

Targeted coronary post-mortem CT angiography, straight to the heart

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Published in:
The Lancet

DOI:
10.1016/S0140-6736(17)31260-6

Publication date:
2017

Document version:
Final published version

Document license:
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Citation for pulished version (APA):
van Rijn, R. R., & Leth, P. M. (2017). Targeted coronary post-mortem CT angiography, straight to the heart. *The Lancet*, 390(10090), 100-101. [https://doi.org/10.1016/S0140-6736\(17\)31260-6](https://doi.org/10.1016/S0140-6736(17)31260-6)

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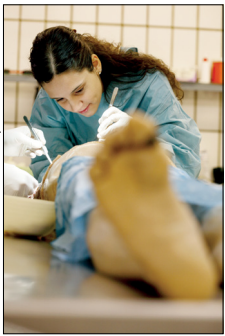
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Targeted coronary post-mortem CT angiography, straight to the heart



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Published Online
May 24, 2017

[http://dx.doi.org/10.1016/S0140-6736\(17\)31260-6](http://dx.doi.org/10.1016/S0140-6736(17)31260-6)

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Soon after the discovery of x-rays in November, 1895, by Wilhelm Conrad Röntgen, the first post-mortem radiographs were obtained; one example being the post-mortem angiography done by Haschek and Lindenthal in January, 1896.¹ However, it took the pioneering work of Richard Dirnhofer and Michael Thali with their Virtopsy group to regain wider attention for post-mortem radiology and more specifically post-mortem CT (PMCT).² In the past decades, substantial progress has been made, although the main focus of attention has been on adult forensic PMCT. PMCT can have an effect on the diagnosis of the manner and cause of death, and it certainly has limitations. Most of these limitations are related to the fact that the person is no longer alive and thus ventilation and circulation have stopped. This fact also implies that a normal contrast-enhanced PMCT scan, which clinically is routinely acquired, is not possible. To overcome this limitation, the use of whole body PMCT angiography (wbPMCTA) or focused PMCT angiography (fPMCTA) has been advocated.³ A lot of effort has been put into the development, use, and validation of multiphase wbPMCTA and good results have been shown with a dedicated wbPMCTA system.^{4,5}

In the *Lancet*, Guy N Rutty and colleagues⁶ report a prospective study about the value of PMCTA in natural sudden death. For this post-mortem imaging study, the primary outcome for large prospective series was the accuracy of cause of death, if identifiable on PMCTA compared with the autopsy (which they class as gold standard). The radiologists reporting the PMCTA, which included a precontrast total body PMCT, had access to a full report consisting of external examination findings and additional medical history. If requested, toxicology and biochemistry results were given. This approach has previously been named a minimal invasive autopsy.⁷ In all these cases in Rutty and colleagues' study, the frequency of PMCTA error was 6% (12 of 193 cases). Secondary endpoints were, among others, success of procedure (204 of 241, 85%) and identification of a cause of death (193 of 210, 92%).

Therefore, the authors show that, in the English coronial system, 92% of autopsies could be avoided.

This approach would not affect overall population cause of death data, nor would cases of substantial trauma (unnatural cause of death) be missed. How this would affect clinical pathology services in other parts of the world is unclear.

This study by Rutty and colleagues adds weight to the use of PMCTA because it clearly shows the feasibility of the technique and the potential effect on daily pathological routine. The way this study has been designed is reminiscent of the highly acclaimed MaRIAS study,⁷ and we expect that it could have a similar effect in the specialty of post-mortem imaging. The success of PMCTA in up to 85% of cases, after a learning curve, implies that it is feasible to use in a specialised setting. The question is whether this success would also be attained in a normal setting, where a larger group of radiological technicians would be doing the PMCTA scans. A second drawback, as acknowledged by Rutty and colleagues, is the fact that PMCTA was reported by three examiners without any time constraint, which would not be feasible in a normal clinical setting.

The study by Rutty and colleagues focused on cause of death and individual diagnoses. Many important forensic questions concern injury mechanisms, not the individual diagnosis, and more research in this area is needed. Finally, it would have been interesting to know if a limited autopsy or an autopsy limited to percutaneous image-guided biopsies would have reduced the need for autopsies even further. Nevertheless, this study shows that PMCTA is a robust and reliable technique, which, if access to a CT scanner is available, can be implemented without much financial investment in daily pathological practice.

