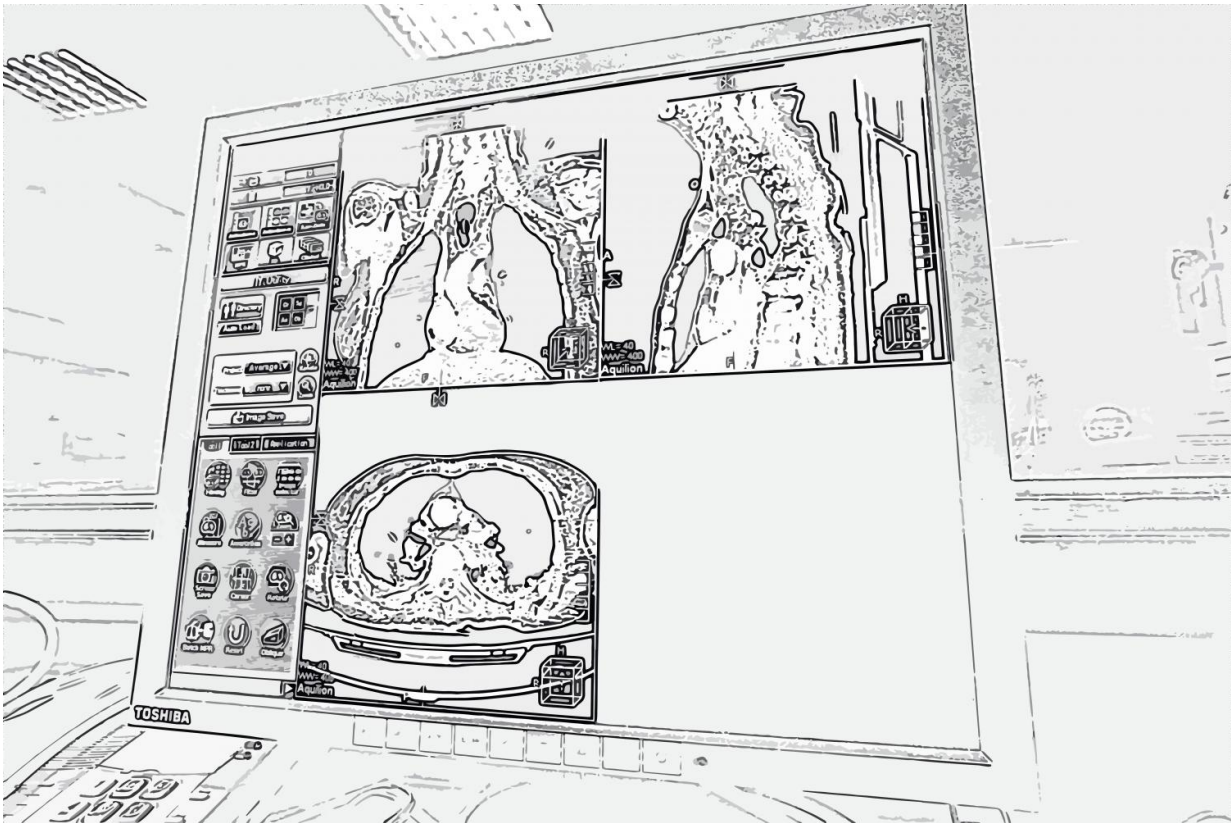


Breakthrough in how autopsy practice is conducted worldwide

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Credit: University of Leicester

A ground-breaking study by University of Leicester pathologists and radiologists could represent a breakthrough in how autopsy practice is conducted in the United Kingdom and around the world.

The research was led by Professors Guy Ruttly and Bruno Morgan from the University of Leicester. It was funded by the National Institute for Health Research (NIHR) and is published in the *Lancet*.

Professor Ruttly explained: "Over the years there have been several attempts to develop alternative approaches to the [invasive autopsy](#) to limit the extent to which the cadaver is dissected. Although these techniques have been published, the invasive examination remains the standard adopted approach."

