Origins of...

The postmortem examination in diagnosis

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"...you may take notes for twenty years, from morning to night at the bedside of the sick, upon the diseases of the viscera, and all will be to you only a confusion of symptoms,...a train of incoherent phenomena. Open a few bodies, this obscurity will disappear."

Bichat (c 1800)¹

Rituals related to the disposal of the dead date back to prehistoric times. They arose from religious beliefs and from a sense of duty to the dead. From the earliest primitive rituals, man has evolved a variety of means to deal with the dead body, based on religion, culture, and geographical conditions; culminating in rituals such as exposure of the bodies in caves, trees and towers; to burials, embalming, cannibalism, cremation, mummification, and head shrinking.

For thousands of years, dissection of the bodies was done for reasons as varied as magico-religious, cultural and scientific. Currently, the words autopsy (see for oneself), necropsy (to look at the dead) and postmortem examination (often shortened to postmortem (PM)) are used interchangeably to describe the systematic examination of the dead body for medical, legal and scientific purposes.

Traditionally, there has been a distinction between hospital or 'academic' autopsies on the one hand, and forensic, medicolegal, police surgeon, or coroners cases on the other. This distinction arose from the evolution of most medicolegal systems in which the investigation of deaths from natural causes was separated from the investigation of unnatural deaths.

The knowledge of normal and abnormal anatomy derived from procedures with a magico-religious background such as foretelling the future (divination) by the study of animal entrails including the liver (hepatoscopy or haruspicy), a procedure that was known to be practised 3500 years ago in Babylon²; examination of slaughtered animals for signs of disease by Rabbis in the Talmudic period³; and the Egyptian process of mummification.⁴ As disease was viewed by the Egyptians as a manifestation of Magic or Divine intervention, examination of the dead was not used as a means of diagnosing cause of illness.

Hippocrates (468-377 BC) linked causation of disease to natural (humours) rather than supernatural causes.² 'Health' was a state of balance between the four humours—phlegm, blood, yellow bile, and black bile.⁵ PMs were conducted as a tool for teaching anatomy by Herophilus (c 335-280 BC) who paid little attention to the morphological disturbances

and still subscribed to the humoral theory of disease.² Erasistratus (c 310-250 BC), however, carried out dissections to observe changes due to disease.² By using the autopsy to explain physiological changes in terms of anatomy he refuted occult explanations for disease.

Although Galen (131-200 AD) carried out dissections on animals and extrapolated the anatomical findings to humans, he endorsed the humoral theory propounded by Hippocrates.⁵ As a result of his dogmatic approach and the esteem in which he was held, the fallacies which he propagated were accepted blindly and followed for centuries. Autopsy examinations were discouraged as Galen and later Christian and Muslim theologians regarded the human body as the vehicle of the soul and therefore sacrosanct.

In the Middle Ages there were isolated reports of the use of the PM in diagnosis. King and Meehan cite an example of the diagnosis of liver damage due to alcohol in a follower of a Norwegian King returning from the Crusades in 1111 AD.² The first recorded text dealing with a number of medicolegal issues, including examination of the dead, was the 13th century Chinese five volume treatise *Hsi Yuan Lu* (Instructions to coroners).⁶ In Italy at the same time, dissections were carried out mainly for medicolegal, rather than medical, reasons.

With the birth of the Renaissance in Europe there was a new spirit and thirst for knowledge including the Classics. The Greco-Roman medical traditions were largely preserved and introduced to the West by the Arabian scholars whose system of medicine was referred to as Greco-Arabian medicine or Unani (Ionian Greek).

Dissection of the human body by students at Bologna and Padua was permitted by a bill issued by Pope Sixtus IV (1471-1484) and later confirmed by Clement VII (1523-1534).² The performance of autopsies for forensic purposes was sanctioned in 1532 when Emperor Charles V introduced the *Constitutio Criminalis Carolina*.⁷

A further impetus to the performance of PMs was given by the interest in anatomy exemplified by the classical *Fabrica Humani Corporis* published in 1543 by Andreas Vesalius. In spite of these advances, Galenic theory still dominated and continued to inhibit the use of the autopsy in understanding disease.

