

# The Autopsy

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## ABSTRACT

**The autopsy can be divided into medico-legal and academic autopsies. The autopsy has proven its value in the elucidation of the cause of death, medical audit, clinical quality control, education and the continuing understanding of disease pathogenesis. In addition, the medico-legal autopsy plays an important role in the administration of justice. While the rate of medico-legal autopsies remains relatively stable, all over the world there has been a steady decline in the rate of academic autopsies. Most studies show an unsatisfactory agreement between the clinical diagnosis and the autopsy diagnosis. When the pattern of autopsies is skewed towards deaths of medico-legal significance, health statistics based on death certificates on which healthcare policies are formulated may not be useful. Therefore, the decline in autopsy rates should be reversed. All health professionals, hospital administrators, medical students and relatives should be educated about the relevance of the autopsy to each of them. There must be increased communication between the clinician and the pathologist.**

**Keywords:** autopsy; medico-legal, coroner, hospital, academic, value, disease pathogenesis, rates, consent, decline

## INTRODUCTION

The word autopsy comes from the Greek meaning 'eye witness' (auto meaning self, and opsis meaning view). The main aim of the autopsy is to elucidate the cause of death, and uncover diseases that were undetected during life. The autopsy has a secondary but equally important role in medical audit.

What is the value of the autopsy in the technological age of medicine?

## TYPES OF AUTOPSIES

Generally, autopsies can be divided into hospital and medico-legal autopsies<sup>(1)</sup>.

### Medico-Legal Autopsies

Medico-legal autopsies are performed under the law, with the consent of the State. In Singapore, the medico-legal autopsy is performed by forensic pathologists, under warrant issued by the State Coroner.

The main purpose of the medico-legal autopsy is to determine the cause, manner and time of death; to recover and preserve evidential material from the body and sometimes from a crime scene; to correlate and interpret all the findings with the circumstances

of the case; and to provide a report for purposes of law enforcement, and the prosecution or defence of persons alleged to be involved in the death. Exceptionally, to fulfil the purpose of the medico-legal autopsy, only a partial autopsy is done, where the thoracic and abdominal viscera are examined, and the skull is not opened.

Because consent from relatives is not required in medico-legal autopsies, it would be unethical for doctors to refuse to sign death certificates with a view of pressurising relatives to consent to an academic autopsy in cases where the manner of death is natural, but the exact cause of death is uncertain because multiple pathologies are involved. In these cases too, refusing to issue death certificates with a view to making the case a medico-legal case so that the coroner will order a medico-legal autopsy is unethical, and will not succeed because a certificate of death will be issued by the forensic pathologist if possible.

### Hospital autopsy

On the other hand, the hospital autopsy is essentially an academic and scientific procedure, performed usually by hospital (staff) pathologists who are histopathologists, with the consent of the relatives, or the legal custodian of the body who is responsible for the proper disposal of the body. The purpose is to determine the cause of death, so as to correlate diagnosis to symptoms, to determine the effectiveness of therapy, to study the natural course of diseases, and for the edification of the medical profession.

## VALUE OF THE AUTOPSY

### Education and Quality Control

The most important value of the autopsy lies in its relationship to clinical practice.

Most studies show an unsatisfactory agreement between the clinical diagnosis and the autopsy diagnosis, from as low as 30% to 80% agreement<sup>(2-5)</sup>. In the local context, Teo<sup>(2)</sup> in a study of 623 cases referred to the coroner in the year 1990, showed that the clinical cause of death was confirmed by autopsy in 72% of all cases, but in natural deaths and deaths related to surgical or therapeutic procedures, the confirmation was much lower, being 54%. This is the most important proof of the need for the autopsy - as a quality control tool.

Many patients do not undergo a post-mortem

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examination<sup>(2)</sup>. Therefore, there is no way to tell if the clinical diagnosis is accurate or not. This would imply that health statistics based on death certificates on which healthcare policies are formulated may not be useful. Only the autopsy diagnosis can be the basis for accurate statistics<sup>(2,6)</sup>. Unfortunately, the pattern of autopsies is skewed towards sudden deaths, unnatural and violent deaths, deaths of medico-legal significance, and complex multi-system cases in which the cause of deaths is unknown or uncertain<sup>(2-4)</sup>.

