

the SHAKEN BABY DEBATE

Can medical science answer the question: Does this syndrome actually exist? BY MARK ANDERSON

In 1997, in the child abuse case involving British nanny Louise Woodward, the words *shaken baby syndrome* leapt from medical textbooks into international prominence. Woodward was accused of shaking infant Matthew Eappen, fatally injuring him. In the 11 years since Woodward was convicted of second-degree murder and then released on a lesser sentence for involuntary manslaughter, a debate has simmered in the child abuse world, and it is now rising to a boil.

On one side of the courtroom, representing mainstream medical opinion, are those who believe shaken baby syndrome (SBS) is a valid diagnosis. They say that decades of clinical experience and criminal confessions—in which a parent has admitted to shaking a child with symptoms of SBS—bolster their case to the point of near-certainty. On the other side, a growing number of skeptics are now claiming that the evidence for the syndrome rests on dubious medical ground with questionable biophysical models supporting it.

Each side, too, is battling for the moral high ground. Those who give credence to SBS say they are using modern diagnostic technology (magnetic resonance imaging in particular) to catch child abusers who might once have gone unpunished. The skeptics, on



The 1997 Louise Woodward case catapulted shaken baby syndrome into the public awareness.

the other hand, say that innocent families around the world have been left in ruins by prosecutors and child protective agencies who have wrongfully accused parents and child-care workers of child abuse.

Shaken baby syndrome excites such controversy partly because it invokes the specter of horrible cruelty to an innocent, often in the immediate wake of the child's death. Yet in the classic SBS case, signs of child abuse that one might expect—suspicious bruises, burns, cuts, or other injuries—are missing. According to the 2001 textbook *The Shaken Baby Syndrome: A Multidisciplinary Approach*, "It is this absence of external signs of abuse which makes the early diagnosis of SBS so difficult."

It is important to clarify that DISCOVER is weighing the science behind the textbook definition of shaken baby syndrome, not delving into casework involving children who *do* display "external signs of abuse." This article is about the evidence for and against a specific syndrome, not the vital importance of child abuse prevention.

The Centers for Disease Control and Prevention reports that as of 2005 there were between 1,200 and 1,600 confirmed SBS cases per year. While no official statistics are available on SBS prosecutions, Toni Blake of the American legal consulting firm 2nd Chair Services says that at least 2,000 to 3,000 lawyers and defendants have contacted her over the past decade to request assistance on SBS trials and appeals around the country. In 2007, she says, "we saw one of these cases overturned about once a month."

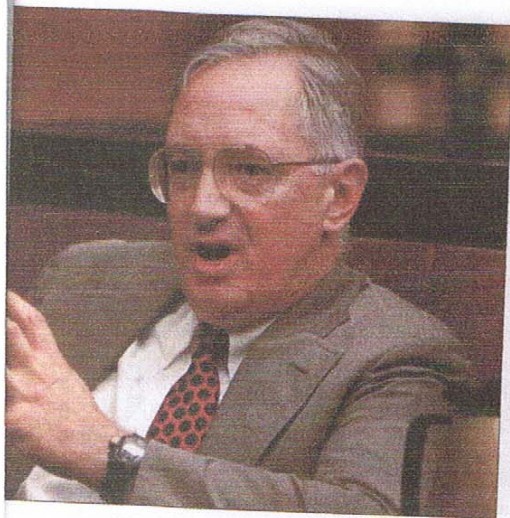
As with baby Matthew Eappen in the Woodward case, SBS typically first presents itself when an infant is brought to a hospital or doctor's office suffering a life-threatening condition such as con-

vulsions, an inability to eat or to be awakened, or difficulty breathing. (SBS can also present with seemingly less serious symptoms, such as changes in feeding behavior.) The 2001 SBS textbook cites two studies (from the journals *Annals of Emergency Medicine* and *Developmental Medicine and Child Neurology*) showing that between 15 percent and 33 percent of SBS-symptomatic infants died, while one-third to one-half suffered permanent injury such as paralysis or mental retardation. Although many infants are hospitalized with life-threatening conditions, it is only on closer examination—CT or MRI scans of the infant's head and ophthalmological examination of the infant's eyes—that a diagnosis of shaken baby syndrome comes into play.

"The thing we pick up on most easily is the bleeding," says Randell Alexander, chief of the division of child protection and forensic pediatrics at the University of Florida at Jacksonville College of Medicine. "You see intracranial bleeding, between the brain and the skull...and then the other thing you see in about 90 percent of the cases is retinal hemorrhages."

