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FORENSIC HISTOLOGICAL ASSESSMENT OF FAT EMBOLISM IN COMBINED INJURY DEATH CASES

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RESUME

One of the most common early complications of severe joint injuries is fat embolism. In cases of death due to fat embolism, the final forensic diagnosis of the medical examiner is based on the results of the autopsy and the study of histological examinations. Fat emboli are detected in small blood vessels during histological examination of pieces taken from internal organs (lungs, brain, heart, liver and kidneys).

INTRODUCTION

Fat embolism is an occlusion of fat droplets into blood vessels, that is, obturation of small vessels of internal organs with neutral fat droplets. As a direct cause of death from IOE, mechanical injuries account for 1.9-7.0% of the total number and 10.6% of long tubular bone fractures. These data are based on forensic medical examination and forensic histological examination of corpses, as well as clinical examinations [2, 10, 11].

Fat embolism is one of the most common early complications of injury in forensic medicine practice. In cases of death due to fat embolism, the final forensic diagnosis of the medical examiner is based on the results of the autopsy and the study of histological examinations. In the histological examination of pieces taken from internal organs, fat emboli can be detected mainly in small blood vessels of lungs, brain, heart, liver and kidneys [1, 4, 7].

In general, severe joint injuries have a high mortality rate, accounting for more than 40% of all violent deaths. If the causes of death in the initial period after these injuries are shock and massive acute blood loss, then severe structural changes in the brain and the development of their residual complications are considered. In a number of scientific studies devoted to the consequences of joint injury, it is stated that it is one of the most characteristic manifestations of shock-traumatic disease, especially in combined severe injuries. In most cases, fat embolism syndrome occurs together with brain tumor against the background of pneumonia, pulmonary edema, severe traumatic shock and post-traumatic anemia [3, 5].

The pathogenesis of fat embolism is multifaceted and there are several theories. In addition, the stages of the development of fat embolism are also different, and within a few minutes, the death of the patient is lightning fast; which develops in the first hours after an acute injury; sub-acute stages with a latent period of 12-72 hours are distinguished [6].

Determining the degree of embolism in tissues is important for morphologists in the syndrome of fat embolism and in shaping thanatogenesis. Depending on the number of fat emboli detected

in the vein and the extent of their spread in the pulmonary vessels, histological examination distinguishes several levels of fat embolism: low-grade, weak, moderate, strong, extremely strong [8, 9].

The purpose of the study: Histological evaluation of intravascular fat emboli in internal organs to determine the main cause of death in cases of death caused by joint injuries with bone fractures.

The research objects are 20 histological samples prepared from the internal organs of the dead bodies of persons who died after applying to the hospital with severe joint injuries.
Preparations prepared for the study were stained with hematoxylin eosin and Sudan III dye.
Forensic histological examination of pieces taken from Murda's internal organs (staining with Sudan III) revealed the following.
When 4 cross-sections from the brain are stained with Sudan-III dye, fat emboli painted in flame color can be distinguished in capillary spaces.

More than 25 fat emboli are detected in veins in 10 fields of view and when magnified with a 7x8 microscope.
Cerebrum - in cross-sections, the soft membrane is mainly in the spaces between the pedicles, fibrous, uneven swelling, empty arteries and blood vessels, compression of the space of some arteries, dystonia, spasm of some small arteries, arterioles, mesh-like masses are distinguished in the spaces of some venous blood vessels.
In the tissue of the brain, blood vessels are anemic, capillary spaces are compressed, filled with migrated endothelial cells, veins, venules are unevenly full, and reticular masses are distinguished in their spaces.
Perivascular edema.
Dystrophic swelling of ganglion cells, shadowing of some.
When 6 sections from the heart are stained with Sudan-III dye, fat emboli are distinguished in the small capillaries in the interstitial tissue, and in some places, the cytoplasm of myocytes is stained in a fiery color (Fig. 1).

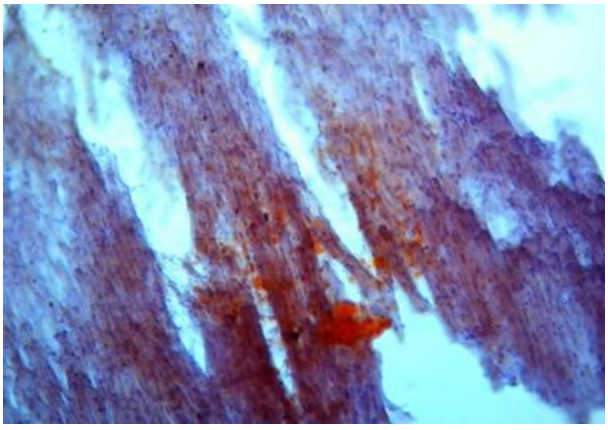

Figure 1. Fat emboli in the arteries of the heart

When 13 cross-sections from the lung organ were stained with Sudan-III dye, fat emboli stained in dark flame color in a cylindrical form were distinguished in the spaces of small arteries, arterioles and capillaries in a large number of blood vessels in the interalveolar barriers (Fig. 2).

