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ESSENTIALS OF AUTOPSY PRACTICE - A REVIEW

Devika. B¹, Jothi Priya . A², V. Vishnupriya³

¹Saveetha Dental College & Hospital, Saveetha Institute of Medical and Technical Sciences,
Saveetha University, Chennai - 600 077

²Assistant Professor Department of Physiology, Saveetha Dental College & Hospital,
Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600 077

³Professor Department of Biochemistry, Saveetha Dental College & Hospital,
Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai - 600 077

¹151901081.sdc@gmail.com, ²jothipriya.sdc@saveetha.com, ³vishnupriya@saveetha.com

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ABSTRACT:

Post mortem examination of a dead body is carried out to gain insight into the disease process as well as for forensic application of medical knowledge. The autopsy is now often regarded as of marginal use in modern clinical practice. Although different specialists viz: pathologist and forensic medicine experts, carry out autopsy for these purposes. On many occasions there may be overlap between these two fields of medicine. Among the very important investigative actions is the autopsy. It is conducted by forensic doctors that work- competent. The autopsy was realized with a court order and performed the function of whitening / lightening of the investigation, given that the main purpose is to conduct the autopsy as the cause of death. Autopsies also generate more accurate vital statistics, provide pathological descriptions of new diseases, and offer powerful tools for education and quality assurance. The scientific, educational, and public health benefits of the autopsy, though generally acknowledged, remain difficult to quantify. However, autopsy plays a demonstrably important role in confirming or overturning diagnoses entertained by treating physicians. Many doctors lack familiarity with autopsy practices, and are insufficiently aware of the benefits for not only bereaved families but also present and future patients. The decline of the autopsy at least partially reflects the absence of incentives for performing it. The study reveals the essentials of autopsy practice.

INTRODUCTION

Autopsy, literally meaning self study of a dead body, is carried out for clinical as well as medicolegal purposes. Clinical autopsy, also called as pathological autopsy, is carried out to diagnose the disease which has caused the mortality when ante-mortem efforts have failed. Many times clinical autopsy is done even though the cause of death has been established ante-mortem to study the disease process in situ, thus enhancing medical knowledge [1]. 20% of all deaths are subjected to medical-legal autopsies. In many countries where relatives consent is required, however, including the UK, clinical autopsy rates have been declining since the 1950s. In the UK, even in teaching hospitals, the clinical autopsy rate has fallen to only 10% of death or less [2]. If clinical autopsy rates continue to decline, such autopsies and the pathologists who perform them will also become extinct, leaving the future practice of medicine blind to many adverse consequences of clinical actions or omissions. Public health measures to reduce mortality from common fatal conditions by scientific validation will be hindered [3]. In clinical practice, autopsy contributes to medical knowledge, medical training, accurate mortality statistics, epidemiologic databases, and therapeutic and diagnostic improvements [4]. Despite continuing development of innovative new diagnostic techniques, these are substantial discrepancies between ante-mortem and post-mortem diagnosis [5].

Over the last decades, MR imaging has been introduced in clinical medicine for perinatal and neonatal autopsy [6]. Many other clinically established imaging techniques have come to light for broad post-mortem use in forensic medicine. Among these are image - guided biopsies, and CT - (or) MR - angiography [7]. Endemic goiter is the enlargement of the thyroid gland due to iodine deficiency. This type of goiter is very common in people living in regions far from the shore where the iodine resources are nominal. Some common symptoms seen in hyperthyroidism are palpitations, anxiety, convulsion, etc. Hypothyroid individuals have weight gain despite poor appetite, cold intolerance, constipation and dullness. Treatment involves medical and surgical techniques. In case of iodine deficiency, the person is asked to consume more iodine in his/her diet [8]. An autopsy case of the congenital goiter of a female newborn is presented. It was an adult-fist sized, horse-shoe like goiter surrounding her fore-neck, and caused air passage obstruction which most probably was the immediate cause of her death. Histologically, the mass consisted of hyperplastic follicles occasionally containing eosinophilic, colloid-like substance [9].

This review was done based on the articles obtained from various platforms like PubMed, Scopus, PubMed central and Google scholar. They were collected with a restriction in time basis till June 2020. The inclusion were original research papers, in vitro studied among various conditions and articles that contain pros and cons. Exclusion criteria came into account for review articles, retracted articles and articles of other languages. All the articles were selected based on Essentials on Autopsy.

