## G82 New Light in Dead Bodies: Value of Postmortem CT Angiography in Traumatic and Natural Causes of Death

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After attending this presentation, attendees will have gained knowledge about the technical settings, the methodology of postmortem Computed Tomography Angiography (pmCTA), and seen a demonstration of findings in natural and traumatic causes of death.

This presentation will impact the forensic science community by showing the potential of minimally invasive pmCTA as adjunct, or in selected cases, even as a replacement for classic autopsy.

Clinical radiology has led to a great improvement in the diagnosis of vascular pathologies such as traumatic vascular injuries, acute coronary syndrome, pulmonary embolism, or aortic dissection, predominantly based on non-invasive angiographic examinations by means of Computed Tomography Angiography (CTA). Meanwhile, the classical postmortem examination is still performed according to a method almost unchanged since the time of Virchow, with dissection being the gold standard for determining the cause of death. In order to enhance the customary and partially restricted approach of manual autopsy, the introduction of unenhanced pmCTA in the field of forensic pathology represents a radical innovation, acting as a powerful adjunct or even a potential replacement for classical autopsy. It showed great potential in the depiction of bones and air-containing structures using unenhanced pmCT, but the diagnosis of vascular pathologies remained a "blind spot." At the time of introduction of pmCT at the end of the 1990s, there was no feasible method of applying a contrast medium to the whole adult corpse. During recent years, further attempts to establish a minimally invasive approach using specially designed contrast medium with subsequent pmCTA of the whole body have led to promising results.

This study used an iodinized water-soluble contrast medium mixed with polyethylene glycol (PEG-200) at a mixture ratio of 1:15. This mixture consists of a large polymerized portion (PEG) and an unpolymerized part with small molecular dimensions (contrast medium). After intravascular injection, enhancement is observed for physiologically well-perfused tissues such as the cerebral cortex, myocardium, pancreatic/splenic tissue, renal cortex, liver, and intestinal wall. This enhancement likely arises from the diffusion of the small molecular hydrophilic contrast medium in the capillary bed into the interstitial and intracellular spaces, whereas the polymerized large PEG molecules have to stay in the intravascular space due to their large size. This mechanism on one side avoids the unwanted extravasation of contrast in areas with early decomposition (e.g., the gastrointestinal (GI) tract).

A simple injection protocol is used, consisting of a divided injection of the contrast mixture into the arterial and venous system without establishing new circulation. This technique has proven its potential in more than 200 cases to this time.

As far as could be ascertained, the fastest access to the vascular system for pmCTA is gained by the cannulation of the relatively large femoral vessels. Harvesting of body fluids (blood, urine, Cerebrospinal Fluid (CSF)) for toxicological examination has to be done before angiography to avoid a dilution of the substances targeted in toxicological examination.

There will be an exemplary demonstration of the performance of pmCTA in different body regions:

**Brain:** Arterial and venous contrast application allows a far better distinction of gray and white matter and the possibility to detect vascular pathologies such as aneurysm or rupture with subsequent hemorrhage than unenhanced pmCT.

**Thorax:** Reliable assessment of cardiac pathologies and a diagnostic-sufficient filling of its vessels can be shown on pmCTA. Pathologies like aortic dissection are easily displayed by pmCTA. Detecting such a finding prior to autopsy may even lead to a change in anatomic preparation, besides already providing the definitive cause of death.

**Abdomen:** Despite vascular pathologies, pmCTA allows a very good parenchymal contrast, therefore leading to superior sensitivity and specifity in the detection of organ laceration, rupture, or masses compared to unenhanced pmCT.

**Extremrties:** Even though injuries to the extremities usually do not lead to death, there are several pathologies that need to be detected and may help to reconstruct the inflicted injury, especially in cases of accidents with reconstructive questions or homicide.

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The conclusions of this study indicate that pmCTA delivers substantial added value to the classic autopsy regarding vascular and parenchymal pathologies in natural and traumatic causes of death and encourage the adoption of its minimally invasive and relatively inexpensive technique in other institutes of forensic medicine.

**pmCTA, Forensic Radiology, Computed Tomography**

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