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Immunohistochemical Study of Neuronal Changes in the Hippocampus and Cerebellum of Intoxication and Drug-related cases

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Abstract

Background: Drug abuse is spreading to controlled substances and also to pharmaceuticals. There are many drug problems in society today. In forensic autopsy cases, drugs such as methamphetamine, amphetamine, illegal herbal products, and psychotropic drugs are occasionally detected. Many of these drugs are drugs that act on the central nervous system (CNS).

Aims: To clarify drug-induced neuronal injury histologically is important for forensic autopsy as well as for clinical medicine. This study examines neuronal changes in the hippocampus and cerebellum immunohistochemically in intoxication and drug-related cases.

Materials and Methods: Fourteen drug-related cases were selected from forensic autopsy cases within 48 hours of the postmortem interval. The hippocampus and cerebellum were observed with Hematoxylin-eosin and Luxol fast blue. Immunohistochemical staining was performed using antibodies against Microtubule-associated protein 2 (MAP2), Glucose transporter 5 (GLUT5), Neuronal nuclei (NeuN), Heat shock protein 70 kDa (Hsp70), and Glial fibrillary acidic protein (GFAP). In the hippocampus, neurons were observed at each sector, including the hilus, CA3, CA2, CA1, and the subiculum (SUB). The granule cell layer and molecular layer were also observed. In the cerebellum, the

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Purkinje cell layer, granule layer, and molecular layer were observed. Neurons of the dentate nucleus were also examined. All cases had their blood alcohol concentration measured. A drug screening test was performed and the detected drugs were analyzed quantitatively.

Results: In the hippocampus, immunoreactivities to MAP2, GLUT5, NeuN, Hsp70 and GFAP decreased sequentially in CA2 and CA1 pyramidal cells than in CA3. In the cerebellum, the positive rate of Purkinje cells with MAP2 and GLUT5 were 28.6% and 64.3%, respectively, and that of Hsp 70 was 42.9%.

Conclusion: Drug-induced neuronal injury was examined immunohistochemically. It was considered that CA2 and CA1 pyramidal cells in the hippocampus and Purkinje cells in the cerebellum might be damaged by drug ingestion. This tendency was thought to be particularly pronounced for neuroexcitatory/stimulant drugs. Further clarification of the actual state of drug-induced neuronal injury by the accumulation of target drugs and cases is required.

Keywords: neuronal changes, drug related forensic autopsy cases, immunohistochemistry, hippocampus, cerebellum