Once a doctor says that an infant must have been shaken, it triggers a hunt for the shaker. In one diagnostic step, the legal system is brought to bear on the baby's family and anyone else near the infant at the time of the supposed shaking.

The symptomatic triad of bleeding between the brain and skull (known as subdural or subarachnoid hematomas), bleeding behind the retinas, and brain swelling is both the core of an SBS diagnosis and the point of departure for the syndrome's skeptics. The medical proof that shaking alone can cause these internal head injuries is questionable, the skeptics say, when many other things, from infections to malnutrition to falls onto a hard surface,



Neurosurgeon Ronald Uscinski (left) testified for the defense in the Woodward trial, and pediatrician Eli Newberger (above) testified for the prosecution. Both experts continue to consult and testify in shaken baby syndrome cases.

are known to be causes of similar symptoms in infants.

One such skeptic testified for the prosecution in the Woodward case but later changed his stance. Pediatric neuroradiologist Patrick Barnes of Stanford University said in an e-mail interview, "It is known from case records that SBS is misdiagnosed/overdiagnosed. It is not only a problem in medicine but a problem in the justice system."

Nevertheless, "we're not teaching Pat Barnes's point of view in medical schools," Alexander says. "What [SBS skeptics] say is generally not believed by a vast majority of doctors—and it's not believed by medical organizations." Alexander points to a 2001 position paper from the American Academy of Pediatrics stating that SBS "injuries are the result of violent trauma" and not from "short falls, seizures, or as a consequence of vaccination."

Ronald Uscinski, a clinical assistant professor of neurosurgery at Georgetown Hospital and George Washington University, first entered the SBS arena when a colleague asked him to testify for the defense in the Louise Woodward case. During the quiet summer before the trial, Uscinski read every paper and monograph he could find on the syndrome.

Uscinski traced medical citations in SBS research back to a 1968 study involving rhesus monkeys subjected to collisions and violent accelerations. Uscinski already knew the study—it had been conducted by his mentor, Ayub Ommaya, the very same colleague who had brought him into the Woodward case. Uscinski says the study yields no firm conclusions about the consequences of shaking monkeys or, for that matter, babies.

"When I put all of this together, I said, my God, this is a sham," Uscinski says. "Somebody made a mistake right at the very beginning, and look at what's come out of it."

In 2007 Uscinski took on an SBS case in Washington, D.C., testifying on behalf of two parents, Greg and Julianna Caplan, who were accused of SBS abuse. The Caplans were ultimately exonerated, yet they remained on the city rolls as potential child abusers until earlier this year. Uscinski wrote in an editorial in the *Washington Post* in March, "This is not to say that child abuse does not exist. I have witnessed such cases and have been deeply and painfully moved by the plight of innocents who have been injured or even killed.... And yet I am no less moved by the plight of the wrongfully accused (and even convicted), their families and their loved ones. This is particularly so when such accu-

sations are based on impure science, a flawed legal foundation, and completely inadequate or inappropriate public policy."

Unlike Barnes, other experts who testified for the prosecution in the Woodward trial continue to support the validity of SBS. One of these is Eli Newberger, an assistant professor of pediatrics at Harvard Medical School, who was among the physicians at Children's Hospital in Boston who treated Matthew Eappen in 1997. Newberger founded the hospital's child protection unit in 1970 and has testified in more than 600 child abuse cases since then, dozens of which, he says, were SBS cases. Although he remains affiliated with the child protection unit, he retired from hospital work in 1999. He continues to teach, write, and provide expert testimony in child abuse cases.

"By the time I was asked to testify in the Louise Woodward case...there was a great deal of clinical understanding about [SBS-related] trauma," Newberger says. "The infant's head is disproportionately larger in relation to the rest of its body than our heads are. A child can't stop the to-and-fro excursions of the head with its neck. The brain bobbles about. The infant's brain is softer than the adult's."

SBS skeptics, he says, muddy the waters "with so-called theoretical or historical perspectives on abuse."

Money, Newberger suspects, has brought otherwise good people over to what he and his colleagues call the "dark side," doubting SBS. "I have never ceased to be amazed about what highly regarded, well published, scientifically informed doctors will do when they're offered large amounts of money," he says.