The rapid development of post-mortem imaging will continue, and it is possible that methods other than CT, such as MRI, will become increasingly important. Future research should be aimed at determining which combination of post-mortem investigation methods are best suited for specific purposes, taking into account the aim of the investigation and securing optimal use of the available resources. Some difficult cases might require an invasive autopsy that follows an enhanced algorithm with extensive histological and genetic

testing, whereas other cases might be satisfactorily investigated with imaging techniques.

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We declare no competing interests.

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1 Dutto O. Fotografi del sistema arterioso ottenute con raggi Röntgen. *Rendic Reale Acad Lincei* 1896; 5: 129 (in Italian).

- 2 Thali MJ, Yen K, Schweitzer W, et al. Virtopsy, a new imaging horizon in forensic pathology: virtual autopsy by postmortem multislice computed tomography (MSCT) and magnetic resonance imaging (MRI)—a feasibility study. *J Forensic Sci* 2003; 48: 386–403.
- 3 Grabherr S, Grimm J, Dominguez A, Vanhaeboom J, Mangin P. Advances in post-mortem CT-angiography. *Br J Radiol* 2014; 87: 20130488.
- 4 Grabherr S, Grimm JM, Heinemann A. Atlas of postmortem angiography. Cham: Springer International Publishing, 2016.
- 5 Grabherr S, Doenz F, Steger B, et al. Multi-phase post-mortem CT angiography: development of a standardized protocol. *Int J Legal Med* 2011; 125: 791–802.
- 6 Rutty GN, Morgan B, Robinson C, et al. Diagnostic accuracy of post-mortem CT with targeted coronary angiography versus autopsy for coroner-requested post-mortem investigations: a prospective, masked, comparison study. *Lancet* 2017; published online May 24. [http://dx.doi.org/10.1016/S0140-6736\(17\)30333-1](http://dx.doi.org/10.1016/S0140-6736(17)30333-1).
- 7 Thayyil S, Sebire NJ, Chitty LS, et al. Post mortem magnetic resonance imaging in the fetus, infant and child: a comparative study with conventional autopsy (MaRIAS Protocol). *BMC Pediatr* 2011; 11: 120.

From universal health coverage to right care for health



Achieving universal health coverage is the most important means to advance health and wellbeing during the next decade. Too many countries—and not only in low-income or middle-income settings—do not have a health system that provides “access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all”, as described in Sustainable Development Goal 3.8.¹

Even many high-income countries, such as the USA and the UK, see important inequalities in income, life expectancy, and health outcomes,^{2,3} and the prevailing political and economic landscapes are not encouraging for a reversal of this trend in the foreseeable future. At the same time, changing demographics in many countries mean that the share of the population with two or more chronic conditions will increase. As a result, the resilience and sustainability of health systems will be put under even more pressure. In a recent report by the Organisation for Economic Co-operation and Development, it is estimated that the proportion of the population in European Union countries aged 65 years or older will increase from 20% in 2015 to 30% by 2060.⁴ The same report states that in 2013, more than 1.2 million people in European Union countries died from avoidable illnesses and injuries⁴—people who would not have died had there been more effective public health and prevention policies in place, or more timely and effective health care. Yet all countries are struggling with spiralling costs of health and social care, with the prospect of rationing and restricting services—a strategy that would increase inequality and injustice

still further. Failure to provide treatment and preventive care at all remains the unacceptable reality in many low-income and middle-income countries for most of their populations. Clearly, something has to change in our thinking about the provision of health and health care to achieve health and wellbeing for all.

In a Series of papers^{5–8} and Comments^{9,10} in *The Lancet*, Vikas Saini and colleagues provide a framework for such a change of thinking. The Right Care Series examines the areas and extent of overuse and underuse of health and medical services around the world. It defines overuse as “the provision of medical services that are more likely to cause harm than good”,⁵ and underuse as “the failure to use effective and affordable medical interventions”.⁶ The Series authors argue that both overuse and underuse happen side-by-side in different countries, within countries, among populations, within institutions, and even for a single person. This situation offers an enormous (and currently poorly recognised) opportunity to tackle underuse and overuse together to achieve the right care for health and wellbeing.

What is right care? In its simplest definition it is care that weighs up benefits and harms, is patient-centred (taking individual circumstances, values, and wishes into account), and is informed by evidence, including cost-effectiveness. The Series authors acknowledge that most medical services fall into a grey zone where the benefit and harm ratio for a given individual is unknown. However, an important start is to think about, and aim to influence, the drivers of poor, unnecessary, and

Published Online
January 8, 2017
[http://dx.doi.org/10.1016/S0140-6736\(16\)32588-0](http://dx.doi.org/10.1016/S0140-6736(16)32588-0)

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