



H78 Preliminary Results of Synaptic Neuroplasticity of Memory Areas: A Comparison Between Violent Deaths and Sudden Deaths

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The goal of this presentation is to understand the differences between cases of violent and sudden deaths in retrieving memories during the antemortem phase by activating dendritic spines. The hypothesis is to demonstrate that in the antemortem phase of violent death, the subject had a dendritic spines modification in areas of memory due to a difficult emotional experience, unlike sudden death.

This presentation will impact the forensic science community by providing valuable assistance to forensic pathologists to determine (for doubtful cases): death by violence; if, during the antemortem period, the subject was a victim of violence by their own killer (psychological violence, physical violence, etc.); and if, during the antemortem period, the subject had a strong emotional experience (suicide, instigation to suicide, etc.). All of these situations produce retrieving memories.

Recent experimental evidence has clarified the important role of some brain areas in the creation and retrieval of memories. In particular, memory mechanisms are linked to the modification of dendritic spines and their plasticity. The scientific literature offers many studies that clarify the framework of synaptic neuroplasticity in chronic mental diseases such as depression or post-traumatic stress disorder, but there are no works that attempt to clarify the neuroplasticity mechanisms that can be realized in a short time, as in violent death cases.

Toward this end, this study compared two groups of subjects. The first group consisted of violent deaths (suicide, homicide) compared to the second group consisting of sudden deaths. All subjects had been autopsied within 24 hours of death. This study includes subjects of a broad range of ages, between 20 and 60 years. During the autopsy, brains were removed and fixed with formalin, then sectioned to separate prefrontal, hippocampus, and amygdala areas in order to obtain samples to analyze.

Samples were treated with the immunofluorescence technique with antibodies against PSD95 and studied with confocal microscopy. PSD95 is one of the proteins involved in the development of dendritic spines from the first week of postnatal life and is part of the protrusions that are contained in the post-synaptic density. Some studies show that this protein is responsible for maintaining the size and binding force of the synapses. During this first step, prefrontal cortexes of six subjects were compared.

The prefrontal cortex is dedicated to the elaboration of current sensory experience in relation to data derived from previous personal experiences. In cases of violent death, a synaptic activation has been demonstrated by the presence of numerous dendritic spines responsive to PSD95 immunofluorescent. This positive response to PSD95 is more represented in violent death, especially when compared with sudden death cases in which the prefrontal cortex is nearly completely negative to the chosen marker.

In conclusion, these preliminary results encourage the continuation of these tests to assess whether there is a change in the synaptic pattern due to the recovery of memories during the antemortem phase and whether memory data retrieval is related to the manner of death (differences were found between a suicide by jumping from a height and a murder by stabbing).

Neuroplasticity, Violent Death, Forensic Science