For the record, Newberger charges \$450 per hour to consult and testify in SBS and other child abuse cases. The University of Florida's Alexander charges \$300 per hour as an expert consultant but notes that all the money goes to the university. Uscinski has, by his own estimate, been in the courtroom as an expert witness in SBS trials nearly 100 times since 1997. His SBS work constitutes 15 percent of his income, he says. His rates are up to \$750 per hour as a consultant and up to \$10,000 per day on the witness stand for out-of-town cases. "If it's a public defender's case, you get paid half that or one-third of that, or even less," Uscinski says. "Not everybody can afford that, and I charge according to what people can pay."

Despite his confidence in the existence of SBS, Newberger adds

that he has consulted for the defense on two or three SBS cases in which, he says, a "juggernaut" develops. "The department of social services sends out a social worker," he says, describing the usual procedure after a doctor reports a possible SBS case to the authorities. "If a parent does not know exactly what's happening, very frequently the first conclusion is that they're trying to hide something. And sometimes parents are racking their brains, coming up with one or two possibilities. Then it looks like they're changing their stories. That can be used to damn them."

The Haynes family of Rantoul, Illinois were caught in just such a juggernaut. In October 2005 the father, Neal, was charged in a civil case with shaking his then 3-month-old son, Jake (not his real name). Although not accused of shaking the baby, the mother, Christy, was also charged with abuse and neglect (for permitting the alleged shaking). Jake had been hospitalized three times over two months for fever, infection, difficulty breathing, and symptoms of seizures. He survived his third hospitalization and returned home healthy, with his parents. However, when emergency room doctors discovered retinal and subdural hemorrhages, they concluded that Jake's medical problems must have stemmed from his being violently shaken.

"The traditional school of thought says whoever had that child [last] is the one who gets the ticket to the ball," says Kristen Fischer, Neal's attorney.

Court-appointed advocates for Jake assembled a time line that made Neal the likely alleged abuser. State child protective services then seized Jake and helped launch a civil trial to terminate both parents' rights to raise Jake or potentially ever to see him again. (Both the Champaign County Court Appointed Special Advocate executive director, Genevieve Lambert, and her attorney on the Haynes case, John DeLaMar, declined an interview for this article.)

Lawyers for the family ultimately called in Uscinski, among other experts. As the chief pediatric neurosurgeon at Georgetown University Hospital from 1983 to 1993, Uscinski operated on the brains of, he estimates, four babies who were said to be victims of SBS, and he saw three or four others. "I noticed something in each instance," he says. "I noticed that there was always a better explanation in that particular case than shaking."

In the Haynes case, Uscinski rendered a professional opinion that concluded, "There is no question but that [Jake] Haynes had a chronic subdural hematoma." As a chronic (rather than acute) case, by definition the "hematoma had its genesis weeks or months earlier." Uscinski suggested that baby Jake's breech birth could have itself produced enough force on the brain to cause subdural bleeding. This kind of wound sometimes doesn't heal and can go undetected for weeks or months, he says.

F. Edward Yazbak, a Massachusetts-based pediatrician, examined Jake's medical records and wrote a 51-page report for the defense that pointed to other possible causes of baby Jake's hemorrhages, including adverse reaction to his vaccinations, a vitamin C and K deficiency, and/or a toxic level of histamine in his blood.

In fact, because doctors had already concluded the cause of Jake's internal trauma was shaking, and therefore that the child was

safe from further injury, they made a crucial mistake in his follow-up care. Leaving aside the judicial impact of an incorrect SBS diagnosis on caregivers, this may be the most worrying aspect of such a mistake: the impact on the child's health.

In Jake's case, by early December 2005 his head had swollen to the point that he was above the 97th percentile for head circumference. In mid-December, Fischer recalls, the doctors "decided that the hematoma hadn't grown, but the brain was atrophying from the terrible abuse." They sent the child home.

By late December, following the ongoing case, the defense's Yazbak learned about Jake's enlarging head size—brought about, he concluded, by a subdural hematoma that was in fact bleeding again. "[Yazbak] said this child has got to see a specialist immediately," Fischer says. "If it's unchecked, he'll die." The lawyers called a meeting with state child protective services, petitioning for a second opinion on Jake's condition. Ultimately he was sent to a hospital in St. Louis, where doctors operated on the hematoma and put in a shunt.

The doctors "had gotten into the routine that it was shaken baby syndrome," Fischer says. "And they could not get out of that routine."

