



Pathology Biology Section - 2012

G49 Investigation of Sharp Trauma by Postmortem Multi-Phase CT-Angiography

*Silke Grabherr, MD**, Centre Universitaire Romand de Médecine Légale, Rue du Bugnon 21, Lausanne, 1011, SWITZERLAND; *Francesco Doenz*, Service de Radiodiagnostic et de Radiologie Interventionnelle, Rue du Bugnon 46, Lausanne, SWITZERLAND; *Sebastien de Froidmont, MD*, University Center of Legal Medicine Lausanne-Geneva, Rue du Bugnon 21, Lausanne, CH-1011, SWITZERLAND; *Cristian Palmiere, MD*, Centre Universitaire Romand de Médecine Légale, 21 rue du Bugnon, Lausanne, 1011, SWITZERLAND; *Stefano Binaghi, MD*, Service of Radiology, University Hospital Lausanne, Rue du Bugnon 46, Lausanne, CH-1011 Lausanne, SWITZERLAND; and *Patrice Mangin, MD, PhD*, Centre Universitaire, Romand de Medecine Legale, Rue du Bugnon 21, Lausanne, CH-1011, SWITZERLAND

After attending this presentation, attendees will understand the advantages and limitations of investigating cases of sharp trauma by postmortem multiphase CT-angiography.

This presentation will impact the forensic science community by showing how the performance of a pre-autopsy postmortem CT-angiography can increase the quality of the medico-legal exam. It also shows the importance to complete the radiological exam by a conventional autopsy and the necessity to further develop this new approach.

While the performance of postmortem Multi-detector Computed Tomography (MDCT) has already become a routine investigation in some institutes of legal medicine, postmortem CT-angiography is still a field of research. At the University Center of Legal Medicine in Lausanne, a standardized technique to perform this kind of exam has recently been developed and is already getting its way into daily routine. The so called multi-phase postmortem CT-angiography (MPMCTA) consists in the performance of a native (without contrast-agent injection) MDCT scan and at least three angiographic phases (arterial, venous, and dynamic phase). As a result of this technique, the vascular system of the head, thorax, and abdomen can be investigated in detail and in a minimally invasive way. Also the examination of soft tissue (musculature, subcutaneous tissue) is significantly increased.

The goal of the presented study was to investigate the performance of MPMCTA on cases of sharp trauma.

More than 170 medico-legal cases have been investigated by postmortem MDCT angiography. From this collective, cases with sharp trauma on which the standardized protocol of MPMCTA has been performed were selected. The findings obtained by native MDCT, postmortem CT-angiography and conventional autopsy have been compared. Additionally, the impact of the radiological findings on the final interpretation of these cases was explored.

Ten cases (six Suicides, four Homicides) were selected for this study. Subjects were primarily men (seven male, three female) and age varied from 17 to 64 years (mean age=37.7). Causes of death were mostly due to exsanguination and hemorrhagic choc (n= 6). Three persons died due to a cardiac tamponade and one victim, on whom the sharp trauma was combined with manual strangulation, died due to asphyxia. More than 75 lesions due to sharp trauma were described in the final autopsy reports (including radiological and autopsy findings). They consisted of 49 stab wounds, 26 cuts, and multiple scratches.

While native MDCT could only identify major injuries due to the presence of air in the soft tissue or due to bone lesions visible on the trajectory, the sensitivity of the radiological examination could be significantly increased by performing postmortem multi-phase computed tomography angiography (PMPCTA). Due to the enhancement of the injured soft tissues, trajectories of stab wounds and even superficial cuts could be rendered visible. The 3D-software of the CT-workstation permitted also different reconstructions that could be used to explain the lesions to medical laypersons and to plan the conventional autopsy. While in most of the cases, the depth of the injury could be measured easily, it was underestimated in some cases because smallest lesions were not visible in the radiological images (e.g., small impact on a vertebra, lesion of the pericardium). On the other hand, the radiological exam revealed vascular lesions that have been missed during the autopsy and could detect the exact source of bleeding. Such findings can be important and can even explain the cause of death (e.g., cardiac tamponade due to a small lesion of branches from coronary arteries).

The sensitivity of PMPCTA to detect mayor lesions (stab wounds, cuts) in the head, thorax, and abdomen was extremely high (100 %). The protocol of PMPCTA allows a complete opacification of the vascular system in these regions; however, the examination of the limbs is not included in the scanning protocol. Therefore, the opacification of the vessels in these regions is not regular and, until now, no standardized protocol exists for the limbs. In cases where their vessels were perfused, the lesions could be identified. Without an optimal perfusion, the radiological exam failed to visualize the morphology of the lesion.

In conclusion, postmortem CT-angiography using the protocol of MPMCTA is a powerful tool to investigate lesions due to sharp trauma localized in the head, thorax and abdomen. The detection of the exact source of bleeding represents an advantage over conventional autopsy. However, this exam should be followed by a conventional autopsy, as smallest lesions could be overseen and the depth of stab wounds can be underestimated. In order to investigate also the limbs, standardized protocols have to be developed that permit the filling of their vascular system.

Postmortem CT, Sharp Trauma, Forensic Imaging