ACTA RADIOLÓGICA PORTUGUESA
January-April 2021 | Vol 33 nº1 | 5-7

Artigo de Opinião / Opinion Article

Radiologia Forense: Renascimento na Era da TC Precipitado pelo Covid-19

Forensic Radiology: Rebirth in the Era of CT Precipitated by Covid-19

Henrique Rodrigues

Médico Radiologista; Mestre em Medicina Legal e Ciências Forenses;
Aluno de Doutoramento em Antropologia Forense

Forensic radiology, in a simple way, can be defined as the application of radiological techniques to forensic problems. This application has several fields of activity and collaboration, extending from archeology to anthropology and to forensic medicine.

In the field of forensic medicine, the contributions of radiology have multiple aspects, applying both to the living and to the postmortem context.

All techniques are liable to contribute and must be chosen according to availability and the forensic problem in question.

Many forensic institutes around the world are already equipped with CT and MRI devices to be used only in this context. They even use machines for extra-corporal circulation adapted for the administration of intravenous contrast after death, allowing the study of the vessels and parenchyma of the various organs just as in the living.

The concept of virtopsy or virtual autopsy has become more and more comprehensive, and constitutes an important support for autopsies. It is not intended to completely replace cadaveric dissection, but rather seeks to complement and guide dissection. In selected cases, or in special circumstances, it can provide important and conclusive information allowing to document the cause and mechanism of death. Evident examples of this utility are the use in cultural environments that exclude the post-mortem examination for religious reasons and the epidemic situations in which the risks of the autopsy for those who perform it are very significant.

The application of radiology to the forensic context is based on the same semiology as in the living and it is important to have knowledge of the imaging findings that result from normal post-mortem changes, whether natural or when caused by the environment. It is also essential to have knowledge about the mechanisms of traumatic injuries, the type of traumatic agents and the injuries they produce.

One of the great advantages of radiology is the fact that VR and Cinematic Rendering images are easy to perceive by other stakeholders in the judicial system, providing evidentiary characteristics that are easy to understand and validate.

Another fundamental aspect is to have knowledge about the legislation and the judicial procedures associated with forensic problems so as not to disrespect the procedural requirements that may jeopardize the evidentiary means provided by the medical image.

In our country, the collaboration between radiology and forensic sciences has a long tradition that has been boosted in recent years. In fact, collaboration has been increasingly requested due to the increasingly accurate and of better quality performance of CT and MRI, and there is also a growing interest from the National Institute of Forensic Medicine and Science in equipping its facilities with CT devices. All this activity is also accompanied by an increase in publications and training courses in this area. In this last year, an unexpected impulse emerged, which resulted from the COVID 19 pandemic, which motivated an increasing number of requests for CAT examinations, whenever the autopsy was not performed for safety reasons.

In view of this reality, there is a need for radiologists to be increasingly interested in this area, which allows them to collaborate in solving an endless number of problems. This collaboration extends from the assessment of corporal harm in the context of accidents, in the context of maltreatment or crimes against humanity, to the determination of age, the identification of strangers and, finally, to the cause and mechanism of death.

In recent months, it has been possible to gather several cases with use of CT in the postmortem context replacing the classic autopsy, and it is from this experience that I try to bear witness. Additionally, I present some cases that resulted from training at the Institute of Forensic Medicine in Lausanne.

This letter to the editor aims to encourage the community of radiologists to take an interest in this area of radiology where, applying our knowledge, we can provide a service to the community, improving the outcome of autopsies, contributing in a relevant way in situations of maltreatment and of crimes against humanity to the law enforcement.

Finally, I attach images of some forensic situations that occurred in post- or ante-mortem context where, because of legal issues involved, we must look at the images and prepare our reports with a forensic perspective.

Figure 1 – VR reconstruction of the skull. A multi-splinter fracture of the skull and face is observed, with sinking of the cap. The injury was conditioned by being run over and the image allows the assessment of the trauma energy necessary to crush the skull.

Figure 2 – CT of the skull. Axial image showing the sinking of the cap, with damage to the brain mass by bone fragments and an extensive pneumoencephalon due to open fracture.

Figure 3 – CT of the skull. Axial image showing sub-arachnoid hemorrhage in the sulci due to mild trauma. There is also hyperdensity of the venous sinuses, which translates to normal blood clotting in the postmortem context and should not be confused with venous sinus thrombosis.

Figure 4 – CAT scan of the chest. Axial image showing a slight increase in post-mortem density, a common aspect, which results from non-ventilation and should not be confused with pathology.

