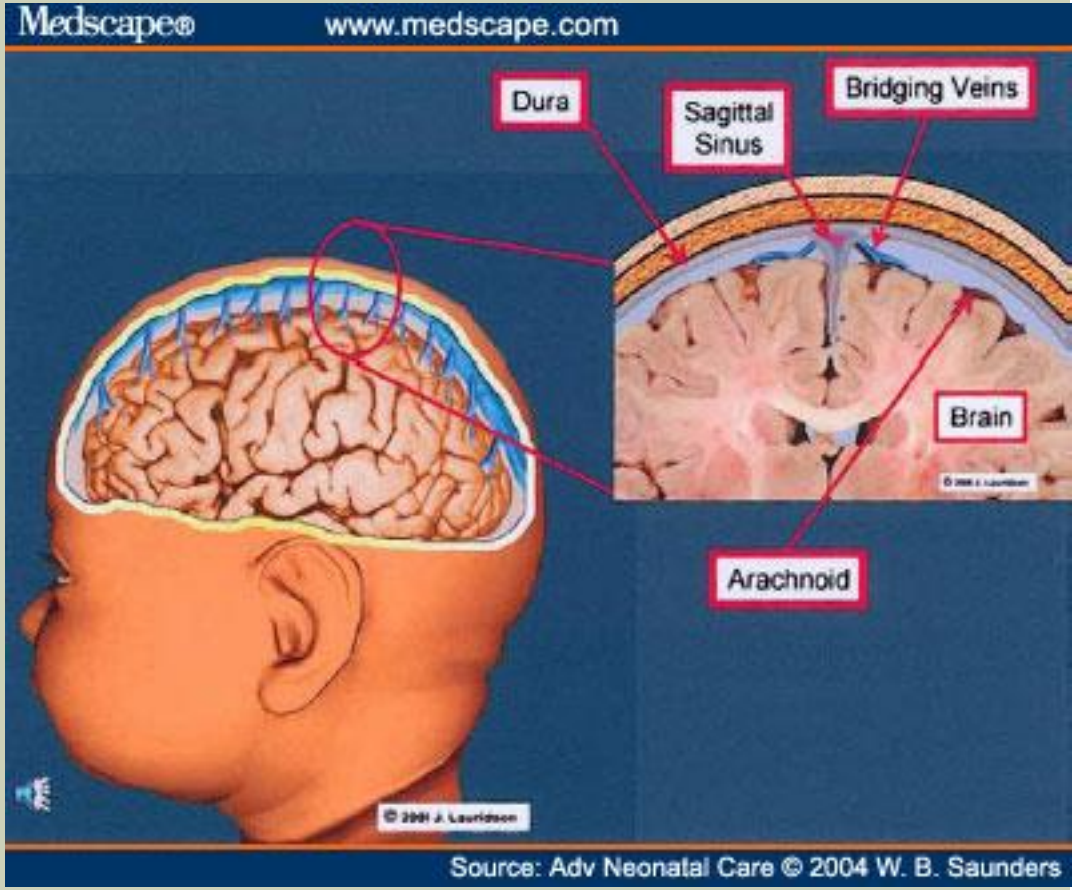
DAUBERT AND SHAKEN BABY SYNDROME

Someone must have made a false accusation against Josef K., for he was arrested one morning without having done anything wrong.

THE SBS HYPOTHESIS

1. The "triad": subdural hemorrhage, retinal hemorrhage, brain swelling (and absence of another explanation)
   a. The hypothesis: *ruptured* bridging veins, retinal veins, axons
   b. violent shaking provided the mechanism, physiology and timing
   c. being a parent/caretaker provided the motive and opportunity



ANATOMY OF SCIENCE-DEPENDENT SBS PROSECUTIONS

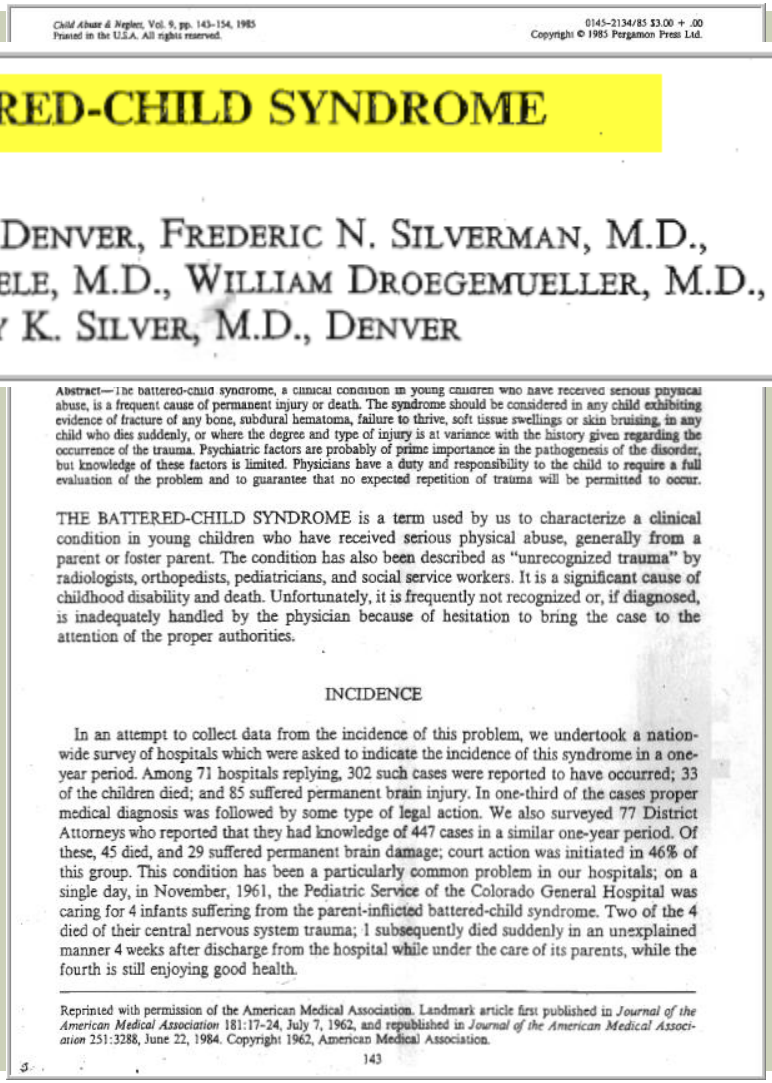
- The science is used to prove all legal elements of the offense
  - Cause and manner of death or injury
    - Shaking, or shaking with impact
  - Mental state of perpetrator
    - Degree of force used so significant as to prove intent, recklessness, deliberate indifference to human life, etc.
  - Identity of perpetrator
    - Because death or collapse is instantaneous (no "lucid interval"), it had to be the last person alone with the child
- "Medically diagnosed murder" (Tuerkheimer 2009)

THE HISTORY OF THE HYPOTHESIS

From SBS to AHT

KEMPE (1962)

- Very famous article



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0145-2134/85 $3.00 + .00

THE BATTERED-CHILD SYNDROME

C. HENRY KEMPE, M.D., DENVER, FREDERIC N. SILVERMAN, M.D., CINCINNATI, BRANDT F. STEELE, M.D., WILLIAM DROEGEMUELLER, M.D., AND HENRY K. SILVER, M.D., DENVER

Abstract—The battered-child syndrome, a clinical condition in young children who have received serious physical abuse, is a frequent cause of permanent injury or death. The syndrome should be considered in any child exhibiting evidence of fracture of any bone, subdural hematoma, failure to thrive, soft tissue swellings or skin bruising, in any child who dies suddenly, or where the degree and type of injury is at variance with the history given regarding the occurrence of the trauma. Psychiatric factors are probably of prime importance in the pathogenesis of the disorder, but knowledge of these factors is limited. Physicians have a duty and responsibility to the child to require a full evaluation of the problem and to guarantee that no expected repetition of trauma will be permitted to occur.

THE BATTERED-CHILD SYNDROME is a term used by us to characterize a clinical condition in young children who have received serious physical abuse, generally from a parent or foster parent. The condition has also been described as "unrecognized trauma" by radiologists, orthopedists, pediatricians, and social service workers. It is a significant cause of childhood disability and death. Unfortunately, it is frequently not recognized or, if diagnosed, is inadequately handled by the physician because of hesitation to bring the case to the attention of the proper authorities.

INCIDENCE

In an attempt to collect data from the incidence of this problem, we undertook a nation-wide survey of hospitals which were asked to indicate the incidence of this syndrome in a one-year period. Among 71 hospitals replying, 302 such cases were reported to have occurred; 33 of the children died; and 85 suffered permanent brain injury. In one-third of the cases proper medical diagnosis was followed by some type of legal action. We also surveyed 77 District Attorneys who reported that they had knowledge of 447 cases in a similar one-year period. Of these, 45 died, and 29 suffered permanent brain damage; court action was initiated in 46% of this group. This condition has been a particularly common problem in our hospitals; on a single day, in November, 1961, the Pediatric Service of the Colorado General Hospital was caring for 4 infants suffering from the parent-inflicted battered-child syndrome. Two of the 4 died of their central nervous system trauma; 1 subsequently died suddenly in an unexplained manner 4 weeks after discharge from the hospital while under the care of its parents, while the fourth is still enjoying good health.

Reprinted with permission of the American Medical Association. Landmark article first published in *Journal of the American Medical Association* 181:17-24, July 7, 1962, and republished in *Journal of the American Medical Association* 251:3288, June 22, 1984.

KEMPE (1962)

- Called out the pediatric community for under-diagnosing child abuse
- Identified “subdural hematoma” as a common injury found in battered children
- Doctor came to assume that subdural hemorrhage is a “traumatic” injury

GUTHKELCH (1971)

- First pediatric neurosurgeon in Great Britain
- Wondered why kids who had subdural hemorrhage and who he suspected had been abused showed no outward sign of head injury
- Concluded they may have been shaken
- Relied solely on a whiplash study by a Dr. Ommaya
- "One must keep in mind the possibility of assault in considering any case of infantile subdural haematoma, even when there are only trivial bruises or indeed no marks of injury at all, and inquire, however guardedly or tactfully, whether perhaps the baby's head could have been shaken."
  - A. Norman Guthkelch, *Infantile Subdural Hematoma and its Relationship to Whiplash Injuries* 2 BMJ 430, 431 (1971).

