H158 The Value of Postmortem Computed Tomography (PMCT) in the Examination of Advanced Decomposed Bodies

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Learning Overview: After attending this presentation, attendees will better understand the importance of PMCT in the examination of advanced decomposed bodies.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by highlighting the importance of PMCT as a useful tool in detecting postmortem gas, even in very small amounts, and by allowing better discrimination of natural biological changes from pathologic processes in advanced decomposed bodies.

Decomposed bodies represent a real challenge for forensic pathologists because putrefaction processes can impressively alter the appearance of the bodies. In this context, PMCT represents an accurate procedure, allowing one to distinguish between normal postmortem changes and pathologic findings (i.e., between putrefactive gas present in normal decompositive processes and pathologic gas collections contributing to death, such as air embolism, pneumothorax, or pneumoperitoneum).

Between May 2013 and November 2016, ten forensic cases (8 males, 2 females) were selected from those admitted to this study's Forensic Unit by the local inquiring authorities to ascertain the cause of death. The Postmortem Interval (PMI) ranged from 7 to 887 days. All the bodies were PMCT-scanned prior to autopsy according to a standardized scanning protocol. PMCT data were transferred to a workstation for post-processing image reconstruction and were finally analyzed using a viewing software.

The internal putrefactive state was determined using the Radiological Alteration Index (RAI), determined by PMCT in seven selected sites, including the major vessels (left innominate vena and abdominal aorta), selected bones (vertebra L3), selected organs (heart cavities, liver parenchyma and vessels, and kidney parenchyma), and subcutaneous tissues and muscles (subcutaneous pectoral tissues), according to a standardized protocol (grade of gas present: 0, I, II, or III).[1] After PMCT scans, a complete conventional autopsy of each body was performed. The Grade of External Putrefaction (GEP) was assigned by the forensic pathologist during the external examination of the bodies, according to a standardized classification (beginning, moderate, advanced, major, mummified).[2] Causes of death were further investigated by histological, immunohistochemical, and toxicological examinations.

As expected, the PMCT image evaluation and the internal state analysis of putrefaction revealed that, in the selected seven sites, the RAI was >70 in all bodies, meaning advanced decomposed status. The gas grade was higher in correspondence of the major vessels, heart cavities, vertebra L3, heart cavities, and subcutaneous pectoral tissues. Coherently, the GEP assessment at the cadaveric external examination revealed the presence of transformative phenomena from "major" to "mummified" in all the examined bodies.

This study offers an overview of the common findings in advanced decomposition that may dramatically alter a body's appearance and consequently add more difficulty in determining the cause of death, significantly increasing the risk of bias and leading to misinterpretation of the autopsy findings. Radiological imaging by PMCT as an adjunct to conventional autopsy in advanced decomposed bodies has been proven to be a useful tool in detecting postmortem gas, even in very small amounts. Putrefaction can be described in postmortem imaging as gas accumulation within vascular system, body cavities, parenchyma, and soft tissues.

Conclusively, the radiological investigation offers an indisputable support to conventional autopsy in cases of decomposed bodies, increasing its performance and allowing the study of findings that would otherwise be difficult to identify. For these reasons, the correct interpretation of PMCT data is fundamental to avoid the misunderstanding of instrumental evidence and to facilitate the differential diagnosis between natural decomposition and pathological processes.

Reference(s):

1. Egger C., Vaucher P., Doenz F., Palmiere C., Mangin P., Grabherr S. Development and Validation of a Postmortem Radiological Alteration Index: The RA-Index. *Int J Legal Med*. 2012;126(4):559-66.
2. Maujean G., Vacher P., Bagur J., Guinet T., Malicier D. Forensic Autopsy of Human Decomposed Bodies as a Valuable Tool for Prevention: A French Regional Study. *Am J Forensic Med Pathol*. 2016;37(4):270-274.

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