They are determined by article title, abstract and complete article. When article holder websites were analysed on the topic of Essential on Autopsy, more than 2000 articles and based articles were found, when it was shortlisted

based on the inclusion and exclusion criteria, the number of articles were lowered to 130 articles. When timeline and other factors were quoted only 48 articles collected came into play. This article is reviewed from the 48 articles collected. Quality of articles used was assessed using a quality assessment tool and graded as strong, moderate and weak. The data was collected and quality analysis of the collected data was done using Health Evidence's Quality Assessment Tool (*Health EvidenceTM Quality Assessment Tool, 2005*), and the data was shown in a tabular column (Table 1). The knowledge at current point of time analysed and thus the consensus was established.

Table:1. QUALITY ANALYSIS OF THE REVIEWED ARTICLES

REF. NO	AUTHOR	YEAR	TAKEN FROM	QUALITY OF STUDY
1.	Kotabagi RB et al	2005	Pubmed	Weak
2.	Start RD et al	1993	Pubmed	Strong
3.	Ayoub T et al	2008	Pubmed	Weak
4.	McDonald KM	2002	Pubmed	Weak
5.	Murken DR et al	2012	Pubmed	Moderate
6.	Brookes JA et al	1996	Pubmed	Strong
7.	Ruder TD et al	2012	Pubmed	Weak
8.	Samuel AR et al	2015	Google scholar	Weak
9.	Okayasu I et al	1973	Pubmed	Moderate
10.	Shojania KG et al	2003	Pubmed	Moderate
11.	Benbow EW	1990	Pubmed	Strong
12.	Komorowski RA et al	1988	Pubmed	Strong
13.	Fathima F et al	2016	Google scholar	Strong
14.	Noritake K et al	2011	Pubmed	Moderate
15.	Harsha L et al	2015	Google	Weak

			scholar	
16.	Dave PH et al	2016	Google scholar	Weak
17.	Foroudi F et al	1995	Pubmed	Strong
18.	Entman ML et al	1994	Pubmed	Weak
19.	Renuka S et al	2015	Google scholar	Moderate

20.	Davies MJ	1992	Pubmed	Weak
21.	Michaud K et al	2020	Pubmed	Weak
22.	David et al	2019	Google scholar	Strong
23.	Shruthi M et al	2018	Google scholar	Strong
24.	Iyer PK et al	2019	Google scholar	Strong
25.	Swathy S et al	2015	Google scholar	Moderate
26.	Blokker BM et al	2017	Pubmed	Strong
27.	Blokker BM et al	2016	Pubmed	Strong
28.	Blokker BM et al	2016	Pubmed	Moderate
29.	Yagoda WD et al	2009	Google scholar	Weak
30.	Bolliger SA et al	2008	Pubmed	Weak
31.	Thayyil S et al	2013	Pubmed	Strong
32.	Kapatia G et al	2019	Pubmed	Moderate
33.	R GayathriDevi et al	2018	Google scholar	Strong
34.	Milroy CM	2018	Pubmed	Weak

35.	Choudhari S et al	2016	Google scholar	Weak
36.	Fisher AM et al	1931	Google scholar	Moderate
37.	Baheerati MM et al	2018	Google scholar	Weak
38.	Ilankizhai Rj GD	2016	Google scholar	Strong
39.	Abigail et al	2019	Google scholar	Strong

40.	Timothy CN et al	2019	Google scholar	Strong
41.	Tlsometsa E	2001	Pubmed	Weak
42.	Hawton K et al	1998	Pubmed	Moderate
43.	Knoll JL 4th	2008	Pubmed	Weak
44.	Cavanagh JTO et al	2003	Pubmed	Moderate
45.	Siegel J et al	2000	Scopus	Weak
46.	Hull MJ et al	2007	Pubmed	Strong
47.	Nemetz PN et al	2006	Pubmed	Strong
48	Jeremy Howick et al	2011	Pubmed	Strong

