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ALGORITHM FOR ESTABLISHING THE VITALITY OF STRANGULATING MECHANICAL ASPHYXIA

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Abstract: Immunohistochemistry methods are of great importance in morphology, namely in forensic histology. Nineteen cases of stangulation mechanical asphyxia in the age group from 28 to 48 years were examined. For comparison, three cases of mechanical asphyxia due to drowning in the age group from 35 to 50 years were studied. The control group consisted of 11 cases of acute ischemic heart disease, six cases of death from traumatic shock. In the course of the study, fibrinogen can be assessed as a substance of early response to injury and a marker of intravital strangulation mechanical asphyxia. This algorithm can be proposed for the diagnosis of strangulation asphyxia.

Keywords: asphyxia, vitality, immunohistochemistry, CD-117.

INTRODUCTION

One of the traditional problems of forensic thanatology remains the establishment of the vitality of the formation of the strangulation groove (SG) and, more broadly, mechanical asphyxia (MA) [1, 2]. In modern morphology, including forensic histology, immunohistochemistry (IHC) methods are increasingly important [1]. In our previous works, we demonstrated the effectiveness of using antibodies to fibrinogen to assess the vitality of SG. Polyclonal antibodies to total cytokeratins, fibrinogen, immunoglobulin lambda, fibronectin and CD-117 were also used. Of the histochemical reactions, the staining methods according to Spielmeyer and toluidine blue were used [2]. Further, based on our research and literature data, we set the goal of developing an algorithm for diagnosing strangulation MA.

MATERIALS AND METHODS

We studied 19 cases of undoubted strangulation mechanical asphyxia (15 men, 4 women, aged 28 to 48 years). Hanging occurred against the background of varying degrees of alcoholemia (from 0 to 3.4 ppm in the blood). Strangulation grooves were predominantly typical, loops were semi-rigid. Lung fragments were removed outside the zone of postmortem atelectasis. Three cases of drowning (a 45-year-old man, 3 ppm of ethanol in the blood, a sober 50-year-old man and a 35-year-old woman, 2.3 ppm of ethanol in the blood), and an observation of prolonged strangulation by hands of a sober 44-year-old woman were studied as a comparison group. As a control group, 11 observations of death from acute forms of ischemic heart disease in sober men aged 56 to 73 years and 6 observations of death from traumatic shock among men aged 23 to 56 years were studied. The corpses were examined in the first 24 hours after death using standard histological and IHC methods [1, 3]. Polyclonal antibodies to total cytokeratins, fibrinogen, immunoglobulin lambda, fibronectin

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and CD-117 were used. Among the histochemical reactions, the staining methods according to Spielmeyer and toluidine blue were used [2].

RESULTS AND DISCUSSION

As before, in the dermis and subcutaneous tissue of the ridges of the intravital pulmonary edema, the expression of fibrinogen was significantly higher than in the postmortem pulmonary edema and areas of the control intact skin. Immunoglobulin lambda revealed a slightly higher expression in the intravital pulmonary edema, but to a slightly lesser extent compared to fibrinogen. At the same time, fibrinogen was not detected in the areas of small-focal pulmonary edema. With respect to fibronectin, its expression was weak and localized only in the venules of the subcutaneous tissue. CD-117 gave significant focal expression in the interalveolar septa in cases of strangulation mechanical asphyxia, but not in death from acute forms of coronary heart disease, being an undifferentiated marker of acute alveolar hypoxia. Cells positive for CD-117 also gave a positive granule reaction when stained with toluidine blue.

In drowning, fibrinogen expression in the pulmonary alveoli was somewhat more pronounced than in strangulation. And in traumatic shock, a picture of full-blown adult respiratory distress syndrome was often observed in the lungs. These differences reflect, in our opinion, differences in the rate of death in these groups. In typical MA, fibrinogen exudation into the alveoli does not have time to develop.

The algorithm is based on the following techniques.

During a sectional study, a fragment of the strangulation groove with underlying soft tissues is removed, as well as a fragment of intact skin and subcutaneous tissue from the area outside the cadaveric spots. In addition, a fragment of lung tissue outside the hypostasis zone is removed for IHC reactions.

Fibrinogen can be assessed as an early response substance to injury and a marker of the vitality of strangulation mechanical asphyxia.

This is also true for immunoglobulin lambda, but the specificity of the reaction is less pronounced.

Activation of mast cells can be noted as a non-specific reaction to acute intra-alveolar hypoxia using IHC reaction to CD-117.

Further efforts in differential diagnostics should be aimed at finding additional criteria for the vitality of SB and MA in general using both IHC methods and morphometric methods [4]. For example, the role of activation of glucose-regulated peptide 78 (GRP78) in brain neurons as an early marker of the vitality of strangulation MA has recently been demonstrated [5]. As for the SB itself, in this direction, it seems to us that further efforts to clarify the early reactions of the cytoskeleton of epidermal and dermal cells to extreme mechanical impact are relevant.

CONCLUSION:

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Thus, an algorithm for diagnosing strangulation asphyxia can be proposed. It consists of the classical method of autopsy of corpses with suspected presence of asphyxia with a number of additions both at the sectional and histological stages of the study.

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