A previous study of PMCT published in the *Lancet* in 2012 showed promise for using medical imaging to investigate the cause of natural [death](#), but with a major weakness: the inability to diagnose [coronary artery](#) disease, the most common cause of natural death.

Professor Morgan explained: "In clinical CT scanning, a contrast agent is injected into a vein and circulation delivers it around the body. This allows the CT scan to show the state of blood vessels anywhere in the body. However, the lack of circulation in cadavers means these techniques cannot be used."

This has been overcome by developing a novel minimally invasive coronary artery angiography technique. A variety of these techniques have been developed around the world over the last few years, but this is the first large-scale fully autopsy-controlled trial to demonstrate their efficacy in adult natural death.

Professor Ruttly explained: "Here at the University of Leicester we developed a quick and minimally invasive approach to improve diagnostic accuracy. This uniquely uses a combination of standard contrast agent (positive) and air (negative) to show the coronary artery lumens and ventricular cavities."

Professor Morgan explained: "By 'minimally invasive' we mean that we use a catheter inserted into an artery to perform the angiography. The insertion techniques are like those we use on patients every day in our clinics, with just the use of local anaesthetic to numb the skin."

The Leicester team applied their PMCTA technique to a cohort of 240 deaths investigated by the HM coroner. They show that a cause of death could be given in 92% of cases, based on "the balance of probabilities", the burden of proof required by the HM Coroner. Comparison with independently generated autopsy results showed that PMCTA had a similar accuracy to autopsy, did not miss autopsy-identifiable unnatural or "reportable" causes of death, and would also not significantly change population "cause of death" statistics.

Professor Morgan added: "We have shown that PMCT enhanced by targeted coronary angiography can diagnose the cause of death in up to 90% of HM Coronal investigations for suspected natural death. This is the most successful application of PMCT and PMCTA to-date in natural death, and shows that a significant number of deaths could be investigated without the need for an invasive autopsy."

PMCTA was found to be superior at identifying trauma and haemorrhage, whereas autopsy was superior at identifying pulmonary thromboembolism. Both tests had different strengths and weaknesses in heart and lung disease.

Professor Rutty cautioned: "Both autopsy and PMCTA have different strengths and weaknesses as investigative approaches. When a higher burden of proof is required the 'gold standard' of death investigation should include both PMCT and invasive autopsy."

The findings of the study are unique from an international perspective as it focuses on natural death. In the study a small number of unnatural

deaths were also examined, showing PMCTA was also useful in these cases.

Professor Rutty concludes: "There is already great interest in providing PMCTA as an alternative to autopsy in the UK with several centres, including Leicester, recently initiating services. These data now provide strong evidence to validate these services, especially where they use angiography techniques. We therefore expect these results to have a major influence on the future of [autopsy](#) practice in the UK, and across the world."

Professors Rutty and Morgan are internationally recognised as pioneers, researchers and practitioners within the field of post mortem computed tomography. They are the authors of the largest body of scientific publications in this field within the United Kingdom, including research studies and educational papers and book chapters.

They both state "we dedicate the success of our research to the families of Leicestershire, who have consented for their loved ones to be involved in these studies, despite being in a period of bereavement."

They have pioneered other investigative adjuncts to augment PMCT studies, developed a 'patent-pending' PMCT catheter, and they have launched the first educational postgraduate teaching programs for PMCT at the University of Leicester, which started in 2016.

The team believes adopting PMCTA as the standard first-line test in natural death would have a positive and profound effect on the public and religious groups within the UK and potentially beyond.

The research was authored by Professor Guy Rutty (East Midlands forensic Pathology Unit, CSMM) and Professor Bruno Morgan (University Radiology Unit, CSMM), in collaboration with other

University of Leicester, and University Hospitals of Leicester employees past and present.

More information: *Lancet* (2017). [DOI: 10.1016/S0140-6736\(17\)30333-1](https://doi.org/10.1016/S0140-6736(17)30333-1)

Provided by University of Leicester

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