IMPORTANT OF CONVENTIONAL NON-CORONAL HOSPITAL AUTOPSY

The information obtained from autopsies not only instructs and confirms but also serves as a pathway of study and source of investigation. It remains a necessary tool in explaining the changing spectrum of diseases. The goal of autopsy is not to point out to clinicians their mistakes or judge them but rather to inform clinicians so that they learn from their own mistakes. Despite improvements in diagnostic technology, the frequency of mis-diagnosis has not decreased significantly [10]. Discovery of clinico-pathological discrepancies in the post-mortem room is also a powerful tool for spotting faults in medical practice and the need for clinical audit utilising autopsy data. However, many pathologists do not appreciate students' psychological reactions to seeing distracted cadavers; their emotional experience may detract from the potential educational benefit. It is therefore the pathologist's duty to ensure that appropriate steps are taken to minimise these reactions so that the

autopsy is an educational experience for students [11]. According to previous research, thyroid glands from autopsies on 138 adults, ages 20 to 40 years, with unknown clinical or laboratory evidence of thyroid disease, were serially sectioned at 2 mm intervals and microscopically examined for occult thyroid disease and anatomic variations [12]. Thyroid is a large ductless gland which secretes hormones regulating growth and development through rate of metabolism. Thyroid hormones play critical roles in differentiation, growth, and metabolism [13]. Autopsy was conducted on a 54-yr-old man by a medical examiner to clarify the cause of death. Externally, manifestations of severe jaundice were apparent over the whole body, along with extensive abdominal swelling and edema of the extremities. The liver (650 g) was elastic hard and had a micro-nodular surface, which exhibited severe atrophy [14]. Jaundice is a yellowish pigmentation of the skin and other tissues. At an adult level of 34 $\mu\text{mol/l}$ (2 mg/dL) would look icteric. Kernicterus is a bilirubin-induced brain dysfunction. Bilirubin is a highly neurotoxic substance that may become elevated in the serum, a condition called hyperbilirubinemia. Hyperbilirubinemia may cause bilirubin to accumulate in the gray matter of the central nervous system [15]. Asthma prevails and affects almost 20 million people in the United States and more than 300 million people worldwide. Asthma is a heterogeneous group of conditions. Obstructive airway illnesses are manifested with chronic inflammation affecting the whole respiratory tract. Asthma education programs focused on asthmatic inner-city black males, especially those with a history of drug abuse, and on parents of inner-city asthmatic infants and children may be a useful preventive strategy [16].

ALTERNATIVES TO A FULL AUTOPSY:

LIMITED AUTOPSY:

Full autopsy is unexcelled as a method of auditing. The reliability of clinical diagnosis, because complete dissections of the body ensures significant unexpected morphological findings are detected. An alternative form of limited autopsy is the use of Endoscopic techniques that do not require the large incisions or removal of organs for which some relatives may withhold their agreement. This form of autopsy of autopsy can only be performed by a person skilled in the operation of such a device, and can only be used in the areas of the body that will allow passage of an endoscopic device [3]. However, a study comparing the needle biopsy post-mortem with the conventional autopsy concluded that needle biopsy is inferior to the conventional biopsy [17]. Myocardial infarction (MI) is a major cause of death and ailment worldwide. It is associated with an inflammatory reaction, which is a prerequisite for healing and scar formation [18]. When blood flow stops to some part of the heart due to blockage of coronary arteries in the heart. It causes damage to the heart muscles. This in-turn leads to improper function of heart. If it is untreated, the inadequate vascular supply leads to myocytes loss. In response, rupture of myocytes and deposition of fibrous connective tissue occurs, which may cause cardiac dilation, resulting in overload of heart. This condition is called Ischemic Cardiomyopathy. It may also lead to sudden death [19]. The most frequent cause of acute myocardial ischemia is atherothrombotic occlusion of a coronary artery [20]. The presence of a mural or totally occlusive thrombotic mass can be observed at autopsy in approximately 50–70% of sudden coronary deaths and is a reliable marker of

