



G89 Perfusion Technique for Postmortem CT-Angiography

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After attending this presentation, attendees will understand the interpretation of different pressure variations and gradients, understand the concept of a specialized perfusion machine with integrated controller and software for most-mortem CT-angiography, and know the concept of an ideal ante- or retrograde perfusion.

This presentation will impact the forensic science community by explaining the background and the development of a new technique and new equipment for postmortem CT-angiography, which is easily applicable and therefore interesting for everyone performing postmortem analysis.

By the use of special perfusion techniques and equipment, important information about the status of the vascular system can be gained, even without performing radiological imaging. The combination of such adequate perfusion and imaging by CT-angiography provides images and physical data that allow diagnoses of the vascular system.

In the University Center of Legal Medicine, Geneva – Lausanne, a research group has been created with the goal to develop a standardized protocol and special equipment for postmortem CT-angiography. Therefore, a specialized perfusion machine that should ease the use of the technique and that includes software giving information about the vascular status of the investigated body should be developed. With the knowledge of two European-board certified perfusionists, pressure values obtained during the perfusion for postmortem angiography are used for this development.

In general, the postmortem perfusion can be obtained by a femoro- femoral access. Therefore, the femoral artery and vein of one side are cannulated. Once the cannulas are connected to the tubes of the perfusion machine, the perfusion is started using the oily contrast agent Angiofil®. The arterial and the venous tubes are connected to the pressure monitor to register the pressure variations and pressure gradients.

In the first phase of the perfusion, the arterial system is filled antegrade under pressure control. In general, 1200 ml of contrast agent are introduced during ninety seconds. Increasing pressure values measured in the venous tube are signaling the integrity of the arterial system. Once the defined quantity of contrast agent is injected, the arterial and venous tubes are clamped to keep the pressure inside of the vascular system steady and the perfusion machine is stopped. Under those “static conditions” (stopped perfusion), a first acquisition of CT- images can be performed to visualize the arterial phase of angiography.

The same technique is repeated with the venous system, with the only difference that the veins are perfused retrograde. This second phase of the perfusion is made to visualize the venous phase of angiography.

During the first to phases of postmortem angiography, the most important perfusion value is the “delta p” which is indicating the pressure gradient from the arterial to the venous system. A low delta p, during an arterial perfusion is a sign for an intact arterial system, during a venous perfusion it indicates the integrity of the venous system. If this value increases, a leak of the arterial (during the arterial perfusion) or the venous system (during the venous perfusion) has to be suspected.

As a third phase in postmortem angiography a dynamical perfusion can be performed, that means that further contrast agent is injected and CT-data are obtained during the ongoing perfusion. Depending on the case, one or more acquisitions of images can be made. During the perfusion, pressure gradients are measured under a volume-controlled pump speed. This dynamic phase is especially useful if leaks of the vascular system are identified. In those cases, it can allow to quantify blood loss in cases of hemorrhages.

Conclusion: By performing a standardized perfusion technique with adequate perfusion equipment, changes of perfusion values can indicate leaks and show whether they are situated in the arterial or in the venous part. By using a contrast agent as perfusate, the perfusion can be used to perform postmortem angiography. The developed perfusion technique and special perfusion pump with integrated controller and software allows the performance of postmortem CT-angiography and the interpretation of the perfusion values, so that the technique becomes applicable in the routine of postmortem investigation.

Postmortem Angiography, Forensic Radiology, Postmortem Perfusion