Neal and Christy Haynes spent \$200,000 on their defense—retaining Yazbak and Uscinski as well as experts in pediatric ophthalmology and neuroradiology to provide expert testimony—and endured 14 months of trials and hearings. Then the charges against



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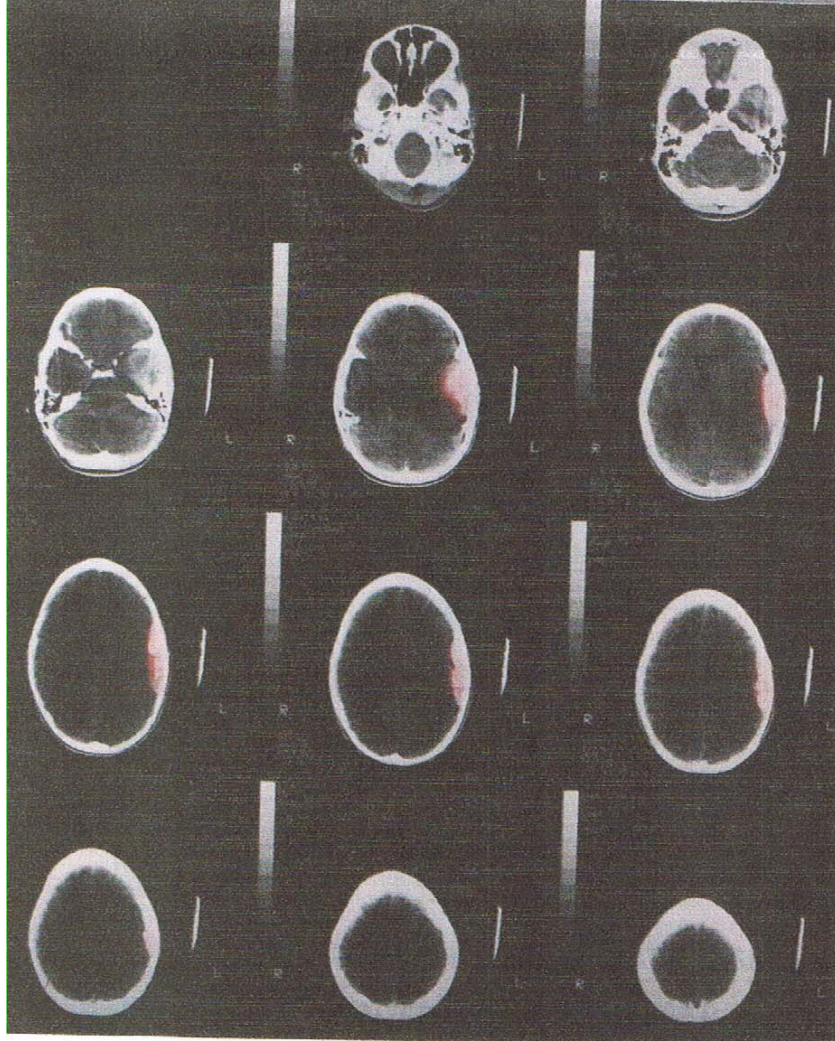
them were dropped. "The court further finds that...[Jake] Haynes is neither an abused minor nor a neglected minor," Judge Chase Leonhard ruled. "Let this boy become a man in the home of loving parents and family. Please make it so."

The fact that the Hayneses were able to tap leading medical experts who were willing to reduce their rates to devote scores of hours to their case is just the first of a number of fortuitous turns their story took. According to jury consultant Blake, theirs is more the exception than the rule.

SBS cases today, she says, practically require top-flight, credentialed medical SBS specialists on the witness stand who can produce a credible alternative scenario—more than just the reasonable doubt that courts theoretically require. Otherwise, she says, what remains is typically the testimony of doctors who believe that, absent a serious car accident or a two-story fall, only shaking can produce a subdural hematoma. And shaking means someone is guilty of child abuse.

"For the jury...the defense needs to prove what happened to this baby," she says. "Unless you've got the money to hire top experts, you're probably going to prison.... It's guilty until proved innocent."

Cheri Landers, chief of the division of pediatric critical care at Kentucky Children's Hospital in Lexington, says that if an infant were brought into the emergency room suffering seizures and was discovered to have a subdural hematoma and retinal hemorrhaging,



A CT scan of a 10-year-old with head trauma. Bleeding inside the skull (in red) is similar to that cited in shaken baby syndrome.

she would want to ask the family about the background before rendering a diagnosis. "We would need to find out...was there any known trauma?" she says. According to Landers, a severe car accident, for instance, could explain subdural and retinal hemorrhages and consequent seizures. She points to a 1993 article in the journal *Neurosurgery* that examined the retinas of 140 children involved

in car accidents. Two had hemorrhages, and both were in high-velocity side-impact crashes.