myocardial ischemia, even in absence of microscopically visible necrosis [21]. A comparative study of cervical spines from 16 subjects who died of major trauma and 16 control subjects who died of natural causes, showed clefts in the cartilage plates of the intervertebral discs in 15 of 16 spines from the trauma victims. Precise manner of long working hours, inability to select the appropriate size of dental instruments and high job demand are the most significant risk factors. Back and neck pain has been found to be a major health problem for dental physicians with musculoskeletal disorders affecting the physical, psychological and social aspects of dentists. This, in turn, has a great impact on their productivity and ultimately reduces their quality of life. Musculoskeletal disorders contribute significantly to sick leave, and reduced productivity and quitting the profession [22]. Tongue position was recorded in all cases where position of the tongue could be visually determined. The condition of the body was recorded as follows: fresh flaccid, fresh with rigor mortis, early decomposition, and advanced decomposition [23]. Ingrown toenail is one of the most common nail disorders. Since teenagers are the most agile group, they are more prone to the disease. This disease can be easily avoided by maintaining the hygiene of the feet and by wearing proper fitting shoes. Onychocryptosis (ingrown toenail) and onychomycosis are common pathologies of the toenail and affect many people. Since levels of trace elements have been shown to vary in certain diseases, in the presented work, chromium (Cr), copper (Cu), iron (Fe), magnesium (Mg), manganese (Mn), selenium (Se), and zinc (Zn) levels of toenail and serum samples of healthy individuals and patients with onychocryptosis and onychomycosis were compared [24]. Acupuncture is a traditional Chinese treatment that involves the stimulation of specific acupuncture points usually with a needle. It involves triggering of the acupuncture points which corrects the disruption of energy flow and the imbalances in the flow of qi (life) through channels called meridians. Though acupuncture is regarded as pseudoscience sometimes, it proves itself good on treating certain conditions. A 52-year-old man underwent acupuncture and cupping treatment at an illegal Chinese medicine clinic for neck and back discomfort and was admitted to the hospital with severe gasp and dyspnea about 30 hours later [25].

NON-INVASIVE AUTOPSY

Autopsies are important, not only for identifying the cause of death and related pathology, but also for health care quality control, vital statistics and education. The steady decline of autopsy rates world wide is worrying [26]. The possible explanation may be the invasive nature of the procedure [27]. Non-invasive or minimally invasive autopsy procedure has been developed as alternatives to invasive autopsy, and maybe more acceptable to the next of kin [28]. As an advantage over the autopsy, the minimally invasive autopsy provides a permanent integrated record of imaging and histology that can be revisited for re-interpretation of the post-mortem findings. In addition, it is a valuable source for research and teaching purposes [29].

In the forensic setting, non-invasive or minimally invasive autopsies are mainly used as an adjunct to, rather than a replacement of invasive autopsy [30]. Extensive research on the value of post-mortem perinatal imaging as an alternative to the non-forensic autopsy has been done, and efforts are made to

facilitate the transfer of high-quality evidence from research into clinical practice [31]. Likewise, the potential of minimally invasive autopsy in hospitalised adult patients is now under investigation. Adenoid cystic carcinoma is a common malignancy that arises within the salivary glands, it is seldom encountered as a tracheal mass and represents < 1% of all lung cancers [32]. An adenoid is the lymph tissue and is located on the upper airway between the nose and the back of the throat. Adenoids are the part of the immune system, and it fights against an infection thereby protecting the body [33]. For a diagnosis of Non-Alcoholic Steatohepatitis (NASH), alcohol consumption should be less than 20 grams per day. Although significant ethanol consumption is an exclusionary criterion for the diagnosis of NASH, patients classified as having NASH were found to have had a significant lifetime exposure to alcohol. As there is overlap between NASH and alcoholic steatohepatitis (ASH) histologically, with the exception of an increased incidence of glycogenated nuclei in NASH, it can be impossible to tell the two disorders apart, especially in a medicolegal investigation when medical and social history may be limited [34]. Non-alcoholic fatty liver disease (NAFLD) is an increasingly prevalent condition affecting adults and children, leading to significant morbidity. It is often associated with the metabolic syndrome, although multiple pathogenetic mechanisms have been suggested [35]. A case is presented of a man of 32 years with a typical history of asthma for two years. No definite allergic etiologic substance was found, but his allergy was thought to be bacterial in origin, and he apparently died of asphyxia during an acute attack. Small holes were found in both lungs with an escape of air into the pleural cavities, but without collapse of the lungs [36]. Infertility is a growing problem, affecting approximately 15% of couples worldwide. Male infertility can be detected by semen analysis test. Male infertility is caused by physical problems that prevent the sperm ejaculation from the semen. Histological findings of testicular biopsy were studied following the Johnsen's score count method in 68 cases of idiopathic male infertility, and the relation between serum levels of luteinizing hormone (LH), follicle stimulating hormone (FSH), and testosterone (T) and histological findings were analyzed in the same cases. This fact might indicate that absence of T in Sertoli cells is related to spermatogenetic maturation [37]. Sleep loss and sleep disorders are among the most common yet frequently overlooked and readily treatable health problems. It is estimated that 50 to 70 million Americans chronically suffer from a disorder of sleep and wakefulness, hindering daily functioning and adversely affecting health and longevity. It is clearly evident that the group which is most affected are the adolescents. There are few autopsy studies of patients dying suddenly with obstructive sleep apnea (OSA) [38]. Many dentists experience the MSDs, especially in cervical region, as a consequence of occupational stresses. Therefore, detecting occupational risk factors, standards of work position, regular exercise and following ergonomic policy are intensely recommended. Prevalence of musculoskeletal symptoms among dentists represents a major occupational health issue. An abundance of subsarcolemmal mitochondria located close to the capillaries, efficient capillary proliferation between fibres where sharing can occur and greater relative distribution and size of type I fibres are, collectively, efficient characteristics of extreme endurance training [39]. PEF was assessed at baseline along with chronic conditions and smoking history. The onset of

