticulous examination is required to know about the manner of separation of parts and determination of the cause of death. When the skeletal remains that are recovered from various places like open land, forest, ditches, exhumed from burial ground and sent to the forensic pathologist by the police for examination, it is referred to as “*skeletal autopsy*”. Procedure of examination of skeletal remains is almost similar to that of autopsy performed on fragmented human remains.

Lawful disinterment or digging out of a buried body from the grave is known as exhumation. The main objective of exhumation is to confirm individuality, which arises after burial, or when any foul play is suspected in cause of death or when first autopsy is challenged. Postmortem examination on the exhumed body is known as “*exhumation autopsy*”. If poisoning is suspected, samples of earth should be collected and preserved. Care must be taken to interpret various artifacts due to embalming, first autopsy or decomposition. After burial of the body, if discrepancy arose regarding cause of death, or first autopsy report is challenged or ambiguous, the forensic pathologist may then be asked to perform “*second autopsy*”. If possible the first Autopsy Pathologist should be called to correlate all the findings. Interpretation of the findings of second autopsy become difficult due to various artifact of burial and exhumation and alteration resulting from first autopsy. As majority of Indian population are

Hindus and they cremate the body after death as early as possible, the incidence of exhumation autopsy and second autopsy is quite rare in India. [8]

If due to any reason, like objection from the family of the deceased or where there are no traditional dissection facilities available in the vicinity of the hospital, postmortem examination can be performed with the help of endoscopy. This is known as “*Endoscopic autopsy*”. [9] Endoscopy is an instrument, which is useful for both diagnosis and therapeutic purposes. It is useful to visualise sinuses, auditory meatus, larynx etc. Now it can be useful to visualise internal injuries or disease process without opening the dead body. [10] The procedure is similar to the procedure of endoscopy used for clinical diagnosis. A study in Israel [9] found endoscopic postmortem examination to be extremely reliable in the assessment of intraperitoneal and thoracic injuries and more important is ruling them out. In the same study endoscopic autopsies were performed on 20 cadavers. It showed less sensitive for retroperitoneal and posterior mediastinal investigation i.e retroperitoneal hematoma was identified in 2 of 3 cases and injury to great vessels in 3 of 4 cases. Samples like body fluids and tissues, necessary for investigation can be obtained during endoscopic autopsy. It can be a good alternative for complete pathological autopsy when the lesions are in abdomen or thoracic cavities. Another variant known as “*Needle autopsy*” which is done when there is no permission from the relatives for regular hospital autopsy, but they would agree to multiple sampling by needles. Vim-Silverman needle is recommended for this. [4]

With the advent of modern imaging technologies like Magnetic Resonance Imaging (MRI) and Multi-Slice Computed Tomography (MSCT), the traditional autopsy methods in Forensic cases have been

revamped. MSCT is a newer generation CT scanner introduced in 1998, which allows for scanning of complete anatomic regions of the body within few seconds. By this procedure it is possible to reconstruct three-dimensional views to visualise soft tissues and bone. This virtual forensic autopsy done with help of imaging technologies with minimally invasive procedure is known as “*digital autopsy*”. Radiological imaging techniques are particularly beneficial for reconstruction and visualization of forensic cases, including the opportunity to use the data for expert witness reports, teaching, quality control, and telemedical consultation. [11] Study conducted in 27 cadavers, in which cadavers were examined by sequential cranial computed tomography (CT) and helical CT and subsequently underwent an autopsy with histomorphologic examination and compared. In 19 of 27 cases the finding explaining the cause of death were concordant for CT and autopsy. [12] A study in Switzerland [13] showed that “*virtual histology*” with help of magnetic resonance microscopy (MRM) can be done against routine histology. In the same study MRM was first used to study electrical injury pattern in human skin. MRI can be useful to detect intramuscular haemorrhage i.e in sternocleidomastoid muscles and subcutaneous neck tissue in case of hanging. [14]

Half of all pediatric sudden unexplained death cases have normal structural autopsy and disposed without a diagnosis. With discovery of the genetic basis of fatal arrhythmias associated with the inherited long QT syndrome (LQTS), postmortem molecular diagnosis of this disorder is possible. Till date, six LQTS genes, and more than 200 mutations have been identified in patients. By probing these molecular targets, Forensic evaluation of sudden unexplained death is possible. This is known as “*Molecular autopsy*”. Concealed LQTS can be diagnosed in the

survivors by catecholamine provocation testing. [15] Diagnosis of concealed LQTS in survivors is not only helpful to identify additional at risk individual of the same family but also helpful in diagnosing LQTS in deceased.