In addition, the autopsy can act as a check of appropriateness of medical and surgical therapy<sup>(7)</sup>. The autopsy thus allows conscientious clinicians to keep track of their competence and to develop clinical craftsmanship<sup>(8)</sup>. No one expects clinicians to have a perfect record in diagnosis and treatment. There are surprises at almost every autopsy no matter how routine it may seem. The reminder of clinical fallibility should serve to sharpen diagnostic sense, distinguish culpable from non-culpable error, and impel clinicians to improve accuracy for all clinical diagnostic entities.

In this respect, the gradual decline of the clinico-pathologic conference is unfortunate. Properly conducted, the clinico-pathologic conference puts the clinician's thinking process through explicit, open and rigorous criticism that it rarely receives anywhere else.

In Singapore, doctors must also keep in mind that there is an obligation to report to the coroner deaths which occur during or shortly after surgery, anaesthesia or an invasive diagnostic or therapeutic procedure<sup>(9)</sup>.

Observation of autopsies is important in medical student education. There is no comparable substitute for firsthand observation of the pathologic process<sup>(10)</sup>. Lack of experience after graduation results in doctors having a vague understanding or even misapprehensions of autopsy procedures, and lack of enthusiasm for requesting autopsy consent.

### **Disease pathogenesis**

Many of the advances in disease pathogenesis would not have been possible without the autopsy, for example as in collagen diseases like lupus erythematosus.

The term lupus (Latin meaning wolf) has been in use for over seven hundred years to describe morbid cutaneous lesions<sup>(11)</sup>, since circa 1230. Even earlier, the term used by Hippocrates (460-370 BC), herpes esthiomenos (Greek meaning gnawing dermatosis) has been understood to be synonymous with lupus<sup>(12)</sup>.

Initially, lupus was believed to be a cancer or related to tuberculosis. By the turn of the 19th century, William Osler discussed the visceral complications<sup>(13)</sup>. In 1923, Libman and Sacks, both American physicians, described 4 cases of endocarditis<sup>(14)</sup>. Histological examination of the heart of one patient after autopsy showed absence of the Aschoff bodies of rheumatic valvular heart disease, fibrous thickening of the heart valves, diffuse round cell infiltrates, endothelial proliferation, and neovascularisation. These findings were confirmed by Gross in 1932 in 11 further autopsy specimens<sup>(15)</sup>. In 1933, based on autopsy studies, Keil rejected the

theory that lupus was related to tuberculosis<sup>(16)</sup>.

Then followed one of the most important contributions to the understanding of lupus - a communication given by Baehr, Klemperer and Schifrin at the 1935 meeting of the Association of American Physicians<sup>(17)</sup>. They described the "wire loop" appearance of glomeruli in 13 of 23 autopsy cases performed at Mt Sinai Hospital in New York. In 1942 Klemperer, Baehr and Pollack<sup>(18)</sup> introduced the term diffuse collagen disease, where they described the fibrinoid degeneration of collagen fibres, and the appearance of blue collagen fibres (trichrome stain) in ground substance (thus "collagenization"). Thus the stage was set for the intensive study of the pathogenesis of lupus erythematosus and other collagen diseases, with possibly the most important event in the history of lupus occurring in 1948, when the Mayo Clinic reported the discovery of LE cells in bone marrow preparations<sup>(19)</sup>.

Today, the definition of disease processes continues, as illustrated by the slow virus infections of the brain. The understanding of Creutzfeldt-Jakob Disease (CJD) had its unlikely beginnings in the mountains of New Guinea, where a disease known locally as kuru was recognised<sup>(20)</sup>. In 1959, an observation was made that the pathological findings in patients who died from kuru showed close similarity with the pathology already characterised in scrapie two centuries previously, a slow virus infection in sheep in Western Europe<sup>(21)</sup>. It was this lead that led to experiments involving intra-cerebral inoculation of cerebral tissue from kuru sufferers into chimpanzees that produced brain lesions (spongiform encephalopathy) similar to those in the parent lesion<sup>(22,23)</sup>, leading to the American scientist Gadjusek winning the Nobel Prize in 1976.