In the 16th, 17th and 18th centuries autopsy diagnoses were hampered by partial dissections and failure to correlate morphological findings

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with clinical history. In 1724 Boerhaave pointed out this deficiency and described the first PM diagnosis of oesophageal rupture.² Morgagni (1682–1772) in Padua stressed the importance of correlating clinical symptoms with anatomical findings hoping that this would lead to an understanding of the relation between disturbed function and abnormal structure.^{2,8} This philosophy is the basis of the field of pathology. Francois Xavier Bichat (1771–1802) took this a stage further by correlating disease with changes at tissue rather than organ level.² Richard Bright (1789–1858) conducted PMs on his patients and was the first to note the relation between dropsy and renal disease.⁹ Bichat, Bright and Sir William Osler represented a school of clinicians who performed PMs themselves to elucidate the nature of the disease process which they observed clinically in their patients. They defined new disease entities by correlating clinical signs and symptoms with gross PM findings.

Karl Rokitsansky (1804–1878) is reputed to have performed more than 30 000 autopsies.² He advocated detailed and carefully planned PMs according to a rigid protocol. He then made conclusions from the anatomical findings—that is, the field of morbid anatomy. His immense contribution to the autopsy is limited by his approach of not emphasising clinicopathological correlation. He therefore started the trend of making morbid pathology a specialist discipline and not an extension of the practice of clinical medicine.

Rudolf Virchow's (1821–1902) doctrine of cellular basis of disease created the science of medicine.² While Rokitsansky can be said to have made anatomical pathology an independent medical discipline, Virchow combined cellular biology, pathology, physiology, and microbiology into a science. The invention of the microscope and constant improvements in optical instruments coupled with newer sectioning and staining techniques and the pioneering work of Bichat, Rokitsansky, Virchow, and others paved the way for routine use of the PM in diagnosis.

The studies emanating from thousands of PMs have contributed greatly to the advancement of medical science, medical law and to society in general. Today, PMs are done to determine the cause of death (including forensic or medicolegal cases); to provide correlation of clinical diagnosis and clinical symptoms; to determine the effectiveness of therapy; to study the natural cause of disease processes; as a vehicle for paediatric genetic counselling; to provide public health statistics; and very importantly, to educate students, pathologists and clinicians.

Sadly, the number of PMs being done is declining. This can be attributed to: religious and cultural differences; spiralling autopsy costs; loss of prestige of the autopsy with resultant decrease in pathologists' morale and loss of confidence by clinicians; prevailing belief that newer high-tech diagnostic tools are more sensitive and specific in making diagnosis; adverse public view of the PM procedure; and the erroneous belief among some clinicians

that by requesting autopsy examination on their patients they would be exposing themselves to malpractice lawsuits.¹⁰ Even when PMs are being done, they are devalued by the fact that the pathologist is not conversant with the clinical data or experienced enough to recognise artefacts that may lead to misinterpretation of the PM findings. The decline in PM rates has resulted in a loss of valuable material from both the teaching and epidemiological viewpoints.

Forensic pathology has, in recent years, been in the limelight with highly publicised trials such as the OJ Simpson case, as well as in popular fiction and television programmes on the forensic investigation of murder.

The modern PM is more than a dissection and microscopic examination of tissues. Pathologists have at their disposal a range of ancillary techniques and procedures that could be used to make diagnoses at PM including electron microscopy, postmortem chemistry, toxicology, immunohistochemistry, molecular biology techniques (for example, PCR), microbiology, chromosomal studies, PM radiographs, angiography, and computed tomography and magnetic resonance imaging scans. Various studies have come out in support of the renewed use of the PM as the gold standard in the evaluation of new treatment and diagnostic modalities; to note the changing patterns of disease such as those due to environmental and occupational exposures; and in the documentation of new diseases such as AIDS.^{11,12}

The role of the PM in diagnosis is continually evolving to keep pace with progress in medicine and the needs of society. Its final destination is not clear but it still continues to be, and should remain an important tool in research, audit, diagnosis and monitoring of disease. We end this whirlwind tour of the history of the PM by directing the critics of the PM to the quote attributed to J F Lobstein, "...it is not the dead organ that medicine wishes to understand, but the living organ, exercising the functions peculiar to it" (quoted by Castiglioni).¹³

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