CAFFEY (1972 AND 1974)

- Major figure in the pediatric and child abuse communities
- Admitted he based his conclusions on “manifestly incomplete” data
- Concluded that shaking was a leading cause of cases where children had subdural and retinal hemorrhage

Shaken Baby Syndrome: An Odyssey

Ronald H. USCINSKI

Department of Neurosurgery, George Washington University Medical Center, Washington, U.S.A.; Department of Neurosurgery, Georgetown University Medical Center, Washington, U.S.A.; Potomac Institute for Policy Studies, Arlington, Virginia, U.S.A.

Abstract

Shaken baby syndrome is evaluated in the context of its historical evolution and its veracity in ref to causal injury mechanisms. A rational assessment of the injury causation and consequent path cal states associated with the syndrome is presented. It is now evident that shaken baby syn evolved as a result of a faulty application of scientific reasoning and a lack of appreciati mechanisms of injury. A brief explanation of the commonly understood usage and interface of scientif- ic methodology and reasoning as applied to clinical medicine is given.

Key words: shaken baby syndrome, injury biomechanics, subdural hematoma

Introduction

Shaken baby syndrome is characterized as a constellation of clinical findings including subdural bleeding, retinal hemorrhages, and associated fractures of the extremities or ribs, with no external evidence of cranial trauma. This widely proclaimed yet still hypothetical supposition has become a virtually unquestioned assumption nowadays as a modality for causing inflicted intracranial injury in infants. In 1997 the author was asked to review the case of a child fatally injured supposedly by shaking, and in doing so researched the entire body of literature referencing the so-called "shaken baby syndrome." This article is a product of that effort, and in a sense represents an intellectual "odyssey."[15] The paper is divided into three parts. The first places the syndrome in the historical perspective of the original papers providing the initial description of shaken baby syndrome. The second part gives a brief discussion of the physical laws of motion governing injury to relevant body structures, and encompasses a brief overview of the known pathophysiology of certain relevant forms of intracranial injury. The final section discusses the methodology of scientific reasoning and experimentation and its significance in the context of the immediate subject of the so-called inflicted shaking injury and the broader context of observing and understanding phenomena in our physical world.

Historical Perspective

The quantity of articles dealing with shaking as a putative mechanism for inflicting intracranial injury in infants has increased significantly since the 1970s when the original description of shaking first appeared in a paper published in *The British Medical Journal* in 1971 by Guthkelch.[6] Caffey,[2,3] who is generally credited with identifying and characterizing injuries to infants by shaking, published extensively on the subject thereafter. However, it is in the

This excellent paper was presented on May 25, 2005 at the 33rd Annual Meeting of The Japanese Society for Pediatric Neurosurgery in Nara, chaired by Professor Toshisuke Sakaki. All of the audience was greatly impressed by this new and unique concept of the so-called Shaken Baby Syndrome.

Shaken Baby Syndrome has now become a social issue in Japan and neurosurgeons are very much involved in its management. The topic was quite timely, so we thank Dr. Sakaki for selecting this paper as a special lecture for us.

Dr. Ronald H. Uscinski and I were residents together in neurosurgery at the Georgetown University Hospitals, Washington, D.C. in the early 1970s. I am very proud that such an excellent paper was produced in Washington, D.C. and presented in Nara.

Akira YAMAURA, M.D. (Advisory Board of *Neurologia medico-chirurgica*)
President, Chiba College of Health Sciences, Chiba

withstand such shaking. Nonetheless, the mechanism of shaking and the so named syndrome gained immediate acceptance and enormously widespread popularity, with no real investigation or even question as to its scientific validity.

Guthkelch article that shaking is invoked specifical- different physiologically from that of the rhesus

Ommaya, a neurosurgeon studying head injury and building on earlier work by Holbourn,[9,10] attempted to quantify experimentally the rotational acceleration necessary to cause intracranial injury via a whiplash in rhesus monkeys. The animals in Ommaya's experiment were placed in a contoured fiberglass chair with the head free to rotate; the chair was mounted on wheels and placed on tracks; and the apparatus was systematically impacted with a piston to simulate accelerations analogous to rear-end motor vehicle collisions, with the entire event photographed using a high-speed camera. Ommaya found intracranial injury in 18 of the animals, with concomitant neck injury in 11 of the 18. The purely isolated concept of rotational acceleration of sufficient magnitude to cause intracranial injury without impact and therefore without external evidence of injury was seized upon qualitatively by Guthkelch,[6] Caffey,[2,3] and others as the explanation for hitherto unexplained intracranial injury in infants. This concept was hypothesized and put forth by them as being the result of manual shaking.

Hence, the Ommaya paper emerges as the sole source of experimental data from which the initial hypothetical shaking mechanism was drawn. Significantly, Ommaya was actually attempting to quantify the requisite rotational acceleration necessary to cause head injury via whiplash movement of the head in humans during rear end motor vehicle collisions, with attendant vehicular impact. *He never addressed the question as to whether human beings can shake infants with enough force to produce the acceleration necessary to cause intracranial injury.* It is also significant that neither Guthkelch,[6] Caffey,[2,3] nor any subsequent investigators who have sought to identify and characterize ostensible shaking injuries to the infant head ever asked whether the infant torso and neck anatomy, quite

child abuse absolutely compulsory.

The combination of these factors, plus an unspoken, unproved, but increasingly pervasive assumption that all unexplained injuries in children were to be regarded as inflicted injuries, provided a new paradigm for a self-fulfilling prophecy. The hypothesis rapidly metamorphosed to a syndrome; its acceptance expanded exponentially, and "shaken baby" became a term synonymous and ultimately identical with intentional child abuse.

Injury Biomechanics

The causes of trauma obey the laws of injury biomechanics. These laws come from the generalized laws that govern motion, deformation, and forces existing in our universe. An example of one of these universal laws is Newton's second law of motion. Newton's second law governs the relationship between mass, acceleration, and force. In other words, given a mass such as a head, the acceleration of such a mass is governed by Newton's second law when there is a change in velocity divided by a change in time.

In 1943 the physicist Holbourn published a laboratory investigation of traumatic brain injury.[9] Holbourn understood that the deformable brain was incompressible, hypothesized a rotational acceleration level beyond which injury would occur, and that a smaller mass of brain would require larger rotational acceleration. Ommaya himself alluded to this point in his paper,[10] although this seems not to have been recognized by Guthkelch,[6] Caffey,[2,3] and others. In 1987 Duhaime et al.,[7] using available data on scaled injury thresholds, demonstrated that shaking a mechanical model to cause intracranial injury in the form of concussion, subdural hematoma, and diffuse axonal injury, failed to reach such

2001

- SBS endorsed by AAP: "presumption" of abuse in child under 1 year with RH and SDH and no major traumatic event
- Also endorsed by AAO and NAME

2002

- Dr. Ommaya explained that Drs. Guthkelch and Caffey had misunderstood his earlier whiplash study
- One would expect to see significant neck injury in any case of shaking hard enough to cause RH and SDH
- Very unlikely that shaking could cause direct damage to the eye

British Journal of Neurosurgery 2002; 16(3): 220–242

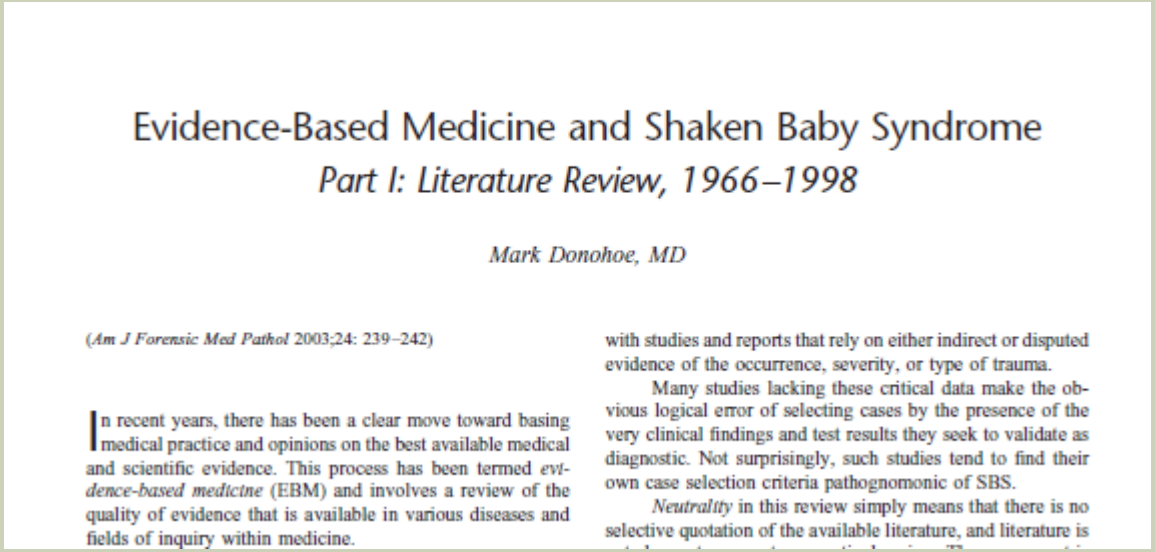
Taylor & Francis
healthsciences

REVIEW

Biomechanics and neuropathology of adult and paediatric head injury

A. K. OMMAYA*, W. GOLDSMITH** & L. THIBAULT***

2003



Evidence-Based Medicine and Shaken Baby Syndrome

Part I: Literature Review, 1966–1998

Mark Donohoe, MD

(*Am J Forensic Med Pathol* 2003;24: 239–242)

In recent years, there has been a clear move toward basing medical practice and opinions on the best available medical and scientific evidence. This process has been termed *evidence-based medicine* (EBM) and involves a review of the quality of evidence that is available in various diseases and fields of inquiry within medicine.

with studies and reports that rely on either indirect or disputed evidence of the occurrence, severity, or type of trauma.

Many studies lacking these critical data make the obvious logical error of selecting cases by the presence of the very clinical findings and test results they seek to validate as diagnostic. Not surprisingly, such studies tend to find their own case selection criteria pathognomonic of SBS.