The experiments led eventually to the event widely known as the prion heresy, when in 1982, Stanley Pruisner, a biochemist at the University of California in San Francisco, proposed that CJD and scrapie were caused by an infectious agent containing only protein and no genes<sup>(24)</sup>. These agents were detected in brain extracts, and were denatured by treatments destroying protein, but not those destroying nucleic acid. Pruisner, described as a flamboyant character, christened the agent prion, short for proteinaceous infectious particle. This has eventually led to the better understanding of similar dementing diseases like bovine spongiform encephalopathy (BSE or mad cow disease), and Gerstmann-Straussler-Scheinker syndrome (GSS).

Since the 1960's, the pathogenesis of various other diseases - like post-radiation thyroid cancer<sup>(25)</sup>, pulmonary alveolar proteinosis<sup>(26)</sup>, progressive multifocal leucoencephalopathy<sup>(27,28)</sup>, adrenoleucodystrophy<sup>(29)</sup>, alpha - 1 antitrypsin deficiency related cirrhosis<sup>(30)</sup>, subacute sclerosing panencephalitis<sup>(31)</sup>, to name a few - have been clarified through autopsy<sup>(32)</sup>.

### **Other uses**

Autopsies are useful for evaluating therapeutic methods. The classical example is the information that

autopsies provided about the physical properties of prosthetic heart valves which in turn brought about better design and patient selection<sup>(33,34)</sup>. The autopsy is also one of the best ways to validate the interpretation of new technology, like high-resolution computer-assisted tomography (HRCT) and magnetic resonance imaging<sup>(35)</sup>. The role of HRCT in the diagnosis of diseases like fibrosing alveolitis was shown in clinical pathologic studies<sup>(36)</sup>. The autopsy plays a part in establishing relationships between the environment and disease, as in the discovery of hepatic angiosarcoma and its relationship to vinyl chloride<sup>(37)</sup>. The autopsy is a provider of organs, tissue and extracts for the benefit of the living. For example, human cells harvested from autopsies can be maintained in immunologically nude mice for *in vivo* experiments in the field of molecular biology.

## AUTOPSY RATES

### Medico-legal autopsies

In Singapore, the number of autopsies has remained stable for many years, at about 2,000 to 2,200 per year out of about 3,000 referrals per year to the coroner<sup>(38,39)</sup>. About half of these cases are natural deaths, and the rest are unnatural deaths. The autopsy rate in Singapore remains stable because of the strict coroner's rules as prescribed by the Criminal Procedure Code (CPC). Under Section 263 of the CPC<sup>(9)</sup>, the Coroner must hold inquiries into sudden, unnatural or violent deaths or where the manner in which the person came by his death is unknown.

### Academic autopsies

Compare the number of coroner's autopsies with the number of non-coroner's autopsies requested by clinicians - about 200 per year, of which the vast majority (about 95%) are perinatal autopsies<sup>(40-42)</sup>.

In many other countries, the number of autopsies has been steadily declining<sup>(43-48)</sup>. Given the need for higher academic autopsy rates, what are the reasons for this?

### Reasons for decline in academic autopsy rates, and reversing the trend

An important reason is that many clinicians feel that diagnoses are already established during life and that nothing new can be learned from the autopsy. The statistics of various studies and the discovery of new diseases as described above challenge this notion.

Autopsies play a major part in medical education, and provide feedback about the accuracy of ante-mortem examinations<sup>(44,49)</sup>. When the autopsy has been done, the results should be communicated quickly to the clinician involved<sup>(9)</sup>. When this does not happen, it may be due to a lack of interest of the clinician in the autopsy findings, a lack of communication between the pathologist and the clinician, or the fact that the hospital may have to pay for the autopsy report<sup>(51)</sup>. What is needed then is to educate clinicians that the autopsy should be seen as part of the overall management of the patient, and that the autopsy can provide useful information that

can improve clinical skills. Also, hospital administrators must recognise that the cost of the autopsy report must be covered and provided for in the budget.

In hospitals where pathology departments have wide responsibilities, the needs of other services are often seen as more pressing than autopsies. Disenchantment may be caused by the disparity between the skills of the clinicians and the autopsy pathologists who may be junior members of the department delegated to perform the academic autopsy<sup>(51)</sup>. When this is the case, the problem can be solved by proper supervision of the junior pathologist who performs the autopsy.

There may be a lack of professional interest in the subject. Pathology has been de-emphasised in some medical schools. As cell and molecular biology advance, more senior pathologists become interested and involved in this new discipline, ignoring the autopsy<sup>(52)</sup>. In teaching institutions, the autopsy cannot compete with the exciting and sophisticated advances in scientific research and experimental pathology, which form the basis for career advancement and professional recognition. Junior pathologists are deprived of the experience of the senior staff and conclude that the autopsy room is not the place where success is to be found.

