



Pathology/Biology Section - 2015

H91 **Limitations of Multi-Phase Postmortem CT-Angiography in Cases of Fat Embolism: The Goal of Immunohistochemistry to Distinguish Between Artificial and Vital Fat Embolism**

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After attending this presentation, attendees will understand how a new technique has been developed for the Multi-Phase Postmortem CT-Angiography (MPMCTA) that allows the visualization of the vascular tree of the body via the use of an lipophilic contrast agent, Angiofil®; however, the contrast agent diffusion in the tissue has to be considered in terms of histological differential diagnosis in certain important pathophysiological events such as the embolism and, in particular, the fat embolism. The goal of this presentation is to underline the usefulness of the immunohistochemical approach in these cases to make a correct histological diagnosis between artifact due to the use of Angiofil® and true pathology such as fat embolism.

This presentation will impact the forensic science community by presenting the immunohistochemical study as the only means to distinguish between vital fat embolism and Angiofil® artifacts, lending certainly to the diagnosis of fat embolism as cause of death also in cases in which MPMCTA was performed. In this way, this technique can also be usefully performed in traumatic deaths and in all cases of suspicious fat embolisms.

In the context of forensic imaging, MPMCTA has developed as a new technique that allows the visualization of the vascular tree of the body. This is a standardized technique that consists in the performance of a native CT-scan (without contrast-agent injection), followed by three angiographic phases (arterial, venous, and dynamic phase). The angiographic phases consist of the perfusion of the vascular system with an oily contrast-agent mixed with paraffin oil through the accesses in the femoral artery and vein. This allows complete opacification of the vascular system, showing very small vascular lesions or abnormalities as exact sources of bleeding. The oily liquid Angiofil® is a contrast agent consisting of iodized linseed oil. To perform whole-body CTA, Angiofil® is mixed with paraffin oil. A mixture of 6% is determined as adequate to obtain an excellent opacification of the whole vascular system. This lipophilic contrast agent, Angiofil®, is easy to handle and highly radio-opaque. Because of its lipophilic abilities, it is retained intravascularly, hence it facilitates virtual segmentation of vessels and yields an enduring signal which is advantageous during repetitive investigations. As described in the literature, the oily liquids enter the venous system by passing through small arteriovenous shunts, while they arrest in the capillary microcirculation. This leads to embolization of lipophilic agent contrast in capillaries or small precapillary vessels and in this manner the Angiofil® can itself cause an “artificial” fat embolism.

The search for fat embolisms is often important because it may help determine the cause of death and it is also an important vital sign in cases of trauma. Fat embolism refers to the presence of fat droplets within the peripheral and lung microcirculation while fat embolism syndrome is a clinically relevant syndrome caused by the distribution of fat in the systemic vascular tree and characterized by clear signs and symptoms.

The study concerned 22 autopsies (MPMCTA was not performed prior) in which the fat embolism was pointed out as the cause of death and compared these with a control group of 22 autopsies in which the MPMCTA was performed prior to autopsy and in which any suspicious fat embolism was excluded and the death was related to other causes. A complete immunohistochemical study of all organs of the two groups was also performed. The immunohistochemical panel used to reveal fat embolism on the brain, lung, and kidney samples included anti-fibrinogen and anti-CD61 antibodies. The immunohistochemistry performed on the 22 cases of fat embolism revealed platelet aggregates (anti-CD61 antibody positive reaction) at the edge of fat globules and an adsorbed fibrinogen (anti-fibrinogen antibody positive reaction) layer to the interface of fat globules. In contrast, in the control group (in which the Angiofil® was injected) the results of the immunohistochemical investigations were negative for reaction of fibrinogen and platelets around the empty spaces in the blood vessels, thus providing evidence of an artificial fat embolism.

Fat Embolism, Multi-Phase Postmortem CT Angiography, Immunohistochemical Study