Neutrality in this review simply means that there is no selective quotation of the available literature, and literature is

- Donohoe evaluated SBS literature against EBM standards
- Concluded “there was inadequate scientific evidence to come to a firm conclusion on most aspects of causation, diagnosis, treatment, or any other matter” related to SBS

2004

- Same type of study by Lantz revealed extremely thin evidence base for accepted belief that retinal hemorrhage were proof of violent shaking

Evidence based case report

Perimacular retinal folds from childhood head trauma

P E Lantz, S H Sinal, C A Stanton, R G Weaver Jr

Editorials by Geddes and Plunkett and Harding et al

A previously healthy 14 month old child was transferred to our medical centre with a severe head injury. The father had collected the boy and his 3 year old brother from their mother at his workplace car park and taken

Postmortem evidence

A forensic autopsy showed no direct trauma to the orbits or eyes. There were prominent bilateral scalp

BMJ VOLUME 328 27 MARCH 2004 bmj.com

2005

- Biomechanical study confirmed that the level of force required to shake a baby hard enough to cause SDH would cause massive neck injury

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Forensic Science International 151 (2005) 71–79

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Shaken baby syndrome: A biomechanics analysis of injury mechanisms

Faris A. Bandak *

Department of Neurology, A1036 F. Edward Hébert School of Medicine, Uniformed Services, University of the Health Sciences, 4301 Jones Bridge Road, Bethesda, MD 20814, USA

Received 2 November 2004; received in revised form 2 February 2005; accepted 8 February 2005

2006

- NAME declined to renew its 2001 position paper on SBS
- At its annual meeting, presentations were made with titles such as *"Where's the Shaking?: Dragons, Elves, the Shaken Baby Syndrome and Other Mythical Entities"*

2007

- Dr. Barnes – lead witness for the prosecution in the "Nanny case" – publishes a lengthy list of conditions that mimic the SBS findings

ORIGINAL ARTICLE

(*Top Magn Reson Imaging* 2007;18:53–74)

Imaging of the Central Nervous System in Suspected or Alleged Nonaccidental Injury, Including the Mimics

Patrick D. Barnes, MD and Michael Krasnokutsky, MD

2008

- Ontario, Canada begins revisiting SBS cases
  - "The predominant view is no longer that the triad on its own is diagnostic of SBS."
  - "In light of the change in knowledge, there may have been convictions that should now be seen as miscarriages of justice."

590 Wis. 746 NORTH WESTERN REPORTER, 2d SERIES

nection with his 2004 case, he is entitled to relief in the form of sentence credit.[2] These are issues requiring an evidentiary hearing to determine the necessary facts. I he do

2008 WI App 33

STATE of Wisconsin, Plaintiff–Respondent,†

v.

Audrey A. EDMUNDS, Defendant–Appellant.

No. 2007AP933.

Court of Appeals of Wisconsin.

Submitted on Briefs Dec. 7, 2007.

Opinion Filed Jan. 31, 2008.

Ba ma les 290, defendant filed motion for new trial on grounds of newly discovered evidence. The Circuit Court, Dane County, Daniel R.

evidence in the form of advances in medical science;

(3) upon finding that defendant's newly

dard to reach a reasonable decision.

3. Criminal Law ⚿1156(3)

2009

- American Academy of Pediatrics states that "advances in the understanding of the mechanisms … associated with abusive head trauma compel us to modify our terminology"
- Recommended that physicians use the term "abusive head trauma"
- "Legal challenges to the term 'Shaken Baby Syndrome' can distract from the more important questions of accountability of the perpetrator and/or the safety of the victim."

Washington University
Law Review

VOLUME 87 NUMBER 1 2009

THE NEXT INNOCENCE PROJECT: SHAKEN BABY SYNDROME AND THE CRIMINAL COURTS

DEBORAH TUERKHEIMER*

this triad, thereby undermining the foundations of thousands of SBS convictions. Outside the United States, this scientific evolution has prompted systemic reevaluations of the prosecutorial paradigm. In contrast, our criminal justice system has failed to absorb the latest scientific knowledge. This is beginning to change, yet the response has been halting and inconsistent. To this day, triad-based convictions continue to be affirmed, and new prosecutions commenced, as a matter of course.

* Professor of Law, DePaul University College of Law; A.B. (1992), Harvard College; J.D. (1996), Yale Law School. Susan Bandes, Keith Findley, Samuel Gross, Christopher Knott, Robert Mosteller, Frank Tuerkheimer, and participants at a DePaul University College of Law faculty workshop provided invaluable comments on an earlier draft. I am also grateful to Patrick Barnes, Toni Blake, Thomas Bohan, Stephen Boos, Keith Findley, Christopher Knott, Patrick Lantz, Tina Nadeau, John Plunkett, Maurice Possley, Lawrence Ricci, Jennifer Wriggins, and Kirk Zwink for their helpful assistance during the research phase of this project. Finally, I wish to acknowledge the generous support of Dean Peter Pitegoff and Dean Glen Weissenberger.

2010

- Medical examiner studied eyes of deceased children and found that RHs are commonly found in natural and accidental deaths, as well as homicides
- Concluded that eye findings are of "limited value" in child death investigations

G1 Retinal and Optic Nerve Sheath Hemorrhages Are Not Pathognomonic of Abusive Head Injury

Evan Matshes, MD, Southwestern Institute of Forensic Sciences, 5230 Southwestern Medical Avenue, Dallas, TX 75235*

2010

- Miller study
  - Males diagnosed with SBS 2-1 over females
  - By very similar ratio, male babies more frequently suffered SDH from non-SBS causes

Overrepresentation of Males in Traumatic Brain Injury of Infancy and in Infants With Macrocephaly

Further Evidence That Questions the Existence of Shaken Baby Syndrome

Rubin Miller, BA, and Marvin Miller, MD

thes. The triad is not specific for SBS and can be seen in accidental trauma and in certain medical conditions. Recent observations, however, question whether SBS exists. Herein, we review the gender differences in 3 groups of infants with traumatic brain injury: (1) neonates with SDH from birth trauma, (2) infants with SDH from accidental trauma, and (3) infants with SDH from SBS. Gender differences are also presented in a fourth group of infants with macrocephaly related to increased extra-axial fluid spaces (IEAFS). Compared with the expected male frequency of 51.4% in newborns, there was a statistically significant overrepresentation of males in each of the 4 groups–65.3%, 62.2%, 62.6%, and 68.8%, respectively. We believe that the most likely explanation for these findings relates to the larger head size of the male compared with the female which has several relevant consequences. First, the larger head circumference of a male newborn compared with a female newborn may increase the likelihood that a male newborn will incur a small SDH from the minor trauma of the birthing process that can later rebleed and present with a symptomatic SDH that could be misdiagnosed as SBS and child abuse. Second, a short fall would have a greater likelihood of causing a SDH in a male infant than a female infant who could subsequently become symptomatic from hours to weeks later and could thus present as an unexplained SDH. Third, infants with macrocephaly related to IEAFS may be at increased risk for developing a SDH from the larger head size and greater tautness of the bridging vessels in the extra-axial fluid spaces. We believe that many infants who have been diagnosed with SBS have been given incorrect diagnoses of child abuse. Rather, their SDH may occur as a result of a small SDH from the birthing process that enlarges during early infancy, a short fall, or from macrocephaly with IEAFS.

Key Words: forensic science, shaken baby syndrome, traumatic brain injury of infancy, increased extra-axial fluid spaces, macrocephaly, subdural hematoma, retinal hemorrhages, male gender

(*Am J Forensic Med Pathol* 2010;31: 165–173)

Traumatic brain injury of infancy (TBII) can be accidental or nonaccidental and is characterized by 3 primary findings: (1) intracranial bleeding, most commonly subdural hematoma (SDH), (2) retinal hemorrhages (RH), and (3) neurologic dysfunction (ND) which can include vomiting, lethargy, decreased level of consciousness, seizures and focal neurologic findings. (These 3 findings–SDH, RH, and ND–will be referred to as the "triad" in this article). The triad associated with trauma can be seen in several different clinical settings. Severe birth trauma can cause the triad and present immediately after birth, and severe accidental trauma such as in a motor vehicle accident or high fall can cause the triad in an infant.[5] Controversy had existed as to whether short falls could cause the triad in an infant, but recent observations clearly indicate that short falls can also cause the triad.[6]

When a young infant presents with the triad and there is no history of trauma to explain the triad and none of the aforementioned conditions is present that might explain the triad, it is likely that the diagnosis of nonaccidental trauma from shaken baby syndrome (SBS) will be made. The triad has been the sine qua non for the SBS.[7,8] However, there is recent evidence that SBS may not even exist and that the triad in these alleged cases of SBS may have a different pathogenesis.[9–13]

Several factors have shown an association with TBII including chronic hypoxia, macrocephaly associated with increased extra-axial fluid spaces (IEAFS), and possibly male gender.[9,14,15] Herein is a formal evaluation of (1) the association of TBII with gender and (2) the association of macrocephaly associated with IEAFS with gender. Our findings show an overrepresentation of males in both groups. A hypothesis to explain these findings is set forth which has implications that raises further doubt about the existence of SBS.

METHODS

Relevant scientific articles of series of infants with TBII published between 1966 and 2005 were found using the keywords "Shaken Baby Syndrome," "Retinal Hemorrhage," and "Subdural Hematoma" using MEDLINE. Articles referenced in these articles and published before 1966 that described relevant series of infants with TBII were also included. Articles were included if they indicated the frequency of males and females with TBII and were classified into 3 TBII groups:

Group 1–neonatal SDH from birth trauma[5,16–21]
Group 2–SDH in young infants from accidental falls[21–32]
Group 3–SDH from nonaccidental TBII (SBS).[21,22,27–30,33–51]

The same type of literature search was also done to determine if there are any gender differences in macrocephaly related to IEAFS (also called external hydrocephalus, benign subdural collections of infancy, benign subdural hygromas, and other terms) which is group 4.[52–72]

If there was no association of gender with TBII or with macrocephaly, then the expected percentage of males would be about 51.4% which is the percentage of births that are male in North America and Europe over the second half of the 20th century.[73] We used a one sample Z test of a single proportion to test whether the percentage of males in each group was significantly different than the expected percentage of 51.4%.[74]

Manuscript received January 13, 2007; accepted October 8, 2007.
From the Department of Pediatrics, Ob/Gyn, and Biomedical Engineering, Wright State University Boonshoft School of Medicine, Dayton, OH.
Figures can be viewed in color at http://amjforensicmedicine.com.
Reprints: Marvin Miller, MD, Children's Medical Center, 1 Children's Plaza, Department of Medical Genetics, Dayton, OH 45404. E-mail: srmmem@aol.com or millermo@childrensdayton.org.

