



## Pathology/Biology Section - 2016

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### H98 The Forensic Applications of 3D Postmortem Multislice Computed Tomography (PMCT): From “Radiopsy” to “Virtopsy”

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After attending this presentation, attendees will better understand the ability of virtual autopsy to make qualitative improvements in forensic pathology.

This presentation will impact the forensic science community by demonstrating the applicability of 3D PMCT in obtaining repeatable and reproducible results in radiological investigations.

The autopsy represents the most appropriate investigative tool in the analysis of the cause of death. In spite of this, the role of diagnostic imaging in forensics has also become increasingly important. The documentation and analysis of postmortem findings, obtained with diagnostic imaging, are operator-dependent, objective, non-invasive, and will lead to qualitative improvements in forensic investigations. Various studies have demonstrated the applicability of radiology in forensics. Radiological methods, when applied for forensic purposes, form the so-called virtual autopsy or virtopsy. Currently, PMCT, which is carried out prior to the autopsy, is considered a valuable aid in forensic investigations. PMCT has become a useful tool in various fields of forensic pathology. It allows the acquisition of data that, together with the autopsy findings, make it possible to answer different medicolegal questions in a more accurate and precise way.

The goal of this study was to demonstrate the applicability of this method in order to obtain repeatable and reproducible results. To attain this goal, 20 different cases of forensic interest were studied. These cases were divided into five groups (Group A through Group E) according to the cause of death. Group A consisted of three bodies whose cause of death was attributed to asphyxia; in group B, eight cases of gunshot wounds were studied; in group C, four exhumed corpses and human remains were analyzed; in group D, three cases of traumatic death were studied; and, in group E, two cases without a specific cause of death were studied.

For each corpse, a total-body Multi-Slice Computed Tomography (MSCT) with a 64-slice MSCT system supplemented with 3D reconstructions of the entire skeletal system was performed. After the CT scan, a standard autopsy was executed, including both external and internal examinations. Next, the analysis and comparison of postmortem radiological data with the autopsy data was completed. In this study, the focus was on specific targets: hollow organs, parenchymal organs, the skeleton, blood vessels, soft tissues, and blood effusion in natural cavities. In the case of human remains, an anthropological study consisting of anthropometric analysis was performed. Additional benefits of using this method include the ability to provide clear and accurate information that can be submitted for judgment to the court as forensic evidence, the documentation of investigation through a 3D reconstruction, and a better quality of documentation due to the storage and transfer of digital data.

In this study, PMCT proved to be very useful in the reporting of alterations of the facial area, with particular emphasis on the masticatory system, in the evaluation of the presence of a tracheal foreign body, in the identification of airway obstruction, in the identification of skeletal injuries and parenchymal lesions, and in the visualization of perilesional gas bubbles; however, the applicability of this method has shown some limitations regarding the identification of small vessel lesions, the visualization of vascular thromboembolism, the identification of infiltration of the soft tissues, and the identification of fractures of the cranial base. In particular, it was discovered that an important disadvantage of the method consisted of an overestimation of hemorrhagic effusion in natural cavities.

**Conclusions:** According to the literature, one can conclude that virtual autopsy today represents a valuable support to the investigation of forensic pathology but it cannot be considered as an alternative to the usual postmortem procedures. This virtual approach is not invasive or even minimally invasive and together with the documentation and analysis of postmortem findings, it will allow qualitative improvements in forensic medicine in the near future.

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#### Forensic Sciences, Virtopsy, Forensic Pathology