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Editorial

Post-mortem examination in the United Kingdom: present and future

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The definition of the term autopsy varies according to the source and here are some examples: Oxford Dictionary: "A post-mortem examination to discover the cause of death or the extent of disease."; Cambridge Dictionary: "the cutting open and examination of a dead body in order to discover the cause of death"; Collins English Dictionary: "An autopsy is an examination of a dead body by a doctor who cuts it open in order to try to discover the cause of death."; The Merrian-Webster Dictionary: "*1*: an examination of a body after death to determine the cause of death or the character and extent of changes produced by disease –called also *necropsy; 2*: a critical examination, evaluation, or assessment of someone or something past" and Illustrated Stedman's Medical Dictionary, Williams and Wilkins, Baltimore 1982, 24th Ed "Postmortem examination; necropsy; thanatopsy: an examination of the internal organs of a dead body for the purpose of determining the cause of death or of studying the pathologic changes present." As can be seen in these definitions, the primary aim of the autopsy is to determine the cause of death and there is no mention to how this can be achieved apart from cutting, dissecting, we should say.

Pathologists, however, know that the autopsy is much more than simply dissecting a dead body as we also rely on further analysis that may involve histological examination of samples of organs and tissues as well as imaging, cyto or molecular genetics, microbiology, virology, toxicology and metabolic studies where applicable. Other techniques can be used in specific cases, such as electron microscopy. The autopsy is no longer the sole examination and dissecting of the dead body and is more appropriately called a Postmortem Examination. As new technologies become available, they can be incorporated in the range already in use and, therefore, the role of the Pathologist is ever changing.

In the United Kingdom, there are two basic types of Postmortem (PM) Examination: Hospital and Coronial, which includes Forensic cases. The Coroner is an independent judicial office holder, who is a lawyer, a doctor or both appointed and paid by the relevant local authority with the mission of inquiring into unnatural deaths. The Coronial system has been around in England and Wales for over 700 years. Coronial PMs are warranted when no doctor attended the deceased during his/her last illness, when the deceased was not seen by a doctor in the last two weeks before death, when the cause of death appears to be unknown, when death occurred during an operation of before recovery from the effects of an anaesthetic, when death occurred at work or was due to industrial disease or poisoning, when death was sudden or unexpected, when death was unnatural, due to violence, neglect or in suspicious circumstances and finally when it occurred in prison, police custody or other state detention.[1] All these deaths are reported to the Coroner of the area who will then instruct a Pathologist and or a Forensic Pathologist to perform the examination. No consent is necessary for Coronial PMs.

In the United Kingdom, when the patient dies in hospital or related places, the doctor in charge is responsible for issuing a death certificate if the cause

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of death is known and there are no circumstances that demand necessarily a Post-mortem Examination, as mentioned above. However, if there are still pending issues that require a better understanding, a Post-mortem Examination may be requested on medical grounds but can only happen with informed consent by a family member or legal guardian. This also applies to foetal deaths, including terminations of pregnancy for whatever reason.

Almost all adult PMs in the UK are coronial and the main objective is to determine the cause of death. It is estimated that only in England and Wales there are about 90,000 coronial PMs per year. In the paediatric age range, however, it is very different. At Sheffield Children's Hospital, for example, there are about 450 PMs per year with about 90 (20%) being coronial cases of which about 12 (2.7%) are Forensic PMs. Hospital PMs therefore correspond to 80%, in sharp contrast with adults. As a legal requirement, paediatric forensic PMs are conducted by two doctors: a Forensic Pathologist and a Paediatric Pathologist. It is therefore recognised that the peculiarities of the foetal and paediatric cases are enough to warrant a detailed examination by a devoted paediatric pathologist who will base his/her conclusions not only based on macro and microscopic features, but on a full range of ancillary tests such as microbiology of blood, tissue, body fluids and secretions; virology of blood, stools, cerebro-spinal fluid and lung sample; cytogenetics and molecular genetics; electrolyte profile from the vitreous humor; metabolic investigation in dry blood spots (Guthrie cards) or in skin fibroblasts; toxicology screening in the blood, urine or bile and skeletal survey. The cost of a paediatric coronial case is about £ 2,000.00 and a forensic about £ 6,000.00 in an average case. The cost can be much higher depending on further tests and/or other professional fees which may be required.

