H85 A Prospective Double-Blinded Comparison of Autopsy and Postmortem Computed Tomography (PMCT) for the Evaluation of Pediatric Trauma Deaths

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After attending this presentation, attendees will understand how and when PMCTs can supplement or supplant autopsy in pediatric trauma deaths and how the two procedures compare in recognizing injuries and determining cause of death in these cases.

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

Given rapid advances in radiologic imaging technology, these modalities might offer an alternative to autopsy in certain types of deaths. In order to better understand when PMCT could be utilized to either replace or supplement traditional autopsies for children ages five years and younger dying of trauma, autopsy reports and PMCT findings from a prospective cohort of these deaths investigated by the New Mexico Office of the Medical Investigator between 2011 and 2013 were compared. Each decedent's autopsy report, completed by a pathologist blinded to the PMCT results, and full-body PMCT report, completed by pediatric radiologists blinded to autopsy results, were coded by a certified Abbreviated Injury Scale (AIS) coder. The results were entered into a shared electronic database (REDCap). Autopsy and PMCT results were reviewed in tandem for each case by a forensic pathologist and radiologist who were not involved in the original assessment of the case and each injury on each report was classified as being a match between autopsy and PMCT, missed and should have been seen (false negative, category 1), or outside the usual range of the alternative modality (category 2). Total numbers of injuries found per procedure, Maximum AIS (MAIS) score by region, cause of death as determined by each procedure, and numbers of "misses" were calculated and compared.

Fifty-five pediatric deaths with complete autopsies and PMCT scans were reviewed, with 64% (35/55) of the decedents male, a median age of one year, and an over-representation of American Indian decedents (15/55, 27%) compared to New Mexico's general population (10% American Indian). Forty-seven percent of deaths were in children under the age of one year. The most common cause of death was suffocation while sleeping (18/55, 32.7%), followed by motor vehicle crashes (12/55, 21.8%). Nine deaths (16%) were the result of homicidal violence. In most of the cases (82%), the cause of death was determined to be correct for both autopsy and PMCT. In nine cases (16.4%) the autopsy cause of death was deemed correct by the review panel and PMCT cause of death incorrect, with the converse being true in one case (1.8%). The calculated Injury Severity Score (ISS) was the same for autopsy and PMCT reports in 13 cases (24%), but was more severe when calculated from autopsy results in 33 (60%) of the reviewed cases. Autopsies revealed 335 total injuries, and PMCT detected 267 injuries, with 120 of these determined to be matches between modalities, leaving 482 unique injuries. Overall, 153 injuries seen on autopsy should have been seen on PMCT (31.7%) and 106 injuries (22%) seen on PMCT should have been seen on autopsy. An additional 37 injuries (7.7%) were determined to be outside of the scope of an autopsy and 54 injuries (11.2%) were outside the imaging capability of PMCT. The highest percentages of false negatives for PMCT were for external findings and head injuries (48% and 32%, respectively) and the highest occurrence of false negatives for autopsy were in the chest and extremities (35% and 23%, respectively). Comparing MAIS scores by region, the agreement between autopsy and PMCT ranged from fair (external, kappa=0.34) to almost perfect (extremities, kappa=0.98). MAIS scores for other regions demonstrated moderate to substantial agreement.

While neither modality is perfect, both autopsy and PMCT can be successfully used to correctly determine the cause of death in pediatric trauma cases. Consequently, PMCT can supplant autopsy in certain cases; however, the most detailed identification of injuries in fatal pediatric trauma comes from combining autopsy with PMCT and would be the ideal approach for pediatric homicides. False negatives will be fewer with the use of autopsy for head injuries, while PMCT improves the opportunity to identify chest and extremity injuries. In most cases, the severity of injuries by region agreed well between procedures.

Pediatric Injuries, Autopsy, Computed Tomography