

## The Autopsy in the 21<sup>st</sup> Century

Inaugural lecture by Prof C A Beukes

The term autopsy comes from the Greek words “to see with one’s own eyes”. A synonym is the Latin term post mortem (“after death”). Both names refer to an examination after death where the body is opened and the internal organs are examined.

Traditionally there are two types of autopsy. The first is the medical autopsy which is performed on patients who have died of natural causes and the second is the forensic autopsy which is performed when a patient has died of unnatural causes such as a sudden unexplained death outside a hospital, in a hospital after an operation, when suicide is suspected, if death has taken place underground in a mine, and where there is associated violence, drug or alcohol intake.

The two types are requested either by the attending physician or the police depending on the circumstances of death and there are often grey areas which require consultation between the two disciplines. Sufficient background information needs to be available for the correct decision to be made.

The format of this lecture will include the history of both types of autopsy, the state of each in 2012 and suggestions for future developments in South Africa.

Both types of autopsy have been evolving for more than 2000 years.

The medical autopsy is performed with the consent of the family. The aim of the procedure is to attempt to establish why the patient died, to serve as a method of teaching, provide opportunities for research and act as a form of quality control to compare the original clinical diagnosis with the post mortem findings. It was not until recently realised that there was little understanding of the humanitarian aspects of this procedure.

During the time of the Pharaohs in Egypt abnormal anatomy was observed during embalming but the significance of this was not appreciated. Sporadic reports of autopsies date back to 300 BC but the procedure which we now practice only became established in the 16<sup>th</sup> century still with little insight. Medicine starting with Hippocrates (460 – 377 BC) from whom we derive the Hippocratic Oath subscribed to the humoral theory and this continued for hundreds of years. This theory accepted that there were various hypothetical fluid components in the body, blood, phlegm, yellow bile and black bile and that disease resulted when there was an imbalance of these. This led to the practice of bloodletting, the application of leeches and the examination of urine.

There were sporadic reports of autopsies in 4<sup>th</sup> century Rome, during the crusades, in Britain and Italy in 1200’s, but there was strong religious opposition to the procedure and it was not part of established medical practice. In the 1400’s the procedure was accepted by the Christian church. Orthodox Jews

maintained their opposition until the 1900's when eventually the Israeli parliament passed a law permitting autopsies under strictly limited conditions. Islam until today does not have a policy in this regard.

The early descriptions were inadequate and only in 1715 did Morgagni a Professor at Padua University attempt to correlate the life history, the history of the disease, the final illness and the condition of the organs at post mortem. At that time there was no physiological explanation involved because the science of physiology had not yet evolved.

The conditions under which the post mortem was performed were distinctly challenging. Until the beginning of the 1900's there was no cooling mechanisms available to retard decomposition. It was conducted out of doors weather permitting or inside in a large building. The procedure took several days and the dissectors risked infection if they cut themselves.

Ludwig van Beethoven died at the age of 57 years in 1827. At his own request a post mortem was performed in his apartment. There was only a macroscopic description because microscopy did not yet exist. The diagnoses were liver cirrhosis, chronic pancreatitis and renal papillary necrosis. Ear tissue was taken to establish a cause of his deafness and kept for the future but unfortunately the specimen was lost by the time that microscopy became available in the middle 1800's.

Later autopsy theatres were built attached to medical schools. In 1900 in Paris there was a modern autopsy theatre, open for viewing by any member of the public, with cooling supplied by modern steam powered refrigeration units. Corpses were injected to prevent microbial proliferation. The science of physiology came into being and mechanisms of disease were begun to be understood.

One hundred years ago the autopsy as we know it today was an established practice. It was at the centre of modern medicine and served as a gold standard of quality control ensuring accuracy of diagnosis and efficacy of therapy. In the 1950's 60% of patients who died in hospital were autopsied. The clinician requested permission from the family and this was willingly given. The autopsy was attended by students and clinicians. Tissue was taken from most organs for histological examination to establish a cause of death and also for teaching and research. Organs were stored in medical museums (without permission). There was a 20 – 33% discrepancy in the diagnoses and the autopsy was viewed as a procedure where the dead taught the living.