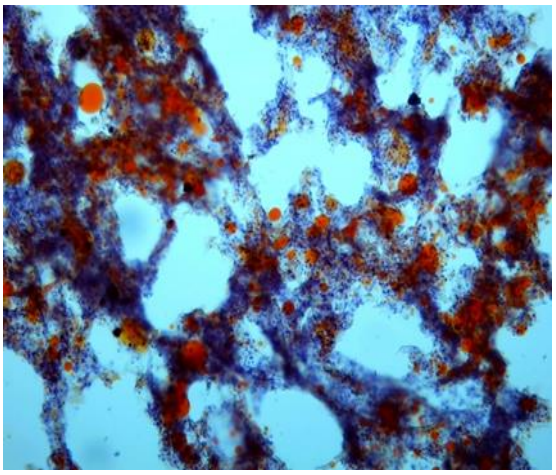

Figure 2. Fat emboli in the pulmonary veins

In liver sections, the capsule is thickened due to sclerosis. Dystrophic changes of hepatocytes in the tissue under the capsule, necrosis of focal hepatocytes, infiltrates consisting of dark lymphocytes, histiocytes, fibroblasts, neutrophils, eosinophilic leukocytes and proliferation of reticuloendothelial cells are distinguished in the surrounding tissues. The segmental structure of the parenchyma has changed dramatically, the columnar structure of hepatocytes has disappeared, the growth of connective tissue in the stroma and tracts of the triads, and the formation of false segments of various forms are distinguished. False lobes have no central veins, dystrophic changes of hepatocytes, with necrobiosis of some groups of hepatocytes. Cell infiltrates consisting of dark lymphocytes, neutrophilic and eosinophilic leukocytes, and proliferation of cholangiola are seen in some fields of view in the stroma of the triads (Fig. 3).

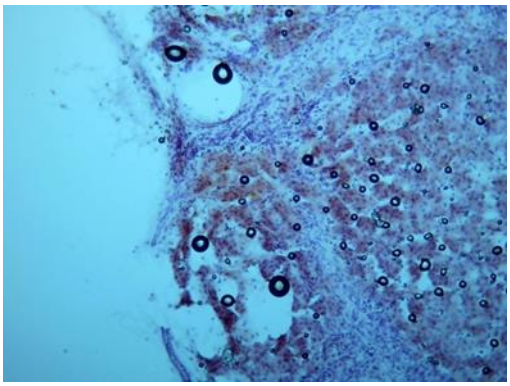

Figure 3. Fat emboli in the liver

When 5 cross-sections from the kidney are stained with Sudan-III dye, in the cortical and medulla layers, in the spaces of small blood vessels, fat emboli are distinguished.

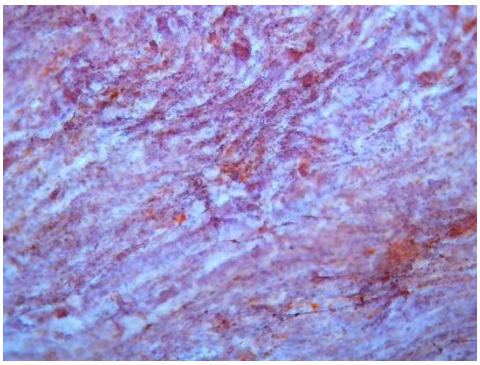

Figure 4. Fat emboli in the kidney

Pancreatic interlobular tissue swelling, uneven filling of blood vessels, arterioles, spasm of small arteries, sometimes compression of the space of large arteries, dystonia, perivascular hemorrhage and diapedesis, lipomatosis in foci, sclerosis of the excretory tube wall. Interstitial swelling in the parenchyma, uneven fullness, dystrophic changes of acinus epithelia, shadow of erythrocytes in the spaces of some blood vessels, rare leukocyte, with admixture of lymphocyte cell elements. In forensic histological practice, the current method for evaluating the degree of YoE involves counting fat emboli in 10 views with a microscope magnification of x56 (x7 eyepiece, x8 lens).

CONCLUSION

Massive fat embolism in blood vessels in lungs; fat emboli are distinguished in the capillaries of the brain, heart, and kidneys. Hemorrhages in foci in the parenchyma of the lung, large bronchi and blood vessels with tissue destruction, edema, atelectasis, dystelectasis, foci of emphysema; focal hemorrhages in the soft membrane of the brain, swelling in its tissue, dystrophic degeneration of neurons; acute disturbance of hemodynamics of the microcirculatory system in organs; dystrophic and necrobiotic changes in parenchymatous organs; portal cirrhosis of the liver.

Thus, embolization of 2/3 to 3/4 of the pulmonary capillaries leads to death from pulmonary embolism, and only a few embolisms are enough for cerebral fat embolism with subsequent severe disorders, because the blood vessels feeding the brain are limited.

In conclusion, it should be noted that the causes of death can be different in those who die as a result of a severe joint injury. Usually, it is associated with fat embolism, pneumonia with pulmonary edema, brain edema against the background of severe traumatic shock. According to the research, one of the main causes of death with polytrauma is often pneumonia, DVS syndrome, and fat embolism, which occurs under traumatic brain injury.

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