ISSN: 0195-7910/10/3102-0165
DOI: 10.1097/PAF.0b013e3181d96a8e

Natural History and Gender Differences of Newborn SDHs from Trauma Related to the Birthing Process

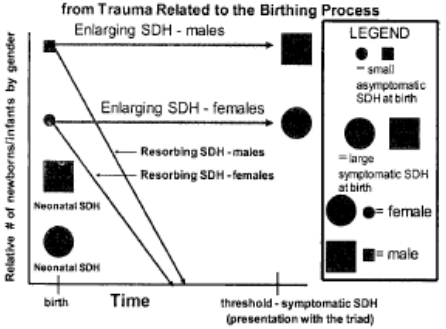

FIGURE 1. Shows the relative increase of SDH in males compared with females in both the newborn period and in early infancy. It is hypothesized that this gender difference is a consequence of the larger OFC of males compared with females. This OFC difference would predict a greater incidence of symptomatic, neonatal SDH in males compared with females as a result of trauma from the birthing process. In addition, there would be a greater number of males compared with females who have a small, asymptomatic SDH at birth as a result of trauma from the birthing process. While most of these small, asymptomatic SDHs from birth trauma will eventually resorb, a very small proportion will rebleed and enlarge during early infancy and eventually become symptomatic. These enlarging SDHs from rebleeding can arise spontaneously or from minimal force impacts of the head and may be incorrectly diagnosed as SBS.

situations there is macrocephaly and thus increased head weight. In some families autosomal dominant inheritance has been described with a male preponderance in these families.[57,94]

The same mechanical analysis of what happens when a larger than normal head hits a surface (ie, an infant falls or hits their head against a hard object) that was previously discussed likewise applies to the infant with macrocephaly from IEAFS. Moreover, there is

1. Biomechanical Analysis

When a biomechanical evaluation is done of the forces that cause the triad in experimental animals and extrapolated to the human, it appears that the forces generated by shaking are insufficient alone to cause the triad. It has been suggested that impact is needed.[6,11–13,93,98,99] Moreover, one would expect severe neck trauma with cervical spine dislocations in infants who are violently shaken, and they are conspicuously absent in SBS.

2. Lack of Witnessed Reports

Despite this diagnosis being in the literature for over 30 years and professed to the general public as a real entity, there have been few credible, witnessed reports of violent shaking causing SBS. When Leestma evaluated the same SBS literature for an accounting of "candidate" cases of shaking causing the "triad," he only found 11 cases in over 30 years of case reports. Eight of these survived and only 3 were autopsied. These were reported not to show impact injury to the head. Thus, the number of possibly valid cases of injuries caused by shaking is very few.[100]

3. Nonspecificity of RHs for Child Abuse

For the past 30 years the finding of RHs has been a finding that almost always led to a diagnosis of SBS, and thus child abuse. The recent, independent observations of Lantz and of Lueder now show that RHs can be seen in accidental injuries of young infants and seriously undermines this long held dogma.[10,101,102]

It has been thought that shaking causes the RHs in SBS. However, there is evidence that RHs are unlikely to be caused by shaking and have a different cause. The individual components of the triad are probably not independent events. Rather, following a traumatic brain injury, the SDH is the primary event and the ND and RHs are secondary to the brain swelling and injury from the SDH. The RHs arise from increased intracranial pressure that exceeds the pressure in the retinal veins.[103–105] SDHs have to be of sufficient size to cause ND and RHs.

4. Problematic Confessions

Confessions in SBS cases are fraught with difficulties, and distinguishing between a true confession that represents real wrongdoing and one that is either coerced or represents innocent shaking related to resuscitating the infant is often difficult.[106–110] Confessions can also be encouraged and tinted, misrepresented, or may

with minimal head trauma. Thus, it is increasingly apparent that inflicted TBII from shaking is controversial with emerging evidence that it may not even exist.

How could such a diagnosis based on such flimsy evidence and with such far-reaching implications become so entrenched in pediatric and legal medicine? The original reports of shaking as the

2011

- *Cavazos v. Smith*, 132 S.Ct. 2 (2011).
  - Evidence sufficient to support conviction even though medical testimony was disputed.
  - But majority also wrote: "Doubts about whether Smith is in fact guilty are understandable."
  - Dissent: "'Doubt has increased in the medical community 'over whether infants can be fatally injured through shaking alone.'"
  - And: "What is now known about shaken baby syndrome (SBS) casts grave doubt on the charge leveled against Smith."

2012

- *Ex Parte Cathy Lynn Henderson*, 384 S.W.3d 833 (Tex. Ct. Crim. App. 2012)
  - Pathologist (Bayardo) who performed autopsy changed opinion
  - Originally testified, "without a scintilla of doubt" that the cause of 3½-month-old child's death was "abuse, homicide."
  - Based on subsequent research (largely biomechanical research on short-distance falls developed after trial), original pathologist, joined by 5 other experts, changed his mind: "I cannot determine … whether [the child's] injuries resulted from an intentional act or an accidental fall." And: "I don't believe it's a case of child abuse.

12 Hous. J. Health L. & Policy

Houston Journal of Health Law & Policy
ISSN 1534-7907

SHAKEN BABY SYNDROME, ABUSIVE HEAD TRAUMA, AND ACTUAL INNOCENCE: GETTING IT RIGHT

Keith A. Findley, Patrick D. Barnes, David A. Moran, and Waney Squier*

University Medical Center. David A. Moran is a Clinical Professor of Law, University of Michigan Law School and Co-Director, Michigan Innocence Clinic. Waney Squier is a Consultant Neuropathologist at the Oxford University John Radcliffe Hospital and Honorary Clinical Lecturer at the University of Oxford.

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12 Hous. J. Health L. & Policy

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PROBLEMS OF INFANT RETINO-DURAL HEMORRHAGE WITH MINIMAL EXTERNAL INJURY

A.N. Guthkelch*

This contribution is offered as a reflection—after 40 years' consideration—on a problem of potential child abuse which has caused a great deal of controversy since it was first described.[1] While controversy is a normal and necessary part of scientific discourse,

12 Hous. J. Health L. & Policy

Houston Journal of Health Law & Policy
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Since subdural and retinal hemorrhages (with or without cerebral edema) may also be observed in accidental or natural settings, I suggest that the elements of the classic triad of retinal hemorrhage, subdural hemorrhage and cerebral edema would be better defined in terms of their medical features. Since subdural hemorrhages in infancy originate in the dura, perhaps "retino-dural hemorrhage of infancy" would be an acceptable name for the primary findings. Other medical findings, e.g., cerebral edema, can be added to the title as appropriate. This would allow us to investigate causation without appearing to assume that we already know the answer.

caused a great deal of controversy since it was first described.[1] While controversy is a normal and necessary part of scientific discourse,

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PROBLEMS OF INFANT RETINO-DURAL HEMORRHAGE WITH MINIMAL EXTERNAL

from a high building or asks for an opinion on intent. Any medical expert who answers in the negative questions such as "Given the injuries that you have described in this case, doctor, have you any doubt that they were inflicted with intent to kill, or at least in total disregard of that possibility?" is exceeding his or her authority. New

caused a great deal of controversy since it was first described.[1] While controversy is a normal and necessary part of scientific discourse,

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imperfectly documented – cases explains some of this disparity.

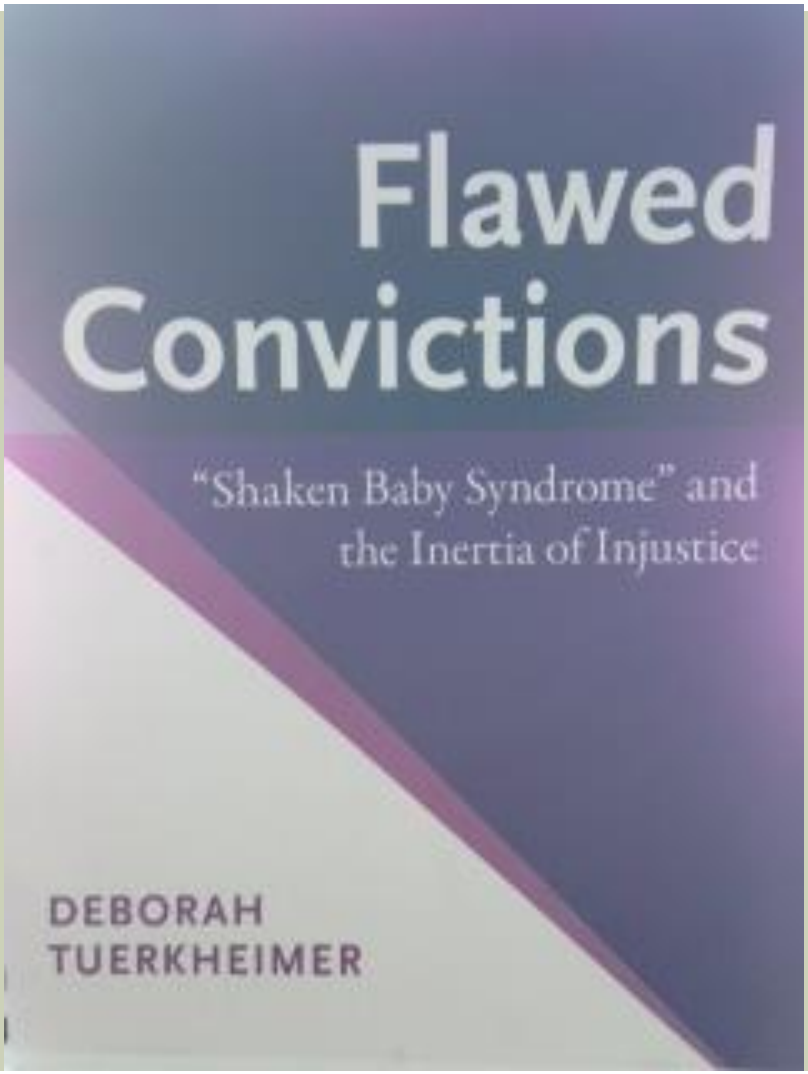
"Getting it right" requires that we distinguish between hypotheses and knowledge. SBS and AHT are hypotheses that have been advanced to explain findings that are not yet fully understood. There is nothing wrong in advancing such hypotheses; this is how medicine and science progress. It *is* wrong, however, to fail to advise parents and courts when these are simply hypotheses, not proven medical or scientific facts, or to attack those who point out problems with these hypotheses or who advance alternatives. Often, "getting it right" simply means saying, clearly and unequivocally, "we don't know."

