



Pathology/Biology Section - 2015

H81 An Extremely Enjoyable Rave Party Resulting in a Fatal Sleep: The Reliability of Postmortem Computed Tomography in a Case of Crush Asphyxia

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After attending this presentation, attendees will understand the importance of Postmortem Computed Tomography (PMCT) in cases of crush asphyxia, with special regard given to the presence of gas (pneumothorax and subcutaneous emphysema) in corpses in a good state of preservation.

This presentation will impact the forensic science community by showing how PMCT allows forensic pathologists to clarify the causes of death and to verify the presence of vital signs even before the traditional autopsy.

The use of PMCT is growing in the field of forensic pathology as a supplement to the traditional autopsy because it is an objective and non-invasive approach. In particular, CT is an extremely reliable diagnostic instrument in several important areas of forensic pathology, such as identification of fractures, foreign bodies, and gas.

The corpse of a 28-year-old man was found under a car. According to the statement of the car's owner, in the early morning, he started his car but the vehicle did not move easily. Therefore, he exited the vehicle and found an unresponsive man lying on the ground under the car. Rescuers jacked up the car and extracted the corpse. According to the circumstantial evidence, the victim had been at a rave party the night before, where he had been heavily drinking.

A preliminary PMCT examination was performed five hours after the death. The following features were described on the CT report: atlo-axial dislocation, bilateral sternoclavicular joint dislocation, and multiple vertebral and rib fractures. On the upper part of the thoracic cavity, an anterior bilateral pneumothorax was present together with diffuse subcutaneous emphysema of the upper anterior trunk.

At the external examination, an ecchymotic mask was observed. Multiple abrasions and lacerations were irregularly widespread over the entire body surface. On the left side of the left nipple, a circular-shaped imprint abrasion was observed. Palpation of the skin over the anterior chest showed evidence of crepitus. The specific autopsy test for pneumothorax was performed, showing a negative result. Rib fractures were confirmed, surrounded by hemorrhage of the soft tissues. Lacerations of the parietal pleura, multiple tears of the lungs, and a left hemopneumothorax were found.

Toxicological analyses showed a concentration of ethanol of 351mg/dL in the peripheral blood and 387mg/dL in the urine. Immunohistochemistry analyses on the left hemithorax imprint abrasion were performed, showing a positive reaction to glycophorin.

In this case, compression of the chest interfered with the respiratory movements. Moreover, it led to severe injuries of the chest wall, resulting in bilateral rib fractures and tears of the lungs with hemopneumothorax. The air then moved into the subcutaneous tissues of the thorax due to a pressure gradient. Since a subject needs to be alive to realize this gradient, pneumothorax and subcutaneous emphysema are vital signs.

The well-timed PMCT examination allowed identification of these vital signs before the traditional autopsy. According to these findings, a specific autopsy technique to identify pneumothorax was performed with negative results, probably due to the small amount of air in the pleural cavities. Thus, PMCT can be considered as the most sensitive method for the identification of body gas, with special regard to small size pneumothorax. Moreover, the circular abrasion located on the left thorax was analyzed by immunohistochemistry, showing a positive reaction to glycophorin. Hemorrhages in the soft tissue surrounding the rib fractures were observed, confirming that the subject was still alive before being run over by the car.

In this case, PMCT was useful to clarify the mechanism of death and to identify signs of vitality before the autopsy examination. Since the autopsy test for pneumothorax identification was negative, without postmortem CT the presence of pneumothorax would definitely have been unrecognized.



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The main limitations of PMCT in case of pneumothorax and subcutaneous emphysema are the preservation status of the corpse and the employment of cardiopulmonary resuscitation procedures. A corpse in a good state of preservation, together with detailed circumstantial evidence and crime scene investigation, could allow the forensic pathologist to clarify the cause and mechanisms of death using only PMCT.

Postmortem Computed Tomography, Pneumothorax, Crush Asphyxia