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The brain tissue reaction to blunt trauma: a field of possible cooperation between neuroanatomists and forensic pathologists

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The goal of this presentation is to describe, through the histological examination, the evolution over time of the biological processes, at the cellular and molecular level, in the neurological tissue after a blunt trauma. The origin of the secondary ischemia, that often occurs after a brain trauma, leading to death the patient, is almost studied on animal models and is not well known yet. It is presumed that hemorrhages and contusions result in brain ischemia, and that also brain edema arises intra-cranial pressure producing ischemia. Forensic pathology deals everyday with cases of traumatic deaths, and is therefore able to study the inflammatory reaction to trauma in a human casuistry giving information to other disciplines like neuroanatomy. The time-dependent appearance of different leucocyte subtypes can contribute to a forensic wound age estimation but, in contrast to peripheral tissue, the cellular reaction in the CNS is characterized by a minimal neutrophil exsudation and a delayed increase in mononuclear cell numbers. 62 deaths due to head injury with a survival time from few minutes till 30 days were studied. Samples of brain tissue were stained with immunohistochemistry using selectin P and E, GFAP, HIF1-α, CD 117 (c-kit), LCA. The schematic information about chronology of head trauma are given as follows: survival of a few minutes, of 1 hour, of 2-4 hours, of 4-12 horus, of 12-24 hours, 24-48 hours, 2-6 days, 6-14 days, 15-30 days. The number of platelets microthrombi increases with TBI age up to 3 days, afterward leukocytes start to take their place. Platelets aggregates may impair cerebral circulation causing ischemia. Cerebral ischemia plays an important role in SBD. There is also an involvement of CD 117+ cells and HIF-1 α in the modulation and progression of the brain injury. After brain injury a cascade of events occurs leading sometime to a brain secondary ischemic injury. Thanks to the availability of injured human brain tissues, forensic histopathologists might work together with neuroanatomists in order to help in the identification of glial cells and leukocytes communication with endothelial cells, and on the post-traumatic ischemic process that causes the death in prolonged survival time after brain injury.

Keywords

Traumatic brain injury; cell movement; immunohistochemistry; secondary brain injury; biological processes.