



Pathology Biology Section – 2011

G123 Infant Death Evaluation: What is the Constellation of Abusive Injuries?

M.G.F. Gilliland, MD*, Brody School of Medicine at East Carolina University, Pathology & Lab Medicine, Brody 7S-10, Greenville, NC 27858-4354

After attending this presentation, attendees will be able to identify components of a constellation of abusive injuries that can be used to reliably identify a subset of abusive injuries.

This presentation will impact the forensic science community by providing knowledge of components of a constellation of abusive injuries that can be used to reliably identify a subset of abusive injuries allowing them to more competently perform determinations of cause and manner of death.

Hypothesis: No single finding is pathognomonic of abusive injuries to infants and children. Findings suggestive of abusive injuries must be used in conjunction with other information to reliably determine that a death is the result of abusive injuries. Additional investigative information about the reliability or number of histories provided by caregivers has been described as useful in this regard. Investigative information about delays in seeking medical attention has been seen more commonly in abusive injuries.

Materials: Information about the circumstances surrounding collapse or death, medical treatment, past medical history, law enforcement investigation, and social service information (when available) was used in a prospective study of 169 child deaths with autopsy and postmortem ocular examinations to make cause and manner determinations. 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.

Results: 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 eight inadvertent injury deaths of the total 36 (22%). The triad was not seen in any of the 46 natural deaths or any of the ten classified as undetermined deaths. Treating these three findings (the "triad") as a "laboratory test" to identify abusive injuries did not meet criteria for reliability of diagnosis. 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%.

Histories of the circumstances of change of status have been important in identifying abusive injury. The original recognition of the "battered baby" followed inquiry into the phenomenon of absent or changing histories in the presence of subdural hemorrhages and extremity fractures. In this population, the sensitivity of finding inconsistent histories with the presence of the triad was 80%. The negative predictive value of finding a consistent history when the triad was absent was 88%. The relative risk of the triad being found with an inconsistent history was 4.56 with confidence limits of 2.53-8.20 and a- value << 0.01.

Delay in seeking treatment has also been identified as a marker of abusive injuries. In this population information was available to identify the interval between onset of symptoms and presentation for medical attention in 127 deaths. This information was then used to look at the deaths with the triad of retinal hemorrhages, subdural bleeding, and brain swelling.

Triad	< 24 hours	24-72 hours	> 72 hours	Total
No triad	55	14	4	73
Triad	38	13	3	54
Total	93	27	7	127

Additional investigative information was used to determine the cause and manner of death to distinguish abusive injuries from accidental injuries. Among children having the triad, delay in seeking treatment was only seen with abusive injuries.

Manner	< 24 hours	24-72 hours	> 72 hours	Total
Abusive	30	13	3	46
Non-abusive	8	0	0	8
Total	38	13	3	54

Summary: Deaths with an inconsistent history, delay in seeking medical attention, and autopsy findings including the triad of subdural hemorrhage, brain edema, and retinal hemorrhages can be reliably used to identify deaths which are more likely to be the result of inflicted injury. Thorough investigation and complete autopsy findings must be used to establish whether or not a particular child's death was caused by inflicted



Pathology Biology Section – 2011

injuries.

Review of the findings and investigative information in this study allows identification of a constellation of reliable markers of abusive injuries, and components of the constellation needed to avoid wrongful accusations of injury. The components include: triad of retinal hemorrhages, subdural bleeding, and brain swelling; inconsistent or multiple histories; and delay in seeking medical attention.

Abusive Injuries, Wrongful Accusation, Child Deaths