G51 Blood Aspiration as a Vital Sign Detected by CT Imaging and Postmortem CT Guided Biopsy

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After attending this presentation, attendees will have learned about the possible contribution of multi-detector computed tomography in forensic investigations on blood aspiration.

This presentation will impact the forensic science community by suggesting that the execution of a CT scanning prior to autopsy in cases suspected for occurrence of blood aspiration may avoid misdiagnoses and provide an easier and immediate visualization of distribution and severity of aspiration.

Based on the proved efficient role of the modern cross-sectional techniques as complementary/additional tool to traditional forensic methods, the aim of this study was to examine the value of postmortem CT imaging in evaluating pulmonary findings related to blood aspiration, compared to traditional forensic pathology techniques.

Identification and correct interpretation of blood aspiration is of substantial importance in forensic cases, as this finding can provide the forensic pathologist with information on whether an injury occurred intravital or postmortem, and give suggestions on the cause of death.

Between January 2005 and December 2008, at the Institute of Forensic Medicine in Bern a total of 359 human corpses underwent MSCT scanning prior to autopsy, within the project. Thirty-seven non-decomposed bodies where blood aspiration was documented with the traditional examinations, or where blood or bloody fluids were found in the airways from larynx to small bronchi were selected. A total of thirty- one cases had demonstration of aspiration in lung parenchyma on autopsy inspection or on histological analysis. The remaining six cases all showed blood or bloody fluids in the airways. Blood aspiration was reported in final autopsy reports as being the primary, assisting or competing cause of death in seven cases. All cases underwent body CT scanning on a six slice scanner. Two- and three-dimensional reconstructions were obtained at a workstation. The images were assessed for presence, entity, density and composition of material in the airways, and for presence, entity and distribution of lung density alterations. The possibility to consider blood aspiration as cause or assisting cause of death was also assessed.

In one exemplary case, biopsy-specimens from abnormal regions of the lungs have been obtained under CT fluoroscopy guidance for histological examination.

The thirty-one cases with traditional demonstration of aspiration in lung parenchyma had ground glass opacities suggestive for blood aspiration on pulmonary CT imaging. In the six remaining cases CT imaging detected pulmonary abnormalities suspected for blood aspiration that was not mentioned in the final autopsy reports. In two cases among these, the route of aspiration was evaluated on the basis of injuries detected by whole body CT images as being anterograde and of scarce severity, in one case retrograde, and in three combined. The biopsy specimens obtained in the one case confirmed the occurrence of blood aspiration. The concordance between post-mortal CT imaging and traditional techniques in attributing primary, assisting or competing cause of death to blood aspiration was of 71%.

Our results show the superior sensitivity of post-mortal CT imaging in detecting areas suspected for blood aspiration in some particular cases of blood aspiration of scarce severity, or when pulmonary injuries are associated. In these circumstances, the typical macroscopical findings on the lung inspection may be absent or be largely concealed by other alterations. Thus, postmortem CT can be excellently used in these cases to guide the forensic pathologist during lung tissue investigation, and to provide focused specimens for the histological examination.

Moreover, postmortem two and three dimensional CT techniques have been proven by this study to be a great device to better analyze distribution and amount of aspirated blood and to document and conduce hypothesises on the cause of death. With the traditional diagnosis of a fatal blood aspiration (made through the analysis of just few slices of the lung tissues considered representative for the whole pulmonary volume) information about the real extent and distribution of this phenomenon is lost. On the contrary, CT imaging techniques can provide a complete collection and documentation.

The analysis of post-mortal CT images of lungs and airways alone doesn't offer in many cases enough data to distinguish with certainty pulmonary findings due to blood aspiration and lung alterations due to other causes. Nevertheless, it should be considered a fundamental, highly suggested complementary tool to traditional autopsy techniques in cases of blood aspiration to avoid misdiagnoses and to provide complete and exhaustive description of the severity of the phenomenon.

Blood Aspiration, Postmortem CT, Postmortem Needle Biopsy

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