W14 Retinal Hemorrhages (RHs) Associated With Pediatric Abusive and Non-Abusive Head Injury — Systematic Reviews and Their Evidence Base: A Review

Patrick E. Lantz, MD, WFU School of Medicine, Dept of Pathology, Medical Center Boulevard, Winston-Salem, NC 27157-1072; Candace H. Schoppe, MD*, Southwestern Institute of Forensic Sciences, 2355 N Stemmons Freeway, Dallas, TX 75207; Anna G. McDonald, MD*, Wake Forest Baptist Medical Center, 1 Medical Center Boulevard, Winston Salem, NC 27157; Maria Cuellar, MS*, Carnegie Mellon University, 5000 Forbes Avenue, Pittsburgh, PA 15213; and Robert G. Stanulis, PhD*, 10940 SW Barnes Road, Portland, OR 97225*

After attending this presentation, attendees will be able to: (1) list the limitations of systematic reviews of retinal hemorrhages in childhood head injuries; (2) recognize observational studies employing imprecise case definition, circularity, selection or information bias, and misrepresentation of data; (3) discuss the use of confessions in case definition for abusive head trauma; and, (4) review issues with proposed statistical tools for the diagnosis of abusive head trauma.

This presentation will impact the forensic science community by exploring the value and pitfalls of systematic reviews and the selected observational studies focused on the diagnostic specificity of RHs in Abusive Head Trauma/Shaken Baby Syndrome (AHT/SBS) and of a proposed analytical tool intended to make the diagnosis of AHT/SBS more objective. This presentation will help physicians understand how to identify common problems in the underlying studies and the analyses, including logical fallacies, circularity, selection and information bias, imprecise case definition including confessions, and even misrepresentation of data.

The presumed mechanism of injury in AHT/SBS is thought to be severe rotational acceleration secondary to violent shaking, direct impact, or a combination of the two. Ocular findings are pivotal in cases of AHT/SBS because retinal hemorrhages (RHs) are often considered diagnostically specific for inflicted head injury. However, researchers are now questioning both the criteria used to identify AHT/SBS and the specificity of retinal findings.

Because the evidence base for the SBS theory relies on anecdote and opinion, proponents often point to confessions as proof that shaking an infant causes the brain and ocular findings that are commonly used to diagnose AHT/SBS. This effort fails to recognize that false confessions occur and pretends that confessions are obtained independent of medical information and psychological coercion.

Case-control studies, in contrast to cohort or cross-sectional studies, begin with subjects who have the outcome (cases) and compare them to individuals who do not have the outcome (controls). A crucial issue in evaluating a case-control study is control selection and the resulting comparability of cases and controls. The selection of controls is complex and often the most controversial facet of conducting a case-control study. Observational studies are assessed in terms of internal and external validity. Internal validity refers to the strength of the interpretation from the study. External validity is the ability to infer study results to a more general, broader population. Accordingly, internal validity is essential for external validity. A systematic review is an essential tool for summarizing evidence accurately and reliably. Unfortunately, critical information is often poorly reported in either the review or the primary studies; thus, diminishing the potential usefulness of a systematic review.

The four systematic reviews are by Togioka et al. in the Journal of Emergency Medicine (2009), Bhardwaj et al. in Ophthalmology (2010), Piteau et al. in Pediatrics (2012), and Maguire et al. in Eye (2013).[1-4] The four systematic reviews identified 19 comparative studies published between 1985 and 2010 that the reviewers considered high

quality. Of the 19 comparative studies, 11 studies were only selected by only one of the four systematic reviews; 5 studies were selected by two of the four systematic reviews; 1 study was selected by three of the systematic reviews; and, only 2 comparative studies were selected by all four systematic reviews. A comparative study by Vinchon et al. published in Childs Nervous System (2010) was online in November 2009, so the systematic reviews by Togioka et al. and Bhardwaj et al. could not have included it in their systematic reviews.[5]

Attendees will participate with the workshop faculty in evaluating the four systematic reviews by examining the 19 primary comparative studies for case definition criteria and for fallacies of logic including circularity, selection and information bias, and data misrepresentation. The faculty will also discuss the validity of confessions for case definition and statistical problems caused by common flaws in study design affecting the scientific tool.

Observational studies that are well designed and carefully executed can provide useful and reliable results. However, observational studies can be misleading when they involve circular reasoning, systemic bias, and skewed age distribution between case and control groups; or, if data gatherers are not blinded for the cases and controls or the study's hypothesis. Researchers in any given field may be prejudiced because of their belief in a scientific theory and claimed research findings from observational studies with methodological flaws may be measuring only prevailing bias.

Reference(s):

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2. Bhardwaj G, Chowdhury V, Jacobs MB, Moran KT, Martin FJ, Coroneo MT. A systematic review of the diagnostic accuracy of ocular signs in pediatric abusive head trauma. Ophthalmology 2010; 117(5):983-992 e917.
3. Piteau SJ, Ward MG, Barrowman NJ, Plint AC. Clinical and radiographic characteristics associated with abusive and nonabusive head trauma: a systematic review. Pediatrics, 2012;130(2):315-323.
4. Maguire SA, Watts PO, Shaw AD, Holden S, Taylor RH, Watkins WJ, et al. Retinal haemorrhages and related findings in abusive and non-abusive head trauma: a systematic review. Eye (Lond), 2013;27(1):28-36.
5. Vinchon, M, de Foort-Dhellemmes S, Desurmont M, Delestret I. Confessed abuse versus witnessed accidents in infants: comparison of clinical, radiological, and ophthalmological data in corroborated cases. Childs Nerv Syst, 2010;26(5):637-645.

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