The definition of what is a forensic or just coronial PM is decided by the Coroner. Road traffic incidents, suicide, positional asphyxia, house fire etc are usually instructed by the Coroner as a coronial PM. This contrasts with many other countries where any unnatural death is necessarily forensics. It is the likelihood of a trial that most of the time drives the Coroner to decide for a forensic rather than a coronial case and not the nature of death. In the paediatric age group, teenage suicide is usually by hanging and most of the time happens at home. This type of case does not require a trial and is therefore a common coronial PM is requested. On the other hand, an intra-partum death of a baby may turn out to be forensics if the Coroner understands that there is a reason to suspect negligence or recklessness, for example, and thus further actions and a possible trial may follow.

The role of the Pathologist in a coronial PM is as an expert witness, expected to provide a detailed report of his/her examination with a recommendation of the likely cause of death *on the balance of probabilities*. It is the responsibility of the Coroner, however, to accept or not this recommendation and issue a Death Certificate. When the Coroner understands that the case has been thoroughly examined and there are no further questions to be answered, the case is then closed and a Death Certificate issued. However, if there are still certain queries or the recommended cause of death is unascertained or not clear, the Coroner may instruct an inquest.

An inquest is a limited but formal, fact-finding inquiry done in a court to establish who has died and how, when and where the person died. The inquest is conducted in the presence of family members or legal guardians, the Pathologist, members of the press and all professionals involved in the case, such as police officers, Paediatrician, Social Service Workers, Nurses etc. It is not intended to establish any matter of liability or blame and is not a criminal trial and its main objective is to answer the four questions above. The Pathologist is usually the first to give evidence and is then questioned by the Coroner and family/legal guardians/legal representatives. After given evidence, the Pathologist is usually discharged and the inquest continues. At the end, the Coroner may be satisfied and the inquest is closed with a Death Certificate being issued.

Coronial and Forensic PMs do not require an informed consent by the family. However, after the case is concluded with or without an inquest, the family or legal guardians need to consent or not for disposal of the remains, including frozen samples, blocks and slides, in which way and must say if the photos taken during examination are to be deleted or kept by the hospital and if they consent or not for the tissues, blocks and slides being used for education, training, quality assurance or research.

In some areas, adult coronial PMs are using imaging, such as Computed Tomography Scans (CT-scans) as an adjunct to the traditional PM. This is only the beginning, and the future of post-mortem investigation is being redesigned right now. A large scale study of adult coronial PMs comparing the use of imaging and traditional PM has been conducted by Leicester University and published in The International Journal of Legal Medicine.[2] Their results indicate that in up to 92% of the cases imaging identified clearly the cause of death, which is a significant improvement in terms of investigation. In the last week of May this year it was opened in the Medico-Legal Centre of Sheffield the first facility dedicated to coronial autopsy using imaging visualisation software and a scanner in order to replace the traditional autopsy in adults and the plans are to introduce other 17 similar centres around England and Wales. At Sheffield Children's Hospital we offer a post-mortem Magnetic Resonance Imaging (MRI) as an alternative to the traditional PM.[3] MRI is notably good for the examination of the central nervous system with superior results when compared with the traditional PM.[4] Other approaches are being tested such as key hole intracavitary assisted laparoscopy and thoracoscopy, with or without biopsy sampling.[5] Imaging techniques are exceptionally better in still bodies than in living patients and there are also no constraints in terms of radio exposure, therefore the quality of the images is much better. 3D reconstruction of images allows different ways of looking at the gathered data and can be used for 3D printing of the whole body or just part of it, like the heart.[6] The traditional PM is by its nature disruptive as the pathologist needs to dissect, section, open, remove, thus preventing re-examination. With new imaging approaches this will no longer be required and therefore the PM could be revisited as many times as needed.

What will the role of the pathologist in future be? What will the required training be? How will the legal issues be solved? These are all open questions, but one thing is certain and can be expressed by a phrase I've recently seen in the window of a shop on my way back home: "Don't look back; you're not going that way."

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