This contribution is offered as a reflection – after 40 years' consideration – on a problem of potential child abuse which has caused a great deal of controversy since it was first described.[1] While controversy is a normal and necessary part of scientific discourse,

DR. NORMAN GUTHKELCH ON SBS

- A.N. Guthkelch, *Problems of Infant Retino-Dural Hemorrhage with Minimal External Injury*, 12 Hous. J. Health L. & Policy 201 (2012)
- NPR, Rethinking Shaken Baby Syndrome, http://www.npr.org/2011/06/29/137471992/rethinking-shaken-baby-syndrome
- http://www.youtube.com/watch?v=kYdZQurLS2k
- http://onsbs.com/category/carrie-sperling/norman-guthkelch/

2014


Flawed
Convictions
"Shaken Baby Syndrome" and
the Inertia of Injustice
DEBORAH
TUERKHEIMER

2014

2014 WL 296094
Only the Westlaw citation is currently available.
United States District Court, N.D. Illinois, Eastern Division.

Jennifer Del Prete, Petitioner,

v.

Sheryl Thompson, Respondent.

Case No. 10 C 5070 | January 27, 2014

Synopsis

Background: Following affirmance of her state-court conviction for first-degree murder, petitioner sought federal habeas relief.

Holding: The District Court, Matthew F. Kennelly, J., held that miscarriage of justice exception applied to petitioner's procedurally defaulted claim of ineffective assistance.

2014 WL 641516

THIS DECISION IS UNCORRECTED AND SUBJECT TO REVISION BEFORE PUBLICATION IN THE NEW YORK REPORTS.
Court of Appeals of New York.

The PEOPLE & c., Respondent,

v.

Adrian P. THOMAS, Appellant.

Feb. 20, 2014.

SBS/AHT: WHERE ARE WE NOW?

***Shaking runs into trouble*:**

a. biomechanics: shaking produces insufficient force to rupture veins or axons; would have neck injury (Duhaime 1987, Ommaya 2002)
b. brain swelling is hypoxic, not traumatic (Geddes 2001)
c. subdural hemorrhages have many causes (Frasier 2006)
d. bridging vein rupture is improbable (Squier & Mack 2009)
e. retinal hemorrhages have many nontraumatic causes (Lantz 2006, Matshes 2010, Lantz 2013)
f. lucid intervals are acknowledged (Gilliland 1998)
g. broad range of alternatives: accidental, birth trauma, natural disease processes, coagulopathies, lumbar puncture, genetic, etc. (Frasier 2006, Barnes 2011)

CHALLENGING ADMISSIBILITY OF SBS/AHT TESTIMONY

The *Daubert* & *Frye* Challenges

GLOBAL CHALLENGES VS. SPECIFIC CHALLENGES

Daubert targets admissibility of evidence specifically for “the task at hand”

THE "TASK AT HAND"

Daubert assigns to the "judge the task of ensuring that an expert's testimony both rests on a reliable foundation and is relevant to the task at hand."

--*Daubert v. Merrell Dow Pharm., Inc.*, 509 U.S. 579, 580 (1993)

GENERAL CHALLENGES

GENERAL CHALLENGES TO THE SBS/AHT HYPOTHESIS

- Research base
- Circularity
- Failure to explain the mechanism/pathway of injury
- Alternative explanations
- Biomechanical research
- Lack of consensus about many aspects
- Growing recognition of weaknesses in legal, medical, and popular sources

WHY MAKE GENERAL CHALLENGES?

- Educate the judge
- Prepare to put specific challenges in context
- Show lack of basic scientific support

CAUSE AND MANNER OF DEATH: THE BIOMECHANICS OF SHAKING

- Forces from shaking fall well below established injury thresholds and are 1/50th the force of impact, including impact on soft surfaces. A. C. Duhaime et al., *The Shaken Baby Syndrome: A Clinical, Pathological and Biomechanical Study,* 66 J. NEUROSURG. 409 (1987)
- The peak rotational accelerations for a shake are less than those in a 1 foot fall onto carpet. Prange et al., *Anthropomorphic Simulations of Falls, Shakes, and Inflicted Impacts in Infants*, 99 J. NEUROSURG. 143 (2003)

THE ABSENCE OF OBJECTIVE CORROBORATING EVIDENCE

- No death or serious injury by shaking has ever been captured on video, despite ubiquity of "nanny cams"
- The only shaking caught on camera has produced no injury
- But short falls causing death have been captured on video.
  - See J. Plunkett, *Fatal Pediatric Head Injuries Caused by Short-Distance Falls*, 22 J. FORENSIC MED. PATHOL. 1 (2001)
  - Queens DA Conference 2011

CAUSE AND MANNER OF DEATH: MIMICS OF CHILD SBS/ABUSIVE HEAD TRAUMA

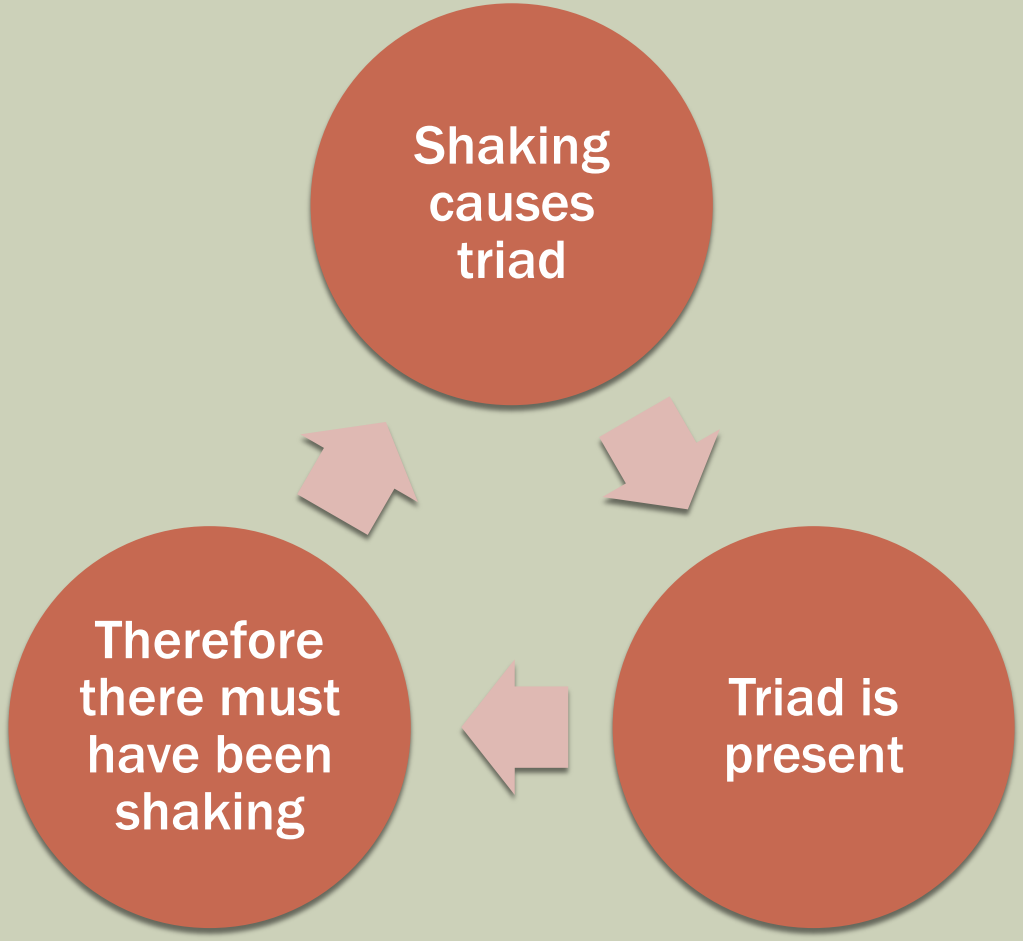
Accidental trauma (e.g., short falls), congenital malformations, metabolic disorders, hematological diseases, infectious diseases, autoimmune conditions, birth effects, rebleeds, hypoxia, childhood stroke, genetic conditions, etc. Patrick D. Barnes & Michael Krasnokutsky, *Imaging of the Central Nervous System in Suspected or Alleged Nonaccidental Injury, Including the Mimics*, 18 TOP. MAGN. RESON. IMAGING 53, 65-70 (2007); Andrew P. Sirotnak, *Medical Disorders that Mimic Abusive Head Trauma, IN* ABUSIVE HEAD TRAUMA IN INFANTS AND CHILDREN: A MEDICAL, LEGAL, AND FORENSIC REFERENCE 191 (Lori Frasier et al., eds. 2006)

THE EVIDENCE BASE IS FLAWED

CIRCULARITY

- What does this mean?
  - A is true because B is true; B is true because A is true
  - Portland is in Oregon; therefore, Portland is in Oregon
    - This statement contains no information that is distinct from the conclusion, so it does not provide proof

CIRCULARITY



ATTEMPTING TO AVOID CIRCULARITY

Typical hierarchy of certainty:

1. Confessions
2. Legal action taken (whether conviction obtained or not)
3. Strong suspicions of staff (based on the medical signs and a "discrepant" explanation offered by caregiver)

--Suzanne P. Starling, James R. Holden, and Carole Jenny, *Abusive Head Trauma: The Relationship of Perpetrators to Their Victims,* 95 Pediatrics 259 (1995)

"[C]onfessed shaking ... *is* the evidentiary basis for shaking."

Mark S. Dias, *The Case for Shaking*, *in* CHILD ABUSE AND NEGLECT: DIAGNOSIS, TREATMENT, AND EVIDENCE, 362, 368 (Carole Jenny, ed., 2011)

CONFESSIONS

- Not science
- False confessions present in nearly 25% of DNA exonerations
  - "People confess to it. So it has to be possible," Dr. Suzanne Starling, director of forensic pediatrics at Children's Hospital of The King's Daughters in Norfolk, VA, in USA Today, April 28, 2007*
- SBS is especially susceptible to false confessions:
  - Extreme trauma/vulnerability—reactions of the good parent
  - Convincing the suspect he or she is guilty
    - The power of the medical evidence when presented to caregiver
    - “coerced compliant false confessions”
    - “internalized false confessions”

*Available at http://usatoday30.usatoday.com/news/health/2007-04-28-675188703_x.htm

JUDGE POSNER ON SBS "CONFESSIONS"

- *Aleman v. Village of Hanover Park*, 662 F.3d 897 (7th Cir. 2011):

  "Not being a medical expert, Aleman could not contradict what was represented to him as settled medical opinion. He had shaken Joshua, albeit gently; but if medical opinion excluded any other possible cause of the child's death, then, gentle as the shaking was, and innocently intended, it *must* have been the cause of death. Aleman had no rational basis, given his ignorance of medical science, to deny that he had to have been the cause."