Performing a complete autopsy requires a broad medical knowledge and more time than reporting on an excised specimen. A review of the past and present medical history, and of the investigations is always necessary, while consultations with other specialists is often vital. The pathologist then tries to unite the clinical picture and the autopsy findings to arrive at the final cause of death. This is not an easy task, and the autopsy cause of death may be delayed because of this. In a very small number of cases, the cause of death may still be unclear after autopsy, but this is still significant as it rules out certain differential diagnoses.

It is possible also that some clinicians unconsciously see death as a failure to be quickly forgotten. This is compounded by the trend towards specialisation which has led to a relative decline of familiarity between doctors and their patients. Patients with multiple or complex problems, which are the type of cases where the academic autopsy is most useful, are usually seen in hospitals. Doctors thus may lack the confidence and determination to ask the family for permission for autopsy<sup>(52-55)</sup>.

The doctors who have the opportunity for discussing the deceased's illness with family members are in the best position to obtain consent for autopsy. When such consent is not obtained, the doctors in attendance should reasonably be expected to account for such a failure.

The act of obtaining consent should not be left to inexperience or chance, depending on which doctor is available at the time. Family objections are less important in determining the ability to obtain consent for autopsy, even when there are religious objections, than the degree of motivation of those who are seeking permission<sup>(56-58)</sup> (religious objections must of course be respected when requesting consent for non-coroner's autopsies).

Success in obtaining consent depends on the cooperative effort of the hospital administration, medical and nursing staff, and other health professionals. The effort must be planned as part of the total management of the patient. This will not sound morbid if the post mortem examination is seen as continuing part of the investigation of the deceased patient. No approach for consent will be successful without the good will of the bereaved family. While the patient is alive, all effort must be made to convince the patient and his relatives that the primary concern is for the patient's welfare. When the patient becomes critically ill and moribund, the family should be notified immediately. After death, the grieving family must be treated with sympathy and tact. Any act that can be perceived as one of neglect, indifference, disrespect, causing unnecessary delay, will reduce the likelihood of obtaining consent<sup>(59)</sup>. The need for autopsy should be explained. Common objections like disfigurement of the body or that the deceased has already suffered enough, should be kept in mind, and the answers to such objections should be given<sup>(10)</sup>, without the relatives expressing them.

For the family that has given permission, they should be told of the autopsy results or they may not see the point of acceding to another request again<sup>(60)</sup>. Autopsy findings can reassure relatives that the outcome was inevitable and dispel fears that adequate steps were not taken to gain a cure.

Sometimes, undertakers may discourage autopsies as they do not want their own work to be delayed and this must be guarded against.

Clinicians who request for academic autopsies should attend and discuss the case with the pathologist, and follow-up by reading the autopsy report. In the author's experience, it is dismaying and frustrating when clinicians who request for academic autopsies do so on forms with a single line of history, or do not attend the autopsy, or do not discuss the case, or show no interest in the final work-up. If busy schedules preclude the clinician from attending the autopsy, then either a representative who has knowledge of the case should attend, or else a telephone conversation between the clinician and pathologist after the autopsy may serve as an alternative.

There may be a fear that an autopsy may disclose a diagnosis which may show medical negligence. This situation is exceedingly rare. It has been pointed out that the advantages of performing autopsy outweigh the disadvantage of possibly causing a lawsuit<sup>(61)</sup>. More often, the autopsy supports the defence of the clinician that medical care was within accepted practice<sup>(62,63)</sup>. In the local context, Lau<sup>(63)</sup>, in a study of 132 peri-operative deaths over a three-year period from 1989 to 1991 showed that in the vast majority (83.3 %), the coroner recorded a verdict of natural cause, while 8.3 % were recorded as misadventures, and the rest were either open verdicts or pending inquests.

## CONCLUSION

This problem of the declining numbers of autopsy have been recognised in many countries, and in some, steps have been taken to stop the decline<sup>(64,65)</sup>. The key is a renewed understanding by pathologists and clinicians and hospital administrators of the role of the autopsy in health care.

The autopsy room should not be seen as the place where sorrow and the spectre of death come alive, but rather it should be where death rejoices to aid the living.

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