H103 A Prospective Double-Blinded Comparison of Autopsy and Postmortem Computerized Tomography (PMCT) for the Evaluation of Potential Drug Poisoning Deaths

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After attending this presentation, attendees will understand how and when PMCT scans can supplement or supplant autopsy in potential drug poisoning deaths and how the two procedures compare in determining cause of death.

This presentation will impact the forensic science community by offering an alternative or supplement to autopsies for specific types of drug poisoning deaths.

In 2013, there were 589 drug poisoning deaths in New Mexico constituting 28% of the autopsies. In order to better understand when PMCT could be utilized to either replace or supplant traditional autopsies on potential drug poisoning deaths, autopsy reports and PMCT findings from a prospective cohort of these deaths investigated by the New Mexico Office of the Medical Investigator were collected between January 2013 and August 2013. Four hundred sixty cases were included. Autopsy reports and PMCT reports were completed, as was a study pathologist's Cause of Death (COD) statement (using PMCT, toxicology, and circumstantial information). Results were paired in Excel® spreadsheets for review in a consensus conference that included a radiologist and pathologist not involved in the original case assessment. The study was double-blinded.

The drug poisoning cohort included 307 males (67.2%) and 157 females (32.8%), ranging in age from 15 years to 90 years old. Accident was the most common manner of death (51.2%), followed by natural (32.4%), and suicide (10.1%). Males between the ages of 40 years and 69 years old were overrepresented.

More injuries and disease processes were recorded from the original autopsy than in the PMCT report used in the COD review. There were 7,121 findings, of which 2,734 were coded as matches (38.4%) and 5,349 (73.6%) as misses. Significantly more findings were ruled R1 (missed on PMCT and should have been seen) than were ruled A1 (missed on autopsy and should have been detected) (23.2% versus 15.3%, $p < 0.0001$). Similarly, significantly more PMCT findings were coded as R2 (would not expect to have seen on PMCT) than A2 (would not expect to be seen at autopsy) (30.7% versus 15.4%, $p < 0.0001$). The sensitivity of detecting all pathologic conditions and injures of PMCT in drug poisoning deaths was 65.5% and for autopsy was 74.3%.

Focusing on the COD statements, the first line of Part 1 of the death certificate was ruled a match and correct in both cases in 77.9% of drug poisoning deaths. In Part 2, Line 1 was correct and matched in the majority of deaths reviewed with a Part 2 (122/169, 72.2%).

Comparing COD evaluations in decedents under the age of 40 years old (113 decedents) to those for decedents ages 40 years and older (344 decedents), the first line of Part 1 of the death certificate was significantly more likely to match between the original autopsy and the CT-based reviewing pathologist ($p=0.019$) (85.8% vs. 75.3%). The first line of Part 2 was more similar between the two age cohorts, with no significant difference in percent matched and correct (63% and 74%, $p=0.24$).

Autopsy most frequently missed vascular calcifications, fractures, nephrolithiasis, aspiration, and diverticulosis, it was found. The findings most commonly ruled "A2" (not expected to be seen at autopsy) included vascular calcifications of the carotid bifurcations, degenerative changes, fractures, and osteoarthritis. The most commonly missed findings on PMCT included external contusions, cardiomegaly, obesity, and pulmonary edema. The most commonly reported R2 (not expected to be seen on PMCT) finding was "substance present on toxicology," followed by external abrasions, atherosclerotic stenosis, and hepatitis.

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With very few acute injuries and a significant incidence of natural disease, drug poisoning deaths are challenging for approaching as external exam, toxicology and PMCT-only. Deaths that present initially as potential drug poisoning are often ultimately attributed to natural disease or an interplay between natural disease and drugs, especially in people over the age of 40 years old; however, in decedents under the age of 40 years old, the use of PMCT only resulted in 86% correct COD determinations. PMCT can certainly be used to supplement traditional autopsy findings in cases of drug poisoning and, with appropriate investigative information, PMCT can reasonably supplant autopsy in potential drug poisoning cases in people less than 40 years of age.

PMCT, Autopsy, Toxicology

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