If a question has only two answers—*A* and *B*—and you tell the respondent that the answer is not *A,* and he has no basis for doubting you, then he is compelled by logic to "confess" that the answer is *B.* That was the vise the police placed Aleman in. They told him the only possible cause of Joshua's injuries was that he'd been shaken right before he collapsed; not being an expert in shaken-baby syndrome, Aleman could not deny the officers' false representation of medical opinion. And since he was the only person to have shaken Joshua immediately before Joshua's collapse, it was a logical necessity that he had been responsible for the child's death. Q.E.D. A confession so induced is worthless as evidence….

CONFESSIONS

The PEOPLE & c., Respondent,

v.

Adrian P. THOMAS, Appellant.

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6 Defendant's inculpating statements were also inadmissible as "involuntarily made" within the meaning of CPL 60.45(2)(i). The various misrepresentations and false assurances used to elicit and shape defendant's admissions manifestly raised a substantial risk of false incrimination. Defendant initially agreed to take responsibility for his son's injuries to save his wife from arrest. His subsequent

"Indeed, there is not a single inculpatory fact in defendant's confession that was not suggested to him."

The agreement of his inculpatory account with the theory of injury advanced by those doctors can be readily understood as a congruence forged by the interrogation. The attainment of the interrogation's goal therefore, cannot instill confidence in the reliability of its result.

THERE ARE NO STANDARDIZED DIAGNOSTIC CRITERIA

SBS/AHT looks different to different health care providers

DAUBERT SAYS METHODOLOGY MATTERS

THE *IPSE DIXIT* OF A PROPOSED EXPERT IS NOT A METHODOLOGY

- The number of cases a doctor has treated, however impressive, is not a valid method of diagnosis
- Method must rest upon scientific principles
- Method must be able to be tested
- Method should be articulable

CLINICAL JUDGMENT

- Proponents of the hypothesis: In the absence of high-quality research, must rely on clinical judgment. (Narang, *A* Daubert *Analysis of Abusive Head Trauma/Shaken Baby Syndrome,* 11 Hous. J. Health L. & Pol'y 505 (2011)).
- Introduces subjectivity that infects other forensic sciences
- Is different than clinical judgment in treatment contexts
- Barred by *Daubert*: "in circumstances when experience alone does not resolve the main doubts about reliability, it would be irrational, and therefore an abuse of discretion to rely upon it." (Risinger, *Defining the "Task at Hand": Non-Science Forensic Science after* Kumho Tire Co. v. Carmichael, 57 Wash. & Lee L. Rev. 767, 773 (2000).)

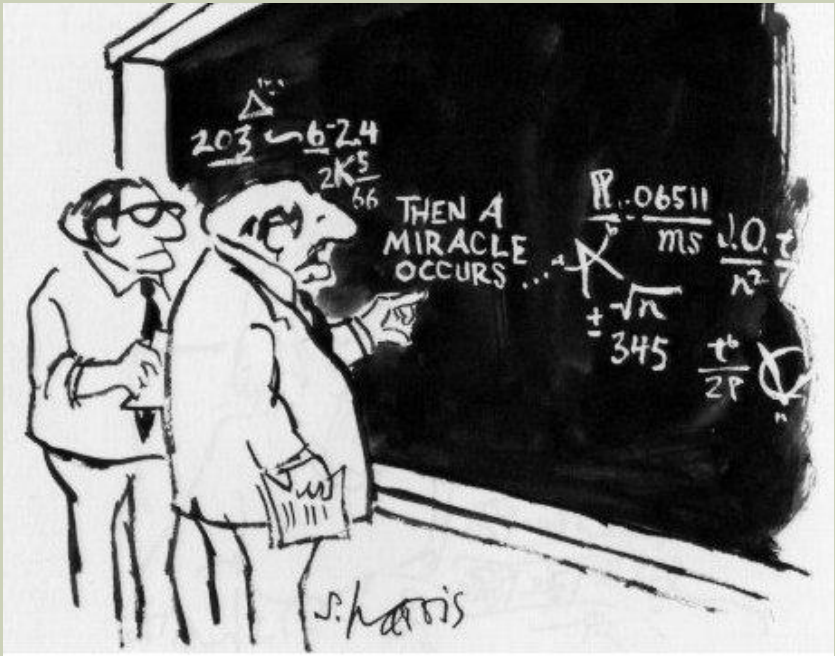
GENERAL ELEC. CO. V. JOINER 522 U.S. 136, 146 (1997)

Daubert stated that the "focus, of course, must be solely on principles and methodology, not the conclusions that they generate."

"But nothing in either *Daubert* or the Federal Rules of Evidence requires a district court to admit opinion evidence that is connected to existing data only by the *ipse dixit* of the expert."

DAUBERT AND TRANSPARENCY OF METHOD

- In order for a method to be valid, it has to be articulable
- It can't be a secret
- Daubert requires that experts explain why and show their work
- You should be asking, "How do you know?"



"I think you should be more explicit here in step two."

from *What's so Funny about Science?* by Sidney Harris (1977)

THERE IS NO STANDARDIZED PROCEDURE FOR THE DIAGNOSIS OF SBS/AHT

- The decision to make an SBS/AHT diagnosis appears to be made based largely on the doctor's perception of the truthfulness of the caregiver
- There are no standardized criteria for diagnosing SBS/AHT
  - So how is the doctor making the diagnosis?
    - What is causing these findings?
    - How do you know?
    - Artifact or cause?
    - Why?

Q Dr. Alexander, please explain to the jury the diagnosis of shaken baby syndrome.

A Okay. Key features -- well, the first thing is history. As is pretty much true in anything in medicine. History. So, if we were even -- just as we were tentatively thinking or something that might resemble shaken baby syndrome, if we found out someone is in a car crash, of course that will lead us to think of car crashes. So we do have that.

The key features we are looking for beyond some history, which we may or may not have or may or may not be right, is we are looking for somebody with a brain injury of some sort. It could be mild, it could be very severe. Along with that, if the child survives long enough we will see manifestation of like brain swelling, the radiologist may see some things. If they die, a pathologist may see some things. So brain injury is the predominant thing.

DEFINITION

- "Gold standard definitional criteria for AHT do not exist. … [I]n the absence of a gold standard, clinicians rarely confirm or exclude AHT with complete certainty and are compelled instead to adopt a probabilistic approach to the diagnosis."
  - Kent P. Hymel, *et al*. *Derivation of a Clinical Prediction Rule for Pediatric Abusive Head Trauma*, 14 (No. 2) PEDIATR CRITI CARE MED. 2013 Feb;14(2):210-20, 212.

DEFINITION?*

Abusive Head Trauma (AHT) is a specific form of traumatic brain injury and is medically defined by the constellation of symptoms, physical signs, laboratory, imaging and pathologic findings that are a consequence of violent shaking, impact or a combination of the two. Characteristic injuries, which may not be present in every child include: bleeding in and around the brain (intracranial hemorrhage), bleeding into the retina (retinal hemorrhage), and brain injury. Skull, rib or long bone fractures may also be present. There may or may not be external evidence of trauma. It is usually seen in infants and young children, however, it can occur in older individuals.

*There is no standardized definition of Abusive Head Trauma other than etiology (abuse). This is the closest thing I can find.

BETWEEN THE LINES
AHT IS:

- bleeding in and around the brain (intracranial hemorrhage)
  - “may or may not be present”
- bleeding into the retina (retinal hemorrhage)
  - “may or may not be present”
- brain injury
  - “may or may not be present”

ALSO MAY INCLUDE

- Skull fractures
- No skull fractures
- Rib fractures
- No rib fractures
- Long bone fractures
- No long bone fractures
- External evidence of trauma
- No external evidence of trauma

WHO ARE THE VICTIMS?

- Infants
- Young children
- Older individuals

HOW IS SBS/AHT DIFFERENT FROM OTHER MEDICAL DIAGNOSES?

SUBJECTIVE DIAGNOSIS

- No “gold standard test”
- Relies on history
- Is a rule-out diagnosis
- Is not informed by the feedback that follows most diagnoses
  - There is no prescribed treatment for AHT/SBS, and hence no opportunity to assess patient responsiveness to see if the diagnosis was correct
- It is really an etiology, not a diagnosis

CONTRAST WITH OTHER DIAGNOSES

- Migraine
  - **Standardized diagnostic criteria from International Headache Society**
  - **Well-defined, well-publicized factors that define migraine headache**
  - **Even so, only 48% of migraine sufferers in the US have a physician diagnosis of migraine**
  - **51% have been undiagnosed or incorrectly diagnosed for a variety of reasons**
  - **Physicians receive feedback based at least on patient responsiveness to treatment**
  - **Physicians are not asked to identify an etiology outside the bio-physical processes that medicine can study (no judgments about external actors, intent, motive, etc.)**

SBS/AHT IS A VALID DIAGNOSIS

- Proponents of the SBS/AHT hypothesis often argue that wrongful convictions or accusations don't occur or are very rare because SBS/AHT is a valid diagnosis
- There are many reasons to doubt the validity of SBS/AHT as a diagnosis, but assuming it is a valid diagnosis, the validity of the diagnosis does not mean that it has been correctly made in any given situation
- Using migraines as an example again, more than half of migraine sufferers are not correctly diagnosed.
- It is clear that despite fact that there is no dispute about migraine headaches *as a diagnosis*, there is a great deal of dispute about whether migraine sufferers *are correctly diagnosed*. A physician is not practicing responsibly simply because he diagnoses a patient with a diagnosis that exists. The diagnosis must also be correctly made.

MIGRAINE EXAMPLE

- Migraine, like AHT, relies upon patient history for diagnosis. This is one of the major obstacles to correctly recognizing migraines. "Recognizing migraine is challenging for several reasons. One reason is the lack of objective screening tools for identifying the disorder in the primary care setting. Clinicians rely on patients to recall and report highly subjective descriptions of headache pain and associated symptoms." Richard Sadovsky & David W. Dodick, Identifying Migraine in Primary Care Settings, 118 Am J. Med. 11S at 12S (2005)
- One example is sinus headache. "Approximately 4/10 IHS-defined migraineurs indicated that they had received a physician diagnosis of sinus headache." Merle L. Diamond, The Role of Concomitant Headache Types and Non-Headache Co-Morbitities in the Underdiagnosis of Migraine. 58 Neurology S3 at S6 (2002). An estimated 4 million persons with migraine, or 14% of migraine sufferers in the US, were reportedly misdiagnosed with sinus or tension-type headache. Diamond at S4.

