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## ANALYSIS OF THE DYNAMICS OF CHANGES IN THE STRUCTURE OF THE VITREOUS BODY MATRIX IN THE POSTMORTEM PERIOD ACCORDING TO SPECTRAL-SELECTIVE AUTOFLUOROCRESCENT MICROSCOPY

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The methods of estimating the time since death (TSD) used in practical forensic medicine, range from traditional morphological methods, such as assessment of early and late postmortem changes, to methods based on biochemical and molecular changes in the human body. However, each of the modern methods mostly has several external or internal modifying factors or limitations, especially with increasing duration of the postmortem period, which allows to establish the TSD with insufficient accuracy for investigating authorities.

Objective of the study is to develop a set of new, objective forensic criteria for an accurate establishment of TSD by spectral-selective laser-induced autofluorescence microscopy of the human vitreous body (VB) matrix. VB was taken from the anterior chamber of the eye from 60 corpses with previously known TSD from 1 to 48 hours, with the following intervals: 1, 4, 8, 12, 18, 24, 36 and 48 hours. The cause of death was cardiovascular pathology. Exclusion criteria: craniocerebral and eyeball injuries, the presence of any laboratory confirmed exogenous intoxications. A blue LSR405ML-LSR-PS-II semiconductor laser with a wavelength $\lambda = 0.405$ μm and a power of W=50mBm at the location of the laser spectral-selective microscope was used to excite autofluorescence. Subsequently, bandpass filters were used.

Experimental measurements of the coordinate distributions of the laser-induced autofluorescence of the VB matrix found dynamic time-dependent changes in the magnitude of statistical moments of the 1st – 4th orders (the value of $SM_1$ varies from 0.91 to 0.42, $SM_2$ – from 0.39 to 0.08, $SM_3$ – from 0.12 to 0.99, $SM_4$ – from 0.18 to 1.19) in the linear range up to 36 h after death. The detected changes in the values with increasing TSD can be associated with destructive necrotic changes in the composition of the human VB matrix, the fluorescent manifestations of which are accompanied by a decrease in the intensity of radiation in the thick green region of the corresponding spectral range of electromagnetic wavelengths.

Analysis of the obtained data on the time dependences of necrotic changes in the set of statistical moments of the 1st – 4th orders, which characterize the distributions of the fluorescence intensity maps of the human VB matrix, found a high level of accuracy in TSD determining within 20 - 22 minutes at intervals of up to 36 hours after death.

The effectiveness of the method of spectral-selective laser-induced autofluorescence microscopy of the human VB matrix in the determination of TSD is demonstrated. The range of sensitivity of the method is determined up to 36 hours with the accuracy of setting the TSD within 20-22 minutes.

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## ANATOMICAL VARIABILITY OF THE VISCERAL BRANCHES OF THE THORACIC AORTA IN THE FETAL PERIOD

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Due to the progress of perinatal diagnostic methods and the development of surgical interventions in the organs and walls of the thoracic cavity, a multidimensional study of the variations of the branches of the aortic arch during the embryonic period is of great practical value.

The aim of the study was to establish the anatomical variability of the visceral branches of the thoracic aorta in the fetal period of human ontogenesis. An anatomical study was performed on 38 human fetuses of 81.0-375.0 mm parietal-coccygeal length (PCL) using macro microscopic dissection, application contrast of dissected vessels and nerves, and morphometry.

As a result of the investigation, it was found that the bronchial branches depart from the anterior wall of the thoracic aorta at the third and fifth levels of the thoracic vertebrae. From 2 to 4

bronchial branches go to the left main bronchus, while there is, as a rule, one branch from the third right back intercostal artery to the right main bronchus. In the vast majority of the investigated fetuses, 2 left bronchial branches were found, which most often depart from the thoracic aorta at the fourth and fifth levels of the thoracic vertebrae and run along the left main bronchus, branching together with the bronchi, providing arterial blood supply to trachea, bronchi, lung tissue and pleura. Correspondingly, single small branches depart from bronchial branches to the esophageal core, the mediastinal part of the parietal pleura, tracheobronchial and bronchopulmonary lymph nodes. During macro microscopic preparation of the thoracic aorta in fetuses of different ages, anatomical variants of bronchial branches were revealed. In particular, in the fetus 210.0 mm PCL right and left bronchial branches departed from the thoracic aorta independently at the level the fourth thoracic vertebra. In another fetus 240.0 mm PCL left upper and right bronchial branches began from the thoracic aorta with a common trunk at the fourth level of the thoracic vertebra. Similarly, in this fetus at the fifth level of the thoracic vertebra the left lower bronchial branch departed from the thoracic aorta to the left main bronchus.

A little below (at the fourth and eighth levels of the thoracic vertebrae) the place of the ultimate end of the bronchial branches, from the anterior wall of the thoracic aorta originate esophageal branches, numbering from 1 to 5, which go to the walls of the esophagus at different levels. In 21 cases of the 35 fetuses, the blood supply to the thoracic esophagus is carried out by one esophageal branch, which departs from the thoracic aorta in the period from V to X thoracic vertebrae, usually at the seventh or eighth levels of the thoracic vertebra. In 8 studied fetuses 2 esophageal branches branched from the thoracic aorta, in 5 observations – 3 esophageal branches, in the fetus 180.0 mm PCL – 4 esophageal branches and in the fetus 95.0 mm PCL – 5 esophageal branches.

In the esophageal wall, the esophageal branches emerge into ascending and descending branches, and form an arterial network. At the same time small branches go to a core and the mediastinal fiber. During the preparation, anastomoses of the esophageal branches were found, namely: in the upper part of the organ – with the esophageal branches of the inferior thyroid artery from the thyroid-cervical trunk of the subclavian artery, and in the lower part of the esophagus – with the branches of the left gastric artery from the abdominal trunk.

At the level of the posterior inferior mediastinum from the anterior wall of the thoracic aorta depart numerous core branches, and from the anterior and lateral walls of the aorta – the mediastinal branches.

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## ANATOMICAL ASPECTS OF THE UMBILIC VEIN STUDY

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The relevance of the study of the umbilical vein lies in the fact that this structure is used in surgical practice in children and adults. UV allows, bypassing physiological filters, to bring the necessary medicinal substances in high concentration to the pathological focus with their long-term deposition in damaged organs and tissues.

When performing scientific work, it is planned to investigate 50 objects of fetuses and 100 objects of a human after birth. Macro- and micropreparation, histological, morphometry, radiography, vascular injection, photographic documentation, statistical, corrosion methods.

The umbilical vein, as an integral part of the umbilical cord vessel, delivers arterial blood enriched with oxygen and nutrients from the mother's placenta to the fetus. After the baby is born, the function of the umbilical vein (and the umbilical cord) ceases. According to most authors, the umbilical vein is obliterated, further called the round ligament of the liver. But the research of Dovineer, Ostroverkhov, Nikolsky proved that after birth, only functional closure of the umbilical vein occurs, so it can be recanalized. This fact is especially important for clinical medicine, since it creates favorable conditions for extraperitoneal intubation of the portal system through the umbilical vein. The umbilical vein originates in the placenta and joins it with the left branch portal