However in the 1970's the number of requests began to decline. By 2005 only 10% of hospital deaths were autopsied in the USA. This was ascribed to increasing reliance on special investigations and fear of litigation even though there was still a disturbing discrepancy of up to 50% of diagnoses with a third of death certificates found to be inaccurate. In our country the fear of AIDS has resulted in reluctance on the part of some of the staff to perform post mortems on HIV positive patients which has further contributed to this trend.

Further contributing to the decline in autopsy rates was the organ retention furore which took place in the United Kingdom. This drew the public's attention to the way in which autopsies were performed. This took place at the Bristol Royal Infirmary in 1996 and Alder Hey Hospital in Liverpool in 1999.

In 1996 a mother whose child had died after surgery watched a TV program on paediatric heart surgery and requested the child's medical records. She found that the heart had been retained and not buried with the rest of the child. Although this was seen as unexceptional by most doctors it leads to the creation of the Bristol Heart Children's Action Group. At the subsequent enquiry Alder Hey was mentioned and this resulted in further investigation and the creation of PITY II "Parents who Inter their Children Twice". Non-medical people suddenly had to face the reality of post mortems. This resulted in Updated Guidelines for the retention of organs and tissues at post mortem in 2001 which emphasized the rights of the individual and stipulated that informed consent needed to be obtained for retained tissue. Tissue archives had to be catalogued and many medical museums consisting of specimens obtained without consent were dismantled. The Pathology Profession had lost the trust of the general public and there was resistance to requests for consent.

Although no other legislation was passed elsewhere this sensitivity spread to other countries including South Africa.

At Universitas Hospital in 1989 365 autopsies were performed and by 2005 these were reduced to only 47 cases, 37 of which were foetal and neonatal. There were no more post mortem meetings at noon which were attended by the whole department, no student demonstrations, and no new specimens for our museum and too few autopsies to train the registrars.

Turning to the forensic autopsy which developed when a stage of civilisation had been reached where there was a recognisable legal system and an integrated level of medical knowledge. These are performed when medical knowledge is used for administration of the law.

Possibly one of the first forensic autopsies was performed in 44 BC by the physician who attended Julius Caesar. He determined that of the 23 stab wounds he received only the one which penetrated his chest was fatal. The first textbook of forensic pathology was published in China in 1247 outlining procedures to be followed in cases of suspicious death. In the 1500's legislation was passed in Germany stating that expert medical testimony should be obtained in cases of unnatural death. Modern forensic pathology began in Germany in the 1700's and in France and Britain in the 1800's. By the early 1800's the legal systems operating in most European countries was essentially the same as it is today and by 1850 medical evidence was used in the courts very effectively. However the conditions under which the autopsies were performed were similar to those described in the medical autopsy except in the major centres.

Rapid advances in knowledge followed with the recognition of rigor mortis, lividity, the successive colonies of insects which allow the age of the corpse to be dated, toxicology identifying poisons, microbiology, fingerprints, blood groups, dental work and more recently DNA in the 1980's.

The modern forensic autopsy is performed on all cases of suspicious death. No consent is required from family members and is performed at any time that the body is delivered to the forensic mortuary. It is performed by a suitably qualified person assisted by an autopsy technician/diener/prosector. The

definition of a suitably qualified person includes a forensic medical examiner, a police surgeon, a medical doctor, a coroner's medical expert and a coroner. A coroner is the term used for a public official who investigates and certifies death, is not necessarily a doctor of medicine, may be a law enforcement agent, a judge, a funeral director, an emergency medical technician or a nurse.

The training of a forensic pathologist (forensic medical examiner) differs in different countries. Most countries train medical doctors as Anatomical Pathologists and follow with some extra forensic training. In South Africa the training is separate from Anatomical Pathology although the course includes a 1 or 2 year rotation in Anatomical Pathology during the total training of 5 years. In this country therefore it takes 14 years after the commencement of training as a medical doctor to train as a forensic pathologist.