MISDIAGNOSIS

- This is only one example of misdiagnosis. Misdiagnosis is more common than other medical errors and accounts for 10-20% of cases. Graber ML, Wachter RM, Cassel CK. Bringing Diagnosis Into the Quality and Safety Equations. *JAMA.* 2012;308(12):1211-1212. doi:10.1001/2012.jama.11913.
- AHT is even worse, because without treatment options and a communicative patient, there is no feedback for the physician about whether the diagnosis is correct. In migraine sufferers, the patient can report the success or failure of treatment options. Without confirmatory tests, communication OR treatment options, the physician can never know whether his or her diagnosis is correct. And the research base is flawed by massive circularity.

UNDERSTANDING DIAGNOSES OF EXCLUSION

- When an objective method to verify a diagnosis is absent
- Excluding known causes with similar clinical presentations
- For example, “fever of unknown origin”
- Sensitivity and accuracy of tests particularly important
- in SBS, diagnosis is not only the cause of medical findings, but also provides the intent and mechanism of injury—all from a lack of other explanations
- "They come into court and they say, 'Oh, you can't kill a baby just by shaking it,' and yet they have a dead baby before them," she says. "Did a flying saucer come in from Mars and strike the baby in the head?“
  - Carole Jenny in USA Today, 4/28/1007

PROCESS OF ELIMINATION

- If a diagnosis of AHT can only be reached when all other diagnoses are excluded, process of exclusion is important
  - What does each test tell you?
  - What is the error rate?
  - Is there a process by which other causes can be excluded?
  - Is there any feature that is indicative of a particular cause?
  - Is there a standardized methodology?

WHAT DOES THE LAW SAY ABOUT DIAGNOSES OF EXCLUSION?

- "Mere possibility does not establish medical causation. Although an adverse case report is not required to "**rule out**" every other possibility to have some reliability, it should do more than just fail to **rule out** the alleged cause. It should provide a source for "ruling in" the alleged cause."
  - Siharath v. Sandoz Pharm. Corp., 131 F. Supp. 2d 1347, 1360 (N.D. Ga. 2001)
- "Coming to a firm conclusion first and then doing research to support it is the antithesis of this [scientific] method."
  - *Claar v. Burlington Northern R.R.,* 29 F.3d 499, 502–03 (9th Cir.1994).
- What is the standard?
  - Reasonable efforts to rule out known alternate causes ***is sufficient to meet the preponderance standard***. The reasonableness of the efforts is usually apparent from the medical records.
    - Stevens v. Sec'y of Dep't of Health & Human Servs., 99-594V, 2001 WL 387418 (Fed. Cl. Mar. 30, 2001) abrogated by Althen v. Sec'y of Dep't of Health & Human Servs., 58 Fed. Cl. 270 (Fed. Cl. 2003)

ANOTHER QUESTION TO ASK

Is this a diagnosis? Or is it something else?

DIFFERENTIAL DIAGNOSIS VS DETERMINATIONS ABOUT ETIOLOGY

- Courts have recognized that "differential diagnosis" does not automatically ensure reliability or admissibility
  - [S]imply claiming that an expert used the "differential diagnosis" method is not some incantation that opens the *Daubert* gate to allow an expert's opinions to be admitted at trial. Indeed, it can easily amount to nothing more than medico-legal sophistry used in an attempt to avoid the Court's reliability analysis.

    Bowers v. Norfolk S. Corp., 537 F. Supp. 2d 1343, 1360 (M.D. Ga. 2007) aff'd, 300 F. App'x 700 (11th Cir. 2008)

- Courts have recognized that "differential diagnosis" and determinations of etiology are not the same
  - It is too easy to gloss over these two definitions and conclude that they amount to a distinction without a difference. Indeed, courts in various circuits have admitted expert testimony supposedly based on the "differential diagnosis" method, when, in reality, the testimony is based on the "differential etiology" method. The distinction is more than semantic; it involves an important difference. *Id.*

THE DIFFERENCE

- The differential diagnosis method has an inherent reliability; the differential etiology method does not. This conclusion does not suggest that the differential etiology approach has no merit. It simply means that courts, when dealing with matters of reliability, should consider opinions based on the differential etiology method with more caution. It also means that courts should not conflate the two definitions.

  Bowers v. Norfolk S. Corp., 537 F. Supp. 2d 1343, 1361 (M.D. Ga. 2007) aff'd, 300 F. App'x 700 (11th Cir. 2008)

DIFFERENTIAL DIAGNOSIS VS DETERMINATIONS ABOUT ETIOLOGY

Dr. Miller's conclusion that Plaintiff's injuries resulted from the September 25, 2002 incident made little difference in his treatment. Regardless of whether Plaintiff sustained his back injuries from lifting weights, crashing his car, or sitting on a vibrating locomotive seat, Dr. Miller would have prescribed the same course of treatment. Plaintiff has offered no evidence to show otherwise. Although Dr. Miller received information about the cause of Plaintiff's injuries in the way he normally receives such information-by taking Plaintiff's history and examining him-he nevertheless developed his causation opinions in the context of the litigation, not independent of the litigation.

Bowers v. Norfolk S. Corp., 537 F. Supp. 2d 1343, 1364 (M.D. Ga. 2007) aff'd, 300 F. App'x 700 (11th Cir. 2008)

WHEN IS A DIFFERENTIAL DIAGNOSIS RELIABLE?

- *Bowers* says:
  - [O]pinions based on a differential diagnosis are admissible only if the trial court determines that the expert reliably applied the differential diagnosis method. *See, e.g., Goebel v. Denver & Rio Grande W. R.R. Co.,* 346 F.3d 987, 999 (10th Cir.2003); *see also Westberry v. Gislaved Gummi AB,* 178 F.3d 257, 263 (4th Cir.1999)
  - [I]n evaluating the reliability of an opinion based on a differential diagnosis, courts look at the substance of the expert's analysis, rather than just the label. *See, e.g., Clausen v. M/V NEW CARISSA,* 339 F.3d 1049, 1058 (9th Cir.2003), *Heller v. Shaw Indus., Inc.,* 167 F.3d 146, 155 (3d Cir.1999), *In re Paoli R.R. Yard PCB Litig.*, 35 F.3d 717, 742 n. 8 (3d Cir.1994)

WHAT IS NOT ACCEPTABLE

- Dr. Johnson has admitted that Viterbo's symptoms could have numerous causes and, without support save Viterbo's oral history, simply picks the cause that is most advantageous to his claim. Indeed, Dr. Johnson's testimony is no more than Viterbo's testimony dressed up and sanctified as the opinion of an expert. Without more than credentials and a subjective opinion, an expert's testimony that 'it is so' is not admissible.
  - *Viterbo v. Dow Chem. Co*., 826 F.2d 420, 424 (5th Cir.1987).

- The Court will recast the question for this case: Is it enough, even if Dr. Wardell exercised the care he usually exercises in practicing orthopedics, for him to reach reliable opinions about the effect of vibration on Plaintiff's back, in light of Plaintiff's pre-existing condition and Dr. Wardell's ignorance, both about the amount of vibration Plaintiff sustained and about the level of vibration that will cause a back injury? The complexity of the question implies the answer: no.
  - Bowers v. Norfolk S. Corp., 537 F. Supp. 2d 1343, 1358-59 (M.D. Ga. 2007) aff'd, 300 F. App'x 700 (11th Cir. 2008)

STATE OF SOUTH DAKOTA)		IN CIRCUIT COURT
) SS		
COUNTY OF MINNEHAHA)		SECOND JUDICIAL CIRCUIT

* *

STATE OF SOUTH DAKOTA,	*	
Plaintiff,	*	CR. 12-8143
v.	*	
MANAGABE ALLY,	*	MOTION IN LIMINE RE OPINION TESTIMONY (AMENDED)
Defendant.	*	

* *

Managabe Ally, by his attorneys, Traci Smith and Kenny Jacobs of the Minnehaha County Public Defender's Office, respectfully moves the Court for an Order prohibiting the prosecutor from eliciting opinion testimony as to the cause of death or timing of the injuries to the decedent unless that witness has been qualified as a specialist in the field of pathology or forensic pathology, on the grounds that to allow such testimony would violate the standard for admission of expert testimony as set forth in Daubert v. Merrell Dow Pharmaceuticals, 509 U.S. 579 (1993) and State v. Hofer, 512 N.W. 2d 482, 484 (S.D. 1994).

Further, Defendant respectfully moves the Court for an Order prohibiting the prosecutor from eliciting opinion testimony that would invade the province of the jury, or attempting to offer any criminal analysis of the case through an

expert witness under the guise of a medical diagnosis.

Specifically, the Defendant would respectfully request the Court issue an order precluding the State from offering any witness testimony that the child suffered from "abusive head trauma." This line of testimony is subject to a legal analysis

"This line of testimony is subject to a legal analysis based on witness statements, and cannot be made exclusively on a physical diagnosis. None of the state's witnesses are qualified to offer any expert opinion that the child suffered from "Abusive Head Trauma. Their medical conclusions should be limited to their medical diagnosis."

scientific and kinetic analysis, the defense is not aware of any medical clinician who can offer anything more than a medical diagnosis, which is that the child suffered from blunt force trauma to the head, and/or a traumatic brain injury.

THEREFORE, Defendant respectfully requests an Order prohibiting the following:

(1) That the State be prohibited from eliciting opinion testimony, other than from Dr. Snell, as to cause of death or timing of injuries, and that unless a showing is made, outside the presence of the jury that would allow the Court to exercise its gatekeeping function as set forth in Kuper v. Lincoln-Union Electric, 557 N.W. 2d 748, 760 (S.D. 1996).

(2) That the State be prohibited from eliciting any expert opinion testimony from any expert that the child suffered from

"abusive head trauma," in the absence of a showing that the medical opinion constitutes a specific "medical diagnosis" rather than a category of abuse that includes a criminal analysis, and that the witness is qualified to offer such an opinion.

Allowing the jury to hear unfounded opinion testimony would violate the Due Process and Confrontation Clauses of both the federal and state constitutions. In order to avoid the inevitable prejudice from having the jury hear improper opinion testimony, the defendant respectfuly requests the Court conduct a hearing outside of the presence of the jury before any such expert testimony is proffered by the state.

Respectfully submitted this _4th__ day of February, 2014.