The main aim of an autopsy is the determination of cause of death. However, in practice it is not possible to establish true cause of death in every case. It is a fact that, in some instances, no clear-cut findings are found so as to give a definite cause of death, in spite of properly done meticulous and perfect autopsy. It is known as “*obscure autopsy*”. There are times when all efforts and investigations including gross, microscopical, toxicological and other laboratory tests fail to reveal cause of death, it is known as “*negative autopsy*”. [16] In medicolegal cases no doctor should entertain guesswork in establishing cause of death, and it is justifiable to give cause of death as undetermined.

A special type of autopsy known as “*psychological autopsy*” which includes perusal of demographics, life styles, personality features, background information and psychological interpretation of a deceased person who had committed suicide and motive is derived there from. [1&3] Although the psychological autopsy is in use since 1958, its constituent elements are yet to achieve both consensual validation and operational standardization. [17] Most commonly the information will be obtained by interviewing the survivor of the deceased and from archival sources. [18] Psychological autopsy is not really an autopsy but it is one of the most valuable tools of research on completed suicide. Admissibility of psychological autopsies is vary from case to case. In a study it has seen that 95 medical examiners who received only physical and circumstantial evidence gave distinctly different judgments compared with 100 who had the same reports augmented by psychological autopsies.

[19] Recently psychological autopsy studies have been better able to estimate the role of various risk factors for suicide, which may be useful for suicide prevention by focusing on specific suicide population. [20]

Another variant known as “*verbal autopsy*” is an indirect method for estimating cause-specific mortality. [21] Reliable information regarding cause of death is extremely useful for setting priorities in health sector. In India, there are two schemes for monitoring cause of death. One is medical certification of cause of death, mainly from urban areas and hospitals. Second one is survey of causes of death from rural areas. One primary objective of the survey would be to build up statistics on “most probable causes of death” using lay diagnosis reporting methods (post death verbal autopsy) through post death enquiry. Verbal autopsy is an investigation of train of events, circumstances, symptoms and signs of illnesses leading to death, through an interview of relatives or associates of the deceased. [22] From 1st January 1999, verbal autopsy has been introduced in sample registration system (SRS) in India. Many studies have already shown that it is feasible, practical and gives a good approach to the cause and manner of death. [22,23, 24&25]

The forensic autopsy is conducted on the instruction of the legal authority primarily for cause of death. For the legal purpose a registered medical practitioner only is entitled to give cause of death and can give evidence in court of law as an expert. But when cause of death is known and in absence of any offence particularly person dying in hospital after having survived for a certain period, conducting postmortems is an exercise without any aim. After autopsy, conducted over thousands of people dying in hospital, neither the death of a patient due to

negligence of attending doctor nor an offence had been detected by the autopsy surgeon. [26] There are some instances where accused were sentenced to death without autopsy on the body of victim. [26] These type of instances are very rare because disputing scientifically given report has become a part of modern medicolegal culture and law enforcing authority do not want to take chance. Extensive dissecting manoeuvres are often used when cause of death is known no offence is detected or the offender himself dies. Instead of doing routine and traditional autopsy in these type of cases, modern technique or methods can be tried which is less mutilating (as in endoscopic or partial autopsy) or even without drawing incision over the body (as in digital autopsy using MSCT and MRI).

In conclusion, autopsies held on apparently non-criminal death such as accident, suicides, sudden death or when death associated with medical/surgical treatment or where there is little or negligible dilemma regarding nature and cause of death, in such cases modern techniques or methods can be used in order to prevent undue mutilation and to save valuable time. But to use modern techniques such as CT, MRI and endoscopic instrument, special training is required by the pathologist. In the era of medico legal culture, use of this methods for frankly criminal deaths (Homicide, manslaughter, infanticide etc) lead to dispute and law enforcing authority do not want to take chance. But use of such newer techniques in day-to-day medico legal autopsies demands a lot of debate amongst the medical fraternity, law enforcing agencies (Police and Judiciaries) and people from political sphere. Although modern methods are the want of the hour, till date complete whole body autopsy by using thorough dissection still remains the autopsy method of choice.

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