G57 Virtopsy Project - Postmortem Needle Biopsy of the Lungs: A Feasible Tool for the Study of Fat Embolism as Vital Reaction

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After attending this presentation, attendees will learn how to overcome the diagnostic gap of postmortal cross-sectional imaging in detecting the occurrence of fat embolism as vital reaction, by using percutaneous needle biopsy techniques.

This presentation will impact the forensic science community by demonstrating how percutaneous needle biopsy technique can improve the diagnostic accuracy of postmortem imaging investigations on pulmonary fat embolism as vital reaction within the concept of a minimally invasive virtual autopsy.

Pulmonary fat embolism, usually, and pulmonary embolism of bone marrow, always, can be considered indicative for antemortem violence. In fact, it is a vital phenomenon after trauma, depending on the pumping action of the heart and an intact circulation. The postmortem diagnosis of pulmonary fat embolism is traditionally based on the histological demonstration and analysis of fat droplets within the lung microcirculation.

The study population consisted of twenty-six randomly selected autopsy cases examined from September 2008 to November 2008, delivered to the Institute of Forensic Medicine of the University of Berne.

In each case, probes from both lungs were obtained using two different sampling methods. Prior to the autopsy, multiple postmortem biopsies from both lungs were executed using clinically approved and postmortem tested ACN-III biopsy core needles (14 gauge -160 mm) with an automatic pistol device. Then, during the traditional autopsy of the same cases, other thin slices of lung tissue from both lungs were taken, using a double-edge knife technique. The double-edge knife consists of a blade sharpened on one or both slides to which a second blade, similar in size and shape, is added on the side, folded out by means of a joint. A knurled nut regulates the distance between the blades, and thus the slice thickness.

All the samples were subjected to water storage and Sudan III staining. The microscopical examination was then performed by six board certified forensic pathologists, and scores were assigned according to the grading scale by Falzi et al. A comparison was made between the results of the histological examinations on both lung specimens from the twenty-six death cases, obtained with postmortem needle biopsy and double edge knife techniques respectively. A statistical analysis of the results was performed.

The statistical analysis conducted separately for each sampling technique showed no significant differences in the grading score for the samples from both lungs obtained with the two techniques. Moreover, it was demonstrated that the six forensic pathologists evaluated homogeneously the slides obtained by both lungs. Absence of pulmonary fat embolism was detected in the same cases investigated by both techniques. With respect to the assigned grading score, a statistically relevant discrepancy between the results of the histological examination conducted on samples by the needle biopsy and double edge knife techniques was found in six cases. Nevertheless, the discrepancy was not systematic, because in three cases the analysis conducted with needle biopsy gave results bigger than that with double edge knife, and in the other three smaller.

In conclusion, this study demonstrates that postmortem pulmonary biopsy, if compared with double edge knife technique, can represent a feasible method of specimen collection for detecting and analyzing pulmonary fat embolism as vital reaction.

Although further studies are needed, the application of post-mortal percutaneous needle biopsy methods to forensic investigations on fat embolism as vital reaction could be able to improve the diagnostic accuracy of postmortem imaging examinations, and even more, the possibility of a minimally invasive virtual autopsy can be envisaged for select cases.

Pulmonary Fat Embolism, Percutaneous Needle Biopsy, Postmortem Imaging

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