**Developing post mortem computed tomography coronary angiography to investigate non-suspicious death**

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Abstract

In the last 20 years, post mortem computed tomography (PMCT) has been recognised as a potential alternative to autopsy in non-suspicious death investigation. To achieve this, PMCT must diagnose coronary artery disease (CAD), the most common cause of sudden adult death in England and Wales. PMCT angiography (PMCTA) makes this possible but gaps remain in our knowledge of its accuracy, if it can be improved and if other techniques could replace it.

Through porcine and in- and ex-vivo human experiments leading to retrospective and prospective clinical studies of PMCT and PMCTA, I evaluated their diagnostic ability for CAD and their implementation by the evaluation of a PMCT non-suspicious deaths service.

Studying coronary PMCTA pressure demonstrated that although pressures achieved were about one-third of that seen physiologically, it was sufficient to fill the coronary arteries and enable an accurate CAD diagnosis. Coronary PMCTA scan analysis demonstrated “dynamic” scanning improved its quality more than any other factor and post mortem clot in the aorta, which restricts coronary artery filling, is negated by sequential injections and rolling the patient. Analysis of coronary artery calcification showed that an Agatston score over 400 predicted significant coronary stenosis and therefore obviated the need for half of PMCTAs. This study also shows that radiographers can identify high scores visually and PMCT and PMCTA would be improved if radiographers were trained to interpret vessel filling and identify pathologies and would enable bespoke scan protocols to minimise the frequency of PMCTA. Evaluation of a PMCT service concluded that PMCT can give a cause of death in more than 90% of cases, exceeding local standards and expectations.

This thesis experimentally supports our empirically developed protocols for PMCTA and shows the PMCT service achieves our goals. It also shows that PMCTA adds little to a “balance of probabilities” diagnosis in cases of heavy coronary artery calcification, scored either using software or by visual assessment.