H40 Postmortem Imaging of Coronary Arteries for Natural and Violent Deaths

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After attending this presentation, attendees will be knowledgeable regarding modern postmortem imaging of coronary arteries and its usefulness in forensic practice for diagnostic and documentation purposes.

This presentation will impact the forensic science community by raising awareness concerning the advantages and limitations of radiological postmortem examination of coronary arteries.

Evaluation of coronary arteries is one of the essential steps during autopsy investigations as many sudden deaths are related to coronary artery lesions. Postmortem imaging is playing an increasingly important role in forensic investigations, not only in violent deaths but also in cases of natural deaths, and represents one of the most important topics of research in forensic pathology. In general, coronary arteries are investigated morphologically during classical autopsy, followed by histological examinations; however, depending on the chosen method and case, the radiological examination of coronary arteries often provides the first appreciation of coronary status and allows documentation before performing a destructive autopsy. The goal of this presentation is to explain the current approach for postmortem radiological investigation of coronary arteries for natural and violent deaths.

Since 2009, more than 700 postmortem cases were analyzed with Postmortem Computed Tomography (PMCT) and Multiphase PMCT-Angiography (MPMCTA) in this study's center. An unenhanced PMCT and subsequent MPMCTA were performed before the classical autopsies, following standard protocols. Postmortem liquid samples for toxicological screening and the biochemistry/microbiology were collected using PMCT guidance. A full classic autopsy, including subsequent histological examination of selected tissue, was performed for every case. Autopsies were performed according to international recommendations for forensic pathology and cardiovascular pathology for presumed sudden cardiac deaths.

Among natural deaths, the most frequent cause of death was ischemic heart disease related to atherosclerotic coronary artery disease. According to research, PMCT permits the detection of coronary artery calcifications while MPMCTA additionally allows for the evaluation of coronary artery lumina, the detection of myocardial lesions such as myocardial rupture, and, in some select cases, signs of myocardial infarction. Thanks to a detailed comparison between radiological images, autopsy, and histology, a specific key for postmortem radiological reading of coronary arteries has been developed which will be presented. Postmortem imaging of coronary arteries in violent deaths represents an additional tool for more detailed documentation and allows for reconstructions of gunshot or sharp injury trajectories, especially important in cases involving a third person. The autopsy technique could also be adapted according to the radiological evaluation. Postmortem imaging of coronary arteries with surgical interventions appears especially useful and is recommended according to this research. PMCT allows for the detection of coronary stents, which can be difficult to visualize at autopsy in the presence of severe calcifications. MPMCTA can demonstrate the permeability of coronary bypass and help guide the dissection technique during autopsy.

Advantages and disadvantages of PMCT/MPMCTA will be discussed. The systematic postmortem evaluation of coronary arteries and the knowledge obtained by comparative studies with PMCT/MPMCTA could improve the

understanding of radiological presentations of coronary morphology and pathologies in living patients. The key for postmortem radiological reading of coronary arteries needs to be evaluated in other centers and adapted, according to the results of further studies. It is felt that, the combination of classical autopsy and postmortem imaging of coronary arteries leads to an improvement of quality of postmortem forensic diagnosis and documentation and should be considered as a new gold standard if lesions of coronary arteries are suspected.

Sudden Cardiac Death, Coronary Arteries, Postmortem Imaging