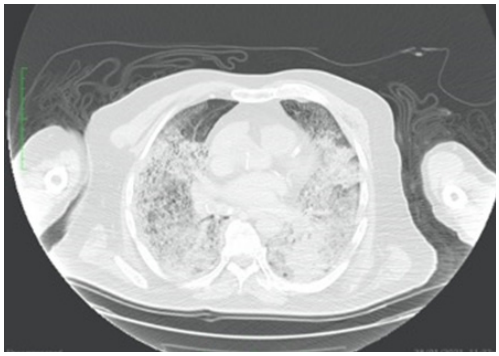

Figure 5 – CT scan of the chest. Axial image showing pulmonary consolidations due to respiratory infection with extension, distribution and density that should not be confused with normal postmortem changes.

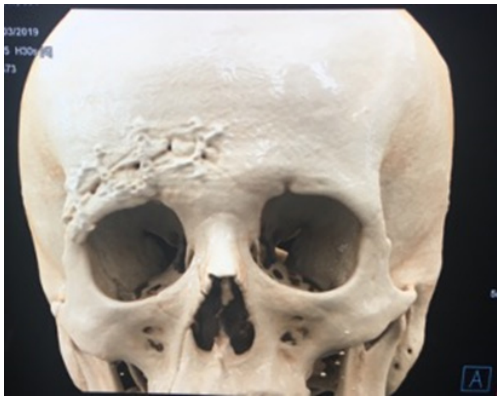

Figure 6 – Cinematic Rendering reconstruction. It allows an easy-to-understand demonstration of the fracture and placement of the surgical material in the right supraorbital region.

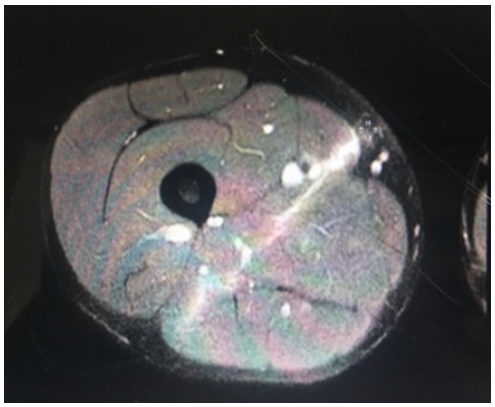

Figure 7 – MRI of the right thigh. Axial sequence weighted in PD with fat saturation. One can clearly observe the course of a piercing injury with a blade, identifying the extent of the various injured muscles and the proximity to the neuro-vascular structures.

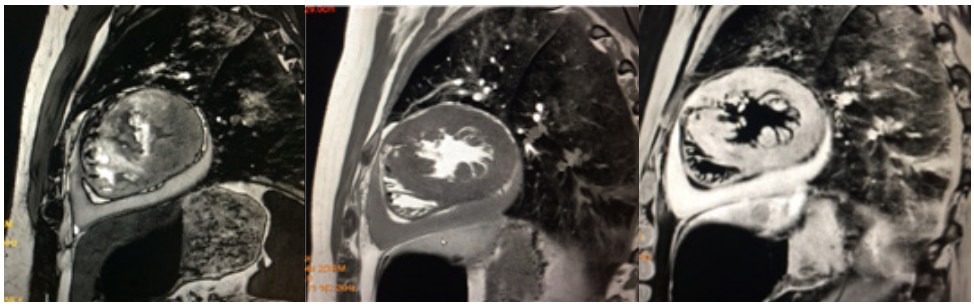

Figure 8 – Postmortem cardiac MRI. Two-camera short-axis images. You can clearly observe the infarction of the anterior wall and left ventricular septum and the perforation of the myocardium that gave rise to the hemopericardium, allowing the determination of the cause and mechanism of death, without the need for a classic autopsy.

Figure 9 –CT of the pelvis in a patient victim of assault by a firearm, with penetrating projectile injury that caused spinal cord injury. It is possible to define the trajectory of the projectile, with the entry point on the right side of the pelvis, the structures it crosses and the spinal cord injury, allowing the establishment of a causal link in the future with possible disabilities.

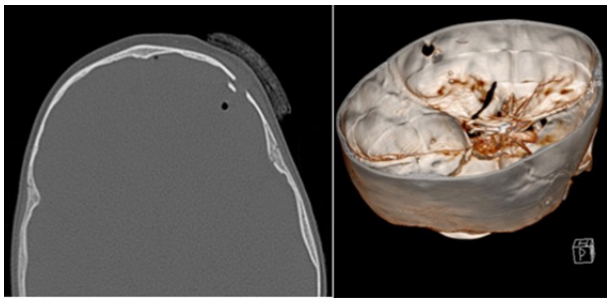

Figure 10 – CAT scan of the skull, with axial image and VR, showing the entrance hole in the skull in the left frontal region, which is characterized by the presence of an internal bevel.