_____
Traci Smith
Minnehaha County Public Defender

_____
Kenny Jacobs
Deputy Public Defender
Attorneys for Defendant

Decision

Abusive head trauma is a legitimate diagnosis and I think that Dr. Snell is competent to make an opinion or render a opinion about whether it exists in this case. But I still worry because abusive head trauma encompasses not only the cause but also the manner of death. I worry his testimony will not say merely that the injuries aren't consistent with non-accidental injuries, but that in fact he knows that abuse occurred in this case.

I'll note as a side event this diagnosis of abusive head trauma applies at this point only in cases involving

"Even though the term 'abusive head trauma' can not be used or should not be used, Dr. Snell and any qualified physician can testify that the injuries in this case were consistent with non-accidental factors or influences."

Dr. Snell and any qualified physician can testify that the injuries in this case were consistent with non-accidental factors or influences.

He can also testify that the, as he says, constellation

"He should not otherwise diagnose anything or restrict his opinions to opinions formed within a reasonable degree of medical certainty."

opinions to opinions formed within a reasonable degree of medical certainty. All right.

MR. HANSON: Can you repeat that last part, Judge?

THE COURT: I think his testimony should be phrased in terms of opinions held to a reasonable degree of medical certainty.

"With the exception of the use of the actual term 'abusive head trauma' and the term 'diagnosis,' medical testimony is otherwise nonrestrictive."

that issue. With the exception of the use of the actual term 'abusive head trauma' and the term 'diagnosis,' medical testimony is otherwise nonrestrictive. I don't know there would be error to allow the use of the term. This issue has obviously not been addressed by our Supreme Court, but I'm

exercising my discretion here to pursue a more cautious course. It still allows testimony that I think will be helpful or could be help depending on how the jury assesses it. Other questions before it? That's my ruling.

SPECIFIC CHALLENGES

Daubert targets admissibility of evidence specifically for "the task at hand"

SPECIFIC CHALLENGES—EXCLUDE PROVEN FALSE CLAIMS

- Certain symptoms are pathognomonic of abuse (cannot be caused by anything else)
- Short falls can't kill/aren't dangerous
- The force required to cause the signs commonly associated with abuse or shaking are massive, equivalent to a multistory fall or a car accident
- Lucid intervals can't happen
- Chronic subdural collections cannot rebleed
- Fractures mean abuse
- The likelihood that a particular case is abuse, given the signs present, is X%
- Qualifications of the particular expert to testify about matters beyond her expertise

CAUSE AND MANNER OF DEATH: THE MYTH OF PATHOGNOMONY

- Most doctors now recognize that the classic "triad" is NOT exclusively diagnostic of SBS, and that no one of the signs or symptoms is pathognomonic.

  Q: Is there any finding, two, or even three findings that would cause you or, in your opinion, any responsible physician to diagnose shaken impact syndrome? Any one, two or three findings?

  A :Not exclusively, no.

  …

  A: That's well recognized, the concept that no single finding is in and of itself pathognomonic, and it's unclear to me why the defense would spend so much time elaborating on that point when I consider it to be a given. No responsible, knowledgeable physician would arrive at that diagnosis on the basis of a single or two findings, but rather the collection of those."

  -- Testimony of Dr. William Perloff, State's pediatric expert, State v. Edmunds, 2008 WI App 33, 308 Wis. 2d 374, 746 N.W.2d 590

CAUSE AND MANNER OF DEATH: DEBUNKING THE MYTH OF PATHOGNOMONY

- Retinal hemorrhages, perimacular retinal folds, and retinoschesis are universally no longer deemed pathognomonic of SBS
- *E.g.*, P.E. Lantz, *Perimacular Retinal Folds from Childhood Head Trauma*, 328 Brit. Med. J. 754 (2004); Gregg T. Leuder et al., *Perimacular Retinal Folds Simulating Nonaccidental Injury in an Infant*, 124 Archives Ophthalmology 1782 (2006).
- State's ophthalmologist Dr. Levin in *State v. Edmunds* acknowledged that new research has shown that "there may be no pathognomonic eye signs in Shaken Baby Syndrome."
- The "triad" has been described as a "myth" by leading proponents of the SBS hypothesis. Carole Jenny, Presentation on The Mechanics: Distinguishing AHT/SBS from Accidents and Other Medical Conditions, slide 33, 2011 New York City Abusive Head Trauma/Shaken Baby Syndrome Training Conference (Sept. 23, 2011), (powerpoint available at http://www.queensda.org/SBS_Conference/SBC2011.html).

CAUSE AND MANNER OF DEATH: DEBUNKING THE MYTH OF PATHOGNOMONY

Q: And you understand that in this case Dr. Mills testified … that that kind of eye injury is not known to occur in infants except in shaking type injury?

A: I do understand that, yes.

Q: And that's no longer true?

A: Well, it's correct, it's no longer true.

Dr. William Perloff, State's expert in State v. Audrey Edmunds

SHORT FALLS CAN'T KILL

- Significant literature, including case reports of witnessed and videotaped falls, detail the dangerousness of falls of less than four feet
  - Plunkett, J. *Fatal Pediatric Head Injuries Caused By Short-Distance Falls*, 22 AM. J. FORENSIC MED. PATH. 1 (2001)
  - Patrick E. Lantz & Daniel E. Couture, *Fatal Acute Intracranial Injury, Subdural Hematoma, and Retinal Hemorrhages Caused by Stairway Fall*, 56 J. FORENSIC SCI. 1648, 1651–52 (2011)Hall
  - Queens DA conference video
- Also important to know the mechanism of injury. Shaking with or without impact is often mentioned, but findings have also been present with crush injuries (objects, older children or adults falling on children, for example).

THE FORCE REQUIRED IS EQUIVALENT TO A MULTISTORY FALL OR A CAR ACCIDENT

- A three-foot fall produces forces ten times greater than shaking
  - A.K. Ommaya et al., *Biomechanics and Neuropathology of Adult and Paediatric Head Injury,* 16 BR. J. NEUROSURGERY 220 (2002).
- Shaking/impact/accelleration-deceleration not necessary either
  - Crush injuries also cause these signs
- Signs often associated with abuse are found in many other situations
  - Including accidents, prenatal conditions, congenital malformations, disease, infection, birth injury, toxins, infections, and more
    - Kent P. Hymel, et al., Intracranial Hemorrhage & Rebleeding in Suspected Victims of Abusive Head Trauma: Addressing the Forensic Controversies, 7 CHILD MALTREATMENT 329 (2002)
- No consensus as to the mechanism of injury

IDENTITY: LUCID INTERVALS

- Lucid Intervals are real; cannot time these brain injuries. Lucid Intervals documented of several hours to 72 hours or more; child may have flu-like symptoms in meantime. M.G.F. Gilliland, *Interval Duration Between Injury and Severe Symptoms in Nonaccidental Head Trauma in Infants and Young Children*, 43 J. FORENSIC SCI. 723 (1998).
- "The lucid interval is a distinct discomforting but real possibility." Dr. Robert Huntington, State's pathologist testifying that research caused him to change his understanding in this way, in *State v. Audrey Edmunds.*

BRAIN INJURIES AND CONDITIONS CAN EVOLVE OVER TIME

...way, or develop... fractured, the brain can bang
...e head may loc... inside the skull.
...o likely to be i...
...on. This is called a traumatic brain injury. Concussion is a mi...

- Friends or family may need to wa... leased from the emergency
- Parents or caregivers of children ... ead injury, and know when the child can go back to being active

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REBLEEDING OF CHRONIC SUBDURAL HEMATOMA

- Or rebleeding is asymptomatic and/or not serious
  - No real debate about whether a chronic subdural hematoma can rebleed
  - Debate does exist around the severity of symptoms from a rebleed, onset of rebleeding symptoms (gradual vs. sudden) and causes of rebleeds
- Marguerite M Caré, *Neuroradiology, in* ABUSIVE HEAD TRAUMA IN INFANTS AND CHILDREN, A MEDICAL, LEGAL, AND FORENSIC REFERENCE 73, 81 (G.W. Med. Publ'g 2006) (septations or membranes that develop within chronic hematomas may predispose infants to repeated episodes of bleeding within these collections; such rebleeding can occur with little or no trauma).

FRACTURES

- Meta analyses are in conflict regarding whether skull fractures are significantly correlated with abuse (Maguire, 2011; Piteau, 2012)
- May not exist at all (misdiagnosed)
- Fractures may be the result of rickets, vitamin D deficiency, brittle bone disease or other diseases (some of which also cause subdural bleeding and retinal hemorrhages)
- Fractures can be caused by resuscitation efforts (such as CPR)

THE LIKELIHOOD OF ABUSE, GIVEN ANY PARTICULAR SIGN OR CONSTELLATION OF SIGNS IS X% OR CERTAIN

- Even assuming a valid statistical correlation, that correlation does not prove abuse in any individual case
- Some alternatives to abuse are rare
- Statistics embody averages, not individuals
- The chance that any given child will die from leukemia or in a motor vehicle accident is also very small, but some do.
- Nationwide, even small risks may translate into significant numbers.
- Physicians should not be permitted to testify that, because the chances of an alternative explanation are low, then to a reasonable degree of medical certainty this is abuse.
  - E.g., DNA analysts work with huge statistical odds, but do not claim identity based on probabilities alone

IN RE YOHAN K. & MARIKA K. V. K.S. & THERESA G.,

2013 IL APP (1ST) 123472, 2013 WL 3088471, --- N.E.2D --- (JUNE 19, 2013)

- "Constellation" theory: Infant suffered seizures and distress, found to have:
  - Subdural hematoma
  - Retinal hemorrhages
  - Possible leg fracture
- Defense experts argued:
  - Child had benign external hydrocephalus (BEH), which, especially in conjunction with difficult delivery (birth trauma) explained both the subdural hematoma and retinal hemorrhages
  - Child suffered from rickets, not a leg fracture

¶113 "[R]elying on a 'constellation' theory when there is no preponderance of evidence proving abusive causation as to each separate injury is akin to relieving the State of its burden of proof."

¶146 "Instead of evaluating and weighing the evidence and expert testimony as to each alleged injury, the trial court allowed the proponents to elude their burden of proof by claiming the 'constellation' of Yohan's injuries created a preponderance of evidence that he was abused. This 'constellation' of injuries theory allowed the trial court to to conclude that Yohan had been abused even though not one of the individual injuries within the constellation had been proven to be by abuse and where highly experienced and credentialed, nationally recognized doctors provided well-reasoned medical explanations, albeit rare ones, to explain each of his injuries."

EXPERTS MUST…

- Show the work
- Explain why

LAWYERS MUST…

- Understand the issues
- Understand the history
- Understand the experts
- Make meaningful challenges to faulty evidence