

Title	Use of the Triad of Scant Subdural Hemorrhage, Brain Swelling, and Retinal Hemorrhages to Diagnose Non-Accidental Injury Is Not Scientifically Valid		
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One emerging issue in forensic pathology is inquiry into the reliability of the science behind determinations of cause and manner of death, especially in child abuse deaths.

Distinguishing non-accidental from inadvertent injury and natural disease can be difficult. Various patterns of injuries found clinically or at autopsy have been proposed to identify child abuse.

Billmire and Myers reviewed computed tomography scans of all children under one year of age and found inflicted injuries in 95% in a study reported in 1985. A description of the neuropathology of inflicted head injury in infants and children by Geddes et al in 2001 included frequent findings of: subdural hemorrhage, increased intracranial pressure, and retinal hemorrhages. The authors did not advocate use of this triad of findings to make the diagnosis of inflicted or non-accidental injury. However, others have taken the observations much further, "The triad of subdural hematoma, cerebral edema, and retinal hemorrhage represents a diagnosis of SBS (Shaken Baby Syndrome), but all three may not be present" is asserted in a nursing education website.

The validity of the triad as a set of anatomic markers of non-accidental injury was assessed using data from a study of 169 child deaths. The patterns of ocular and systemic injuries in children dying as the result of non-accidental injury were compared with those found in injuries from motor vehicle accidents, falls, asphyxia and in natural disease. The immediate causes of death included: 76 (45%) intentional injuries, 36 (21%) inadvertent injuries, 47 (28%) natural causes, and 10 (6%) undetermined causes. Intentional injury was distinguished from inadvertent injury, undetermined causes, and natural disease by investigation of medical and social history, and circumstances surrounding collapse as well as autopsy findings.

The triad of findings of subdural hemorrhage, brain edema, and retinal hemorrhages was seen in 47 of the total 76 (62%) non-accidental injury deaths and in 8 inadvertent injury deaths of the total 36 (22%). The triad was not seen in any of the 46 natural deaths or any of the 10 classified as undetermined deaths. The sensitivity of the presence of the triad was only 62% in detecting non-accidental injuries. The specificity of the absence of the triad in inadvertent injuries was 78%. The positive predictive value of the triad was 85% while the negative predictive value for the absence of the triad was 49% for all causes of unnatural deaths.

If the analysis was limited to head injury deaths, the potential discriminatory power was even less. The triad was present in 47 of 61 non-accidental deaths (77%) and 8 of 18 (42%) of the inadvertent deaths. The sensitivity was better at 85%, but the specificity was much less, 44%. Although the triad was found more commonly in non-accidental deaths the sensitivity and specificity were not sufficient to rely exclusively on these findings to conclude that the injuries were non-accidental. The triad should lead to heightened suspicion and further, thorough investigation, but no clear certainty on its own. **Use of the triad to diagnose Shaken Baby Syndrome is unscientific.**