Abstract: Immunohistochemistry is very useful when investigating the cause of death. Ischemic cell changes in the hippocampal neurons were not obvious in the brains damaged by hypoxic injury. However, it is suggested that even a moderate hypoxia, which may affect the neuronal proteins and metabolism, induced astrogliosis in the CA3 and CA4 regions, and that in patients with a history of hypoxic attacks neuronal damage may be severe even several hours after ischemic injury. Furthermore, hsp70 expression was found in the CA2, CA3 and CA4 regions of long-term survivors after severe hypoxic/ischemic injury. In forensic practice, detailed information about the duration and extent of a hypoxic/ischemic injury is often unavailable, so that immunohistochemical detection of hsp70 and glial cell staining can be of great value in diagnosing not only the hypoxic/ischemic injury during the process of death but also the victim's past history of hypoxic attacks. In diffuse axonal injury, degeneration of axon and myelin, such as swelling and waving, were observed in survivors of more than 8 hours. Retraction balls appeared in survivors of more than 1 days. In longer term survivors, such as 3 or 5 months, breakdown of myelin and fat-granule cells were observed. In addition, retraction balls were also found. Immunohistochemical staining of 200 kD neurofilament was a very useful method to examine axonal changes, because antisera is specific for degenerative neurofilaments. In our study, all cases which had pathological findings of diffuse axonal injury (DAI) were associated with focal head injuries. From the immunohistochemical staining of neurons in the hippocampus, it was suggested that neurons in the hippocampus were injured by diffuse brain damage. Furthermore, repairing and protective mechanisms occurred especially from CA2 to CA4. It was considered that neuronal damage in diffuse brain injury was elucidated not only morphologically but also functionally. Therefore, in cases of suspected diffuse brain damage, it is recommended to examine the neuronal changes in addition to observing the findings of diffuse axonal injury. Immunohistochemical staining of the carotid body is potentially very useful for necropsy diagnosis, since it provides a method to detect evidence of mechanical asphyxia in suspected cases of manual and/or ligature strangulation. J. Med. Invest. 44 : 109-119, 1998

Key Words: forensic neuropathology, immunohistochemistry, ischemic brain damage, diffuse axonal injury, carotid body.
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21. Axonal changes

[Images and diagrams are present in the document, showing axonal changes in tissue samples.]

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2-2. Neuronal changes

Alterations in the neuronal populations have been observed in the brain regions associated with the disease. The changes may involve alterations in the density of neuronal cells, the structure of neuronal processes, and the expression of certain proteins. These alterations can be observed in the cytoplasm, the nucleus, or the extracellular matrix.

The disease-associated neuronal changes can be categorized into two main types: neuronal loss and neuronal hyperplasia. Neuronal loss refers to a decrease in the number of neuronal cells, which can be observed as a decrease in the density of neuronal cell bodies. Neuronal hyperplasia, on the other hand, refers to an increase in the number of neuronal cells, which can be observed as an increase in the density of neuronal cell bodies.

Immunohistochemical studies have been used to investigate the changes in the expression of certain proteins in the neuronal populations. These studies have shown that the disease-associated neuronal changes can be associated with alterations in the expression of certain proteins, which may play a role in the pathogenesis of the disease.

The disease-associated neuronal changes can also be observed in the extracellular matrix, which may be altered in response to the changes in the neuronal populations. These changes may involve alterations in the composition, architecture, and function of the extracellular matrix, which can have implications for the overall health of the brain.

These findings have important implications for the understanding of the disease and the potential development of new treatments. The disease-associated neuronal changes can be further studied using advanced imaging techniques, which may provide additional insights into the pathogenesis of the disease.

Figure 1: Photomicrographs of neuronal changes in the brain regions associated with the disease. The photomicrographs show the changes in the density of neuronal cell bodies and the expression of certain proteins. The changes are observed in the cytoplasm, the nucleus, and the extracellular matrix.
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