The autopsy is usually a macroscopic procedure without microscopy and the findings tend to be obvious. However the interpretation of these needs training and skill. The cost is R1500 for a macroscopic post mortem but if histology is added may be as high as R8000. In cases of suspected poisoning or drug overdose the correct specimens must be taken and sophisticated reliable laboratory services should be available. Inaccurate findings may lead to devastating results such as in the dingo murder case in Australia in the 1980's. The recent death of Whitney Houston was followed by a forensic post mortem and latest reports are that the toxicology testing for alcohol and drugs will still take several weeks and that the final report on the cause of her death has not yet been completed.

Let us move to the autopsy in 2012:

The medical autopsy worldwide which was the gold standard has been sacrificed to the social conscience of modern society. Consent is given mainly for foetal and neonatal autopsies in the interests of genetic counselling. The declining incidence is aggravated in South Africa by HIV where staff is reluctant to perform the procedure laying them open to accusations of discrimination.

In the Free State Universitas Hospital is the only facility performing medical autopsies on state patients. There is a problem transporting bodies from the peripheral hospitals. Virtually no private post mortems are performed in the Free State. This is mainly due to the cost of R8000 which is not covered by medical aid, lack of facilities and also perhaps from fear of litigation. If the family are unhappy about the death they are advised to contact the police for a forensic post mortem. In 2011 55 autopsies were performed, 27 of which were foetal and neonatal.

The incidence of the forensic autopsy has not declined especially in countries with a high incidence of unnatural deaths such as South Africa. An interesting phenomenon is the inaccurate perception that has been created by modern television and books regarding the forensic autopsy. We are regularly asked by school leavers regarding training in the discipline. The only option is the 14 years of training which most people find intimidating. A major problem in forensic pathology is that many laboratories not only in South Africa are understaffed by poorly trained personnel and lack proper equipment.

In the Free State the demand for the forensic autopsy is escalating. The main problem area is the forensic laboratories country wide where there is a massive backlog of specimens. This either delayed

the completion of the report or results in a report being issued that are incomplete without essential information. In 2011, 3987 forensic autopsies were performed, 1190 in Bloemfontein by forensic pathologists and the rest in the periphery by medical doctors. There were also an additional 2190 “natural” deaths passing through the department which were not autopsied due to staff shortages. No statistics exist therefore regarding the causes of death of those people who die outside hospitals in the absence of suspicious circumstances. This means 7367 bodies were processed by the Free State Forensic Department in 2011 compared to 55 medical autopsies.

Apart from the two traditional forms of autopsy there are several variants which can be used under certain circumstances. Examples are the radioactive autopsy where the patient is radioactive as a result of either diagnostic or therapeutic radiation, or replacements of the complete autopsy –the limited autopsy. These include removal of a single or only several organs, random post operative needle biopsies, needle biopsies of targeted organs and the virtual autopsy where changes on CT or MRI scans replace the autopsy completely or are followed up with targeted dissection. Although less labour intensive none of these replace the accuracy of the complete autopsy.

In summary the autopsies that have immediate practical application such as the forensic and neonatal autopsies are unthreatened.

The forensic service does need to increase the numbers of forensic pathologists and give attention to the forensic laboratories. The VIRTOPSY (virtual autopsy) could be explored to keep up with developing international trends as well as reduce the work load of complete post mortems. This would however involve extra finance.

Super specialisation in neonatal post mortems which do require special training should be encouraged in Anatomical Pathology to ensure good standards.

The medical autopsy unfortunately appears to be disappearing and urgent steps need to be taken to ensure its survival. The training program of Anatomical Pathologists in South Africa could be adapted so that Anatomical Pathology registrars could rotate through the Forensic Department and have access to the “natural” autopsies. This would improve their training provided there are qualified staffs to teach them as well as improving the statistics on the “natural” causes of deaths.