"When we discover no reason for the trauma," she adds, "that is the point where we come to the conclusion that there is no reason for this other than shaking." Landers cites a 2000 study in the journal *Pediatrics* that evaluated 19 Florida infants with subdural hemorrhages who were referred to the state's child protective services in 1997. The authors selected nine of these cases and followed them up, reporting that every child was the victim of "inflicted injury, inappropriate infant handling, and/or high-risk social settings" such as a family with a history of domestic violence.

Neuropathologist Jan Leestma of Children's Memorial Hospital in Chicago, who testified for the defense in the Woodward case, has come to a different conclusion. Leestma reviewed 324 apparent or alleged child abuse cases from 1969 to 2001 and published his results in a 2005 issue of the *American Journal of Forensic Medicine and Pathology*. Fifty-four of these cases involved shaking a baby. He found only 20 percent (11 cases) yielded no

evidence of any impact to the baby's skull—such as a fall from a changing table.

"When you have an impact, that trumps everything else," Leestma says. Shaking means "10 g's, versus 200 g's" for an impact.

Impacts and falls are a world apart from shaking. Impacts could be anything from a simple but tragic accident to negligence to child abuse. But shaking means one thing: attempted infanticide.

What happens to infants when they are shaken or suffer an impact? Kirk Thibault is a biomechanical engineer with the Essington, Pennsylvania, firm Biomechanics, Inc. A research scientist who has studied the physical properties and stress loads of infant and adult brains, Thibault has been hired as an expert in, as he recalls, "seven or eight" SBS cases since 1998. (His father, Lawrence, is a research pioneer in the field and testified for the defense in the Woodward case.) Thibault the younger charges \$300 per hour for expert consultation and testimony.

"I do not think of myself as an advocate for anyone, but I do advocate for the science," he says.

Thibault points to a 2003 study in the *Journal of Neurosurgery* that used lifelike infant dolls with crash test dummy accelerometers inside their heads. A team of four bioengineers and neurologists from the Children's Hospital of Philadelphia then simulated vigorous infant shakings—as might happen in an SBS case—as well as shakes that ended in an impact and drops from one-, three-, and five-foot heights.

The group concluded that shaking their model infants produced results "statistically similar" to one-foot falls onto concrete or a carpet pad or higher falls onto a foam mattress. These results were well below reported thresholds for causing the kind of intracranial bleeding observed in SBS babies, suggesting that shaking wasn't enough to induce SBS.

"It's drilled into people's heads that shaking will kill these kids," Kirk Thibault says. "I don't know that shaking *can't* kill a child. I assume you can probably shake a child to death. I have no idea.... What I specifically look at is whether shaking can cause loads [on the brain] that...can cause subdural hematomas. The flip side of that is people abuse kids," Thibault says. But he adds, "You can't simply categorically say this is all nonaccidental. I say one case at a time."

Neurosurgeon Jean-Sébastien Raul, an assistant professor at the Institute of Legal Medicine at the University of Strasbourg in France, says he has a computer model of infant shaking that could help clarify the controversy. In a 2006 paper published in the *International Journal of Legal Medicine*, Raul concluded that, biophysically, shaking alone can produce the kinds of subdural hematomas that are seen in SBS cases.

Raul's group drew from published properties of human baby brains and skulls and pig brains and skulls—markedly similar, he says, in biophysical properties. The group ran computer simulations that examined the behavior of veins that bridge the brain and the covering tissue surrounding the brain. Rupture of "bridging veins," he says, is a known and well-understood cause of subdural hematomas.

Raul says he knows the 2003 *Journal of Neurosurgery* paper well

but argues that the authors looked only at acceleration inside the skull. "We are looking at the relative motion between the brain and skull," he says. It is this additional factor, he thinks, that produces the bleeding inside the shaken infant's skull.

Thibault points out that Raul's group conducted computerized experiments involving unknown situations without first confirming that their model could reproduce known experimental results. For instance, in 1984 Nobuhiko Aoki and colleagues at Nagoya University in Japan studied medical case records of infants who had fallen and hit their heads. Some had died, some had survived. All, Aoki said, had subdural hematomas and retinal hemorrhages and thus could potentially be seen as SBS cases. "You first have to [run your computer model] outside of the vacuum of your model," Thibault says. "At least demonstrate that you can draw a line and say this is a threshold...and now I'm going to re-create every single one of Aoki's falls."

Leestma says, more simply, "These programs are like Pixar cartoons. You can do wonderful things, but is it real or a creation?"

