H122 The Role of Postmortem Computed Tomography (PMCT) In High-Energy Traumatic (HET) Deaths

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Learning Overview: The goal of this presentation is to highlight the importance of a combined approach (postmortem imaging + autopsy) in the study of deaths due to HET that often result in heterogeneous, complex injury patterns with both organ and osseous injuries, including neurovascular structures. This study compared the PMCT and autoptic findings of 21 subjects who died due to HEG and according to the results (compared with those found in the literature), it was concluded that the two techniques (PMCT and autopsy) complement each other: PMCT is very useful for 2D or 3D documentation and analysis of fractures and pathologic gas collections (air embolism, subcutaneous emphysema after trauma, hyperbaric trauma, decomposition effects), while autopsy constitutes the method of choice for the detection of thoracic and abdominal visceral injuries.

Impact on the Forensic Science Community: This presentation will impact the forensic science community in terms of understanding the many advantages provided by PMCT and 3D reconstruction (performed in addition to traditional autopsy) in the approach to deaths due to HET that currently represent one of the leading causes of death and disability (the sixth-leading cause of death and the fifth-ranking cause of moderate and severe disability); deaths resulting from "trauma" are some of the most common cases encountered by practicing forensic pathologists.

The increasing collective experience with PMCT and the collaboration between radiologists and medical examiners appears to be of great usefulness in the reconstruction of the course of events and in determining the cause of death. The idea of using imaging tools in forensic investigation emerged several decades ago and was followed by the concept of objective non-invasive documentation of body surface for forensic purposes. Postmortem imaging has evolved considerably over the years and is now a well-known and useful tool for forensic investigation.

In this study, the feasibility of the complementary use of PMCT with conventional autopsy in trauma victims was evaluated. Trauma, defined as any physical force or agent that causes bodily harm, is a worldwide pandemic and one of the leading causes of death and disability. Statistical data claim that about 5.8 million people die following, or from, traumatic events every year worldwide, which accounts for 10% of global mortality. In particular, HET, generally associated with road traffic accidents, collisions, falls from a great height, or crushing accidents, often results in heterogeneous, complex injury patterns with both organ and osseous injuries, including neurovascular structures.

A total of 21 subjects who had sustained various types of blunt, HET were selected from the Section of Legal Medicine at the University of Pisa in Italy. Before autopsy, a PMCT examination (Toshiba® Aquilion 16 CT scanner) was performed, and after the acquisition of the raw images, Multi-Planar Reconstruction (MPR) and Virtual Reality (VR) reconstructions were performed with dedicated software.

All the typical lesions were diagnosed by the two techniques, PMCT, and autopsy; nevertheless, there were some peculiar differences. For visceral traumatic lesions, most were detected by both techniques (autopsy and PMCT), such as those at cephalic extremity, thoracic organs, and abdominal wall. In contrast, certain lesions were recognized only by macroscopic section; these lesions included multiple brain contusions/brain lacerations, laceration of the pericardium, subpleural hemorrhages, diaphragmatic contusion, and complete bladder rupture. Lesions seen only at PMCT were pneumopericardium, pneumomediastinum, ground glass parenchymal opacities in the lungs, pneumothorax, diaphragm laceration, and pneumoperitoneum.

In conclusion, the two techniques (PMCT and autopsy) complement each other. PMCT is very useful for 2D or 3D documentation and analysis of fractures and pathologic gas collections (air embolism, subcutaneous emphysema after trauma, hyperbaric trauma, decomposition effects), while the classic autopsy documents better the various visceral lesions. PMCT is more sensitive than conventional autopsy in detecting skeletal injuries, while the autopsy constitutes the method of choice for the detection of thoracic and abdominal visceral injuries.

PMCT should be considered a useful tool in addition to conventional autopsy in evaluating trauma victims. It detects further bone fractures in body parts difficult to investigate during autopsy (i.e., posterior regions), facilitating the pathologist in the reconstruction of events and in determining the cause of death.

PMCT, Autopsy, Traumatic Death