H154 Spleen Attenuation and Routine Measurements With Regard to Cause of Death and Estimation of Spleen Weight: A Study on Postmortem Computed Tomography (PMCT)

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Learning Overview: The goal of this presentation is to show how spleen characteristics as interpreted by imaging tools like PMCT can contribute in the determination of a cause of death and predict accurately the actual spleen weight before an autopsy.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by stating that various peri-mortem conditions, such as hospitalization, long or short agonal interval, and cause of death may influence organ findings on imaging. Additionally, by the increasing usage of postmortem imaging as a supplemental tool to autopsy worldwide, organ measurements and weight estimation must be validated.

Objectives: The spleen is the largest lymphatic organ of the human body. Its size, weight, and macroscopic features are of great forensic importance as acute organ responses or chronic diseases can be reflected in the spleen's appearance during an autopsy and may contribute to the determination of a cause of death.[1] PMCT is an invaluable supplement to traditional forensic autopsy.[2,3] The first goal of the current study was to investigate spleen attenuation on PMCT with respect to different causes of death, macroscopic spleen findings during autopsy, the presence of Contrast Agent (CA) rests, and hospitalization prior to death. The second goal was to evaluate the utility of PMCT to perform routine measurements for estimating the actual spleen weight measured during autopsy.

Materials and Methods: The autopsy protocols and PMCT data of all cases with PMCT and full forensic autopsy from 2015 to 2017 were reviewed retrospectively. Spleen attenuation in Hounsfield Units (HU), Width (W), Thickness (T) in cm and axial maximal Surface (S) in cm^2 were measured on PMCT. The cause of death, macroscopic spleen findings (paleness, contraction, congestion), and Spleen Weight (SW) during autopsy, whether death occurred in hospital or not, and the usage of CA prior to death were listed retrospectively for each case. Cases <18 years old, postmortem interval >4 days, asplenia, organ explantation, severe spleen injuries, and cases with artifacts or gas within the spleen on PMCT were excluded. Statistical analysis was performed to investigate first the spleen attenuation values among different causes of death, macroscopic findings, hospital and non-hospital deaths, and CA usage, and second, to assess the utilitlity of PMCT for estimation of the actual spleen weight.

Results: One thousand thirty-five cases were included in this study, 972 of them for exploring spleen attenuation and 1,026 for evaluating spleen measurements for the prediction of spleen weight. Spleen attenuation average was 49.51HU ±6.54HU. Spleen attenuation was significantly higher for cases with CA rests on PMCT (52.05HU±9.22HU), contrary to cases without CA (49.3HU±6.24HU) and significantly lower for hospital-deaths (48.44HU±8.82HU) compared to non-hospital deaths (49.77HU±5.79HU). Spleen attenuation did not differ significantly among the different macroscopic spleen findings. Sixteen different cause-of-death groups were identified, and spleen attenuation was significantly lower for multiple organ failure (43.71HU±11.2HU) compared to fatal hemorrhage (50.01HU±6.42HU), intoxication (50.05HU±5.40HU), strangulation-asphyxia (50.83HU±5.41HU), hypothermia (52.44HU±4.31HU), and metabolic disorders (52.57HU±7.39HU). Spleen W was 8.60cm±1.78cm, T: 4.10cm±1.08cm and S: 26.63 cm^2±10.72cm^2. The average SW was 188.69g±108g. There were strong positive correlations among W-T-S and SW, and the correlations were expressed as linear regressions with equations for predicting SW based on W, T, and S on PMCT. There were no statistical differences between calculated SW and actual SW. The regression equations overestimate smaller SW and underestimate larger SW.

Conclusion: Spleen attenuation on PMCT differs significantly among several causes of death. CA usage and prior hospitalization must always be taken in account during spleen radiological findings' interpretation as CA increases the organ attenuation and intravenous fluid therapy during hospitalization decreases attenuation causing hemodilution. PMCT can accurately estimate SW based on spleen measurements on axial PMCT slices.

Reference(s):

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2. Eriksson A., Gustafsson T., Höistad M., Hultcrantz M., Jacobson S., Mejare I., Persson A. Diagnostic Accuracy of Postmortem Imaging vs. Autopsy – A Systematic Review. *Eur Radiol*. 2017; 89:249-269.
3. Ampanozi G., Thali Y.A., Schweitzer W., Hatch G.M., Ebert L.C., Thali M.J., Ruder T.D. Accuracy of Non-Contrast PMCT for Determining Cause of Death. *Forensic Sci Med Pathol.* 2017;13(3):284-292.

Spleen Attenuation, Spleen Weight, Postmortem Computed Tomography