Raul says his group has begun to verify its computer model with experimental data, but this work hasn't been published yet.

The science behind SBS moves slowly forward. Meanwhile, Toni Blake's office at 2nd Chair Services gets several phone calls or e-mails a day, on average, from a new set of parents or siblings or child-care workers accused of causing SBS (and wrongly so, they claim). SBS cases have been prosecuted around the world for the past 30 years. An unknown number of families have been affected. Certainly some SBS cases bring an abusing parent to justice and save children in the process. But if the skeptic argument is correct, then other SBS cases involve putting an innocent family member behind bars.



Blake tracks SBS cases for both SBSDefense.com and 2nd Chair Services. She has followed 169 shaken baby cases in which medical records were available and which occurred between 1997 and 2007. Forty-one percent of the babies survived, she reports. (Her study is unpublished.) Thirty-one cases she followed resulted in a confession involving "some form of shaking or shaking with impact," she says. But such confessions, often used as the silver bullet to defeat SBS skeptics, became less conclusive upon further scrutiny. Thirteen of the confessions were admissions that the "abuser" had merely shaken the infant as a way to attempt to revive it. Another 15 admitted to "abuse" in a more general sense, which could have involved striking the child or hitting it against a wall or floor. Just three people in Blake's data set admitted to abuse by shaking—and shaking only. And at least one of those three infants, she says, already had a subdural hematoma, before the shaking incident.

Scott Coffee, a public defender in Clark County, Nevada, says, "Shaken baby proponents say you have people confess to shaking babies, and that proves that shaking babies had to cause the injuries. The problem is, when you've been around this as long as I have, confessions don't mean nearly as much as you'd think they do."

Coffee, a public defender for the past 13 years, says child abuse cases often raise the stakes so high that a bias toward false confessions may be concealed within the data. When DISCOVER con-

tacted him last summer, Coffee was working on an SBS case in which the accused abuser had been in jail for six years awaiting trial and potentially faced a first-degree murder charge. (Infanticide by abuse qualifies as first-degree murder in Nevada, Coffee says.)

The sentence Coffee's client would be given, if he went to trial and lost, was either 20 to 50 years, 20 years to life, or life without parole. Agreeing to confess to shaking the child, Coffee says, would considerably reduce any sentence.

In July 2001 Coffee's client was taking care of his 11-month-old son, Mike (not his real name), whom pediatrician Yazbak later described as suffering from "multiple medical problems" including malnutrition and possible blood coagulation deficiency. On July 10 Mike stopped breathing. According to Coffee, his client attempted CPR and called 911 before taking the child to a Las Vegas emergency room. Mike ultimately died on life support. Bruises were found on his abdomen and back, and paramedics had found a cut under his eyelid. Postmortem examinations revealed a subdural hematoma and retinal hemorrhaging.

With an existing criminal record that he feared would bias the trial, Coffee's client opted to plead to shaking baby Mike. "I'm sure at some point during the failed attempt to resuscitate Mike, he was shaken, and as the local doctors were willing to testify that shaking caused the death, there wasn't a problem getting the plea down," Coffee said in an e-mail. In October 2007 Coffee's client was sentenced to 10 years to life for second-degree murder.

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Around the same time, the *Wisconsin Law Review* published a paper entitled "Shaken Baby Syndrome: Medical Uncertainty Casts Doubt on Confessions." The paper's author, Molly Gena, now a Milwaukee-based lawyer for Legal Action of Wisconsin, says her review of recent SBS decisions indicates the tide is beginning to turn.

"It started with the British cases," Gena says, referring to a review ordered by the British attorney general, Lord Goldsmith, of 297 alleged child abuse cases, some of which were SBS convictions based only on the triad of internal symptoms: subdural hematoma, retinal hemorrhage, and brain swelling. In one case, *R v. Harris*, the court concluded that "the mere presence of the triad on its own cannot automatically or necessarily lead to a diagnosis of [SBS]."

An SBS case in which Gena assisted as a law student (*State of Wisconsin v. Audrey Edmunds*) followed similar lines, with the court ruling in January 2008 that "there has been a shift in mainstream medical opinion.... There are now competing medical opinions as to how [alleged shaken baby] Natalie's injuries arose."

Opposed though he is to the SBS skepticism that informed these recent court findings, Newberger of Harvard Medical School says he doesn't disagree with them.

"Yes, there are competing explanations," Newberger says. "The traditional explanation [for subdural hematomas] was that there were bridging veins that are sheared and...explode blood into the space. But does anybody really know that? That's the issue." ■