persistent disability in activities of daily living (ADL), continuous mobility disability, and death were ascertained during monthly interviews over a five-year period [40].

PSYCHOLOGICAL AUTOPSY

Psychological autopsy is considered as one of the most valuable tools of research on completed suicide. The procedure involves collecting all accessible particulars on the deceased through structured interviews of family members, relatives or friends as well as attending health care personnel. Moreover, information is collected from available health care and psychiatric records, other documents, and forensic examination. Thus a psychological autopsy synthesizes the information from several informants and records. The early generation of psychological autopsies established that more than 90% of completed suicides have suffered from usually comorbid mental disorders, most of them mood disorders and/or substance use disorders. Additionally, they disclosed a remarkable undertreatment of these mental disorders, often despite contact with psychiatric or other health care services. Current psychological autopsy studies have predominantly used case-control designs, thus having been better able to estimate the role of various risk factors for suicide [41]. The major obstacle to an understanding of suicide is the victim cannot be interviewed and the recent directly ascertained. One solution has been the development of the psychological autopsy. This technique is based upon a combination of interviews of those closest to the deceased and an examination of corroborating evidence from sources such as the Hospital and general practice case – notes, social work reports and criminal records. Psychological autopsy is probably the most direct technique currently available for determining the relationship between particular risk factor and suicide. This type of intensive approach not only provides information but also aids the interpretation of studies employing other techniques [42]. According to PPC article 79 (post-mortem examination and autopsy, forensic examination of a dead body is accomplished by a physician. During the examination, medical identity of the corpse, time of death and external findings related to the cause of death are revealed [43].

Autopsy is performed by two physicians, one of them being a specialist in forensic medicine or pathologist under the supervision of a Judge or public prosecutor in case of disastrous delay [43]. Procedure involves a thorough and systematic retrospective analysis of the descendants life, with a particular focus on suicide risk factors, motives and intentions [44]. The psychological autopsy can be a very helpful tool to assist medical examiners and homicide investigators in approaching ‘equivocal deaths’. If an information can be obtained from people who had direct or indirect contact with the subject of the examination then it is more likely to be called ‘psychological autopsy’ [45].

REASON FOR DECLINE IN AUTOPSY

A primary factor in the decline in hospital autopsy is because clinicians do not want them. The reasons offered by clinicians for not requesting autopsies are varied and range from a distaste for the procedure [46]. To a belief that the

mortem investigative techniques are so accurate that the autopsy can add nothing extra to the clinical picture [47], [48].

LIMITATIONS

We found very few validation studies on non-invasive and minimally invasive autopsy methods performed on adults with a non-suspicious and supposedly natural cause of death.

CONCLUSION

This review compiled the various types of autopsy and discussed its uses and limitations. Autopsy plays a very important role in modern medicine. It benefits over other forms of post-mortem examination as outlined above. To a belief that the mortem investigative techniques are so accurate that the autopsy can add nothing extra to the clinical picture.

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CONFLICT OF INTEREST

None to declare.

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