H44 The Diagnostic Accuracy of the Triad in Shaken Baby Syndrome: A Systematic Literature Review

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After attending this presentation, attendees will better understand the reliability of the literature pertaining to the accuracy of the diagnostic triad of subdural hematoma, retinal hemorrhage, and encephalopathy as a proxy for shaken baby syndrome.

This presentation will impact the forensic science community by providing results from a systematic literature review and suggestions on how to perform more reliable studies in the future.

In 1971, it was proposed that abusive shaking of an infant was closely associated with subdural hematoma, eventually together with retinal hemorrhage and encephalopathy referred to as a "triad." Later, a corollary was derived; if the triad was identified and no "acceptable" alternative explanation provided by a suspect caretaker, it was concluded that the infant had been intentionally shaken. Over the past decade, the relationship between shaking trauma and the findings used to make the diagnosis of abuse has become the subject of increasing criticism. Since evidence-based knowledge of the effects of shaking has important medical and societal consequences, it is important that the criteria for identifying shaken infants are reliable. The literature review presented here was directed primarily at evaluating with what degree of certainty the presence of the "triad" is associated with shaking.

A literature search was performed in the databases PubMed®, EMBASE® and Cochrane Library through October 15, 2015. All types of studies with ten or more study cases were included. The criteria for eligibility included: ("population") children <12 months of age; ("index test") the triad; ("reference test") confessed or witnessed shaking or other trauma; ("outcome measure") diagnostic accuracy. All studies of potential relevance according to the inclusion criteria were read in full text by two reviewers independently. The relevant publications were assessed for risk of bias using the QUADAS tool, and classified as having low, moderate, or high risk of bias according to defined criteria.

The search generated 3,773 abstracts, of which 1,145 were read in full text; of 43 included studies 41 were assessed as having high risk of bias, two as having moderate risk, and no study as having a low risk. Seven systematic reviews were identified and evaluated using the AMSTAR tool; all seven were found to have a high risk of bias.

The main conclusion was that there is insufficient scientific support to conclude that the diagnostic triad is an accurate test for the identification of shaken baby cases. There is limited scientific support to conclude that shaking can cause the triad, and for the conclusion that other conditions and events are associated with the triad.

The reasons for the low ranking of the majority of studies, including the systematic reviews, were methodological issues and circular reasoning. Apart from the usual issues connected with the retrospective studies, the age of the controls was often significantly higher than among the shaken babies. Further, the radiological and ophthalmological investigations were often not blinded, but when blinded, the inter-rater agreement was poor or moderate. The classification criteria were sometimes only a reference to the judgment of a "child protection team," a sometimes speculative conclusion regarding the injury potential of a fall. Consequently, the group of allegedly shaken baby cases may have included accidental trauma, and the control group may have included shaken baby cases.

Another reason for low quality was circular reasoning employed in the conclusions of some of the studies, resulting from the assumption by the child protection team that if the triad was observed, then the infant had been shaken, unless another "acceptable" explanation was provided; however, the basis for rejecting alternative explanations by caretakers as unacceptable was not linked to any methodologically valid scrutiny. The inherent but invalid assumption in these studies was that the triad has near-perfect diagnostic accuracy. There were other methodological problems in the studies as well.

Future studies with acceptable methodological quality need improved planning, higher quality, and larger study numbers. This means prospective observational studies of reliably documented cases or confessed cases in which the risk of false confessions has been minimized, sufficiently large study numbers examined with uniform methods, age matched controls, detailed descriptions of how the study cases were collected and examined and how differential diagnoses were excluded, information on blinding of the examiners, and presentation of detailed results, enabling the calculation of diagnostic accuracy.

Triad, Shaken Baby Syndrome, Bias