G111 Brainstem Axonal Injury and Retinal Hemorrhages as a Substrate for Sudden Death in Second Impact Syndrome: A Case Report

Rudy J. Castellani, MD, University of Maryland, Baltimore, 22 South Greene Street, NBW-81, Baltimore, MD 21201; and Joyce L. deJong, DO, Division of Forensic Pathology, Sparrow Health System, 1215 East Michigan Avenue, Lansing, MI 48912*

After attending this presentation, attendees will gain an assessment of central nervous system at autopsy for axonal injury, and globes at autopsy for retinal hemorrhage.

This presentation will impact the forensic community and/or humanity by increasing the awareness of the pathology and pathophysiology of so-called second impact syndrome. Moreover, it will raise the much needed concept that retinal hemorrhages, while a useful "marker" of abuse, are not diagnostic of abuse, and that a degree of circumspection is required in assessing accidental vs. nonaccidental trauma in children.

Second impact syndrome is an ill-defined syndrome in which presumably trivial head injury, following a concussion or other significant head injury is associated with sudden death. The pathophysiology of this process is unclear, although diffuse cerebral swelling has been implicated.

An 18-month-old boy who suffered a closed head injury from fall from a balcony, following which he underwent a short period of rehabilitation and was discharged with a helmet. The helmet was prescribed because the child's motor skills had slightly deteriorated. Four weeks following the fall from the balcony, the child suffered a fall from a coffee table witnessed by both a parent and another adult, after which he immediately became unresponsive and expired several days later with cerebral swelling and nonperfusion. He was not wearing the helmet at the time of the fall from the coffee table. At autopsy, marked edema with diffuse bilateral ischemic necrosis was present throughout the cerebrum, cerebellum, and brainstem. In addition, the right lateral brainstem as well as the corticospinal tract at the pontomedullary junction showed axonal shear injury, including numerous swollen axons and microglial activation that were temporally consistent with the initial closed head injury. Bilateral retinal hemorrhages and bilateral optic nerve sheath hemorrhages were also present. This case demonstrated that this subject may have been predisposed to sudden decompensation following trivial head injury because of pre-existing brainstem axonal injury and a vulnerable brainstem cardiorespiratory center. Close examination of the brainstem for evidence of axonal injury is warranted in subjects who expire following trivial head injury, especially in the case of previous head injury. This case further highlights the lack of specificity of retinal hemorrhages in terms of accidental vs. non-accidental trauma, and that careful assessment of individual cases is necessary before concluding injuries were inflicted by another.

Second Impact Syndrome, Axonal Injury, Retinal Hemorrhage

 ** Presenting Author*