Shaken Or Not: That Is The Question

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On Dec. 3, *The Royal Gazette* newspaper in Bermuda published an article by Elizabeth Roberts entitled "Expert witness undisciplined." Apparently the country's Court of Appeal "quashed*"* a young father's earlier murder conviction and mandatory life sentence for killing his six-month-old daughter and criticized the way a pediatrician testified at the original trial, describing his performance as "unduly theatrical and undisciplined." The court then convicted the young father of manslaughter and sentenced him to 10 years in prison. According to the report, the pediatrician apparently shook a plastic doll violently *"before smacking its head down on the witness box, and is said to have then turned the doll over and done the same to the other side of its head."*

The higher court decreed that "Anyone who used the degree of violence … against a six-month-old child could only have intended to cause at least really serious harm. It no doubt formed the basis of the jury's decision to convict of murder rather than manslaughter." The judges added that the expert witness *"was wrong to act as he did. It was his duty to give evidence in the least emotive way possible, particularly in a case such as this where feelings were likely to run high. His performance was, to say the least, unduly theatrical and undisciplined."* They addedthat the "evidence was out of line with evidence received by the Court of Appeal in England, which has accepted that a much lesser degree of force than that illustrated by him is all that is required to produce a non-accidental head injury to a child."

The Bermuda case will not be discussed in full as its details are not available, but general aspects of shaken baby syndrome (SBS) will be explored.

Dolls in Court

Dolls have been used extensively by pediatricians and psychologists to question children and demonstrate how injuries occur. Their use in sexual abuse cases is well known; so is the fact that the technique has been both misused and abused.

Many will recall court scenes where large men, prosecutors or their medical experts, are holding a rubber doll the size of a two-month old baby around the upper torso and shaking it back and forth vigorously to demonstrate to the judge and jury how the accused *must have shaken* the injured or deceased infant.

The proponents of the SBS (and shaking — impacting baby syndrome) describe the injuries and how they occur usually as follows. “When someone forcefully shakes a baby, the child's head rotates about uncontrollably because infants' neck muscles aren't well-developed and provide little support for their heads. The violent movement pitches the infant's brain back and forth within the skull, rupturing blood vessels and nerves throughout the brain and tearing the brain tissue.

“The damage is even greater when the shaking ends with an impact — hitting a wall or a crib mattress, for example — because of the strong forces of acceleration and deceleration associated with an impact. After the shaking, swelling in the brain can cause enormous pressure within the skull,compressing blood vessels and increasing overall injury to its delicate structure.” (1)

Since the 1970s, hundreds (maybe thousands) of adults have been jailed because they were believed to have injured their babies or killed them *by shaking*. Some of these convicted child abusers may themselves have been beaten in prison, even murdered, because everyone, including criminals, hates a child abuser.

There is obviously no doubt that some parents, babysitters and guardians have tortured and killed innocent infants and children. They should be severely punished if they are sane, and receive expert psychiatric therapy if they are deranged.

There is also no doubt that many innocent young parents and caregivers are in jail because they were unjustly accused of shaking or shaking-impacting their children. At trial, the prosecution with its might and resources usually parades expensive medical experts who swear — with authority — that a big man can, indeed, cause subdural and retinal hemorrhages in a small baby and even kill him or her *without visible external bruises and injuries, and with no prior history of abuse.* In most cases, the only crime the adult committed was to be alone with the child when he or she stopped breathing, a “sinister game of musical chairs” — as one of our Australian colleagues calls the situation.

In September, renowned neuropathologist J.E. Leestma published an important review of the shaken baby syndrome in the *American Journal of Forensic Medicine and Pathology*, the official publication of the National Association of Medical Examiners. (2)

He stated in the abstract: “The English-language medical case literature was searched for cases of apparent or alleged child abuse between the years 1969 and 2001. Three hundred and twenty-four cases that contained detailed individual case information were analyzed yielding 54 cases in which someone was recorded as having admitted, in some fashion, to have shaken the injured baby. Individual case findings were

tabulated and analyzed with respect to shaking as being the cause for the injuries reported. For all 54 admittedly shaken-infant cases, the provided details regarding the shaking incidents and other events are reported. Data in the case reports varied widely with respect to important details. Only 11 cases of admittedly shaken babies showed no signof cranial impact (apparently free-shaken). This small number of cases does not permit valid statistical analysis or support for many of the commonly stated aspects of the so-called shaken baby syndrome."

In other words, there were *only 11 confirmed reports* of infants or children who had injuries that could be attributed to shaking and only shaking *in the complete English-language medical literature.*

According to the Centers for Disease Control and Prevention (CDC) and the National Center on Shaken Baby Syndrome (2005), *"Shaken baby syndrome (SBS) is a form of child abuse affecting between 1,200 and 1,600 children every year. SBS is a collection of signs and symptoms resulting from violently shaking an infant or child."* (3)

Some areas of the country seem to report more cases of SBS than others and in certain states, medical centers with organized child abuse teams somehow diagnose more cases than rural and community hospitals.

The "Preventing Child Abuse" web site of The Children's Hospital Medical Center in Denver, Colorado, features the following information under "Babies are Fragile." "Shaken Baby Syndrome is the leading cause of death among child abuse cases in the United States. The syndrome results from injuries received when someone vigorously shakes an infant — usually from 5 to 20 seconds. This can cause severe brain injury and even death. In 2004, The Children's Hospital saw an average of one child a week with signs of Shaken Baby Syndrome — the youngest just 2 weeks old." (4)

In 2004, the population of Colorado was estimated at 4,301,261 — or 1.5 percent of the entire population of the United States. The state is 380 miles east to west and 280 miles north to south. It has high mountains and snow in the winter. Even *if every case of SBS in Colorado* was seen at Denver Children's Hospital, 52 cases of Shaken Baby Syndrome in one year would translate to a national incidence of 3,467 cases, almost three times the CDC figures.

According to a 2004 publication, a study conducted by the University of North Carolina at Chapel Hill found that an estimated 50,000 cases of shaken baby syndrome occur each year in the United States. Of that number, 300 children die. (5)

It is obviously unlikely that the good people of Colorado and North Carolina shake their children more frequently than in the rest of the country or that the CDC and the

National Center on Shaken Baby Syndrome are underestimating the national number of cases of SBS.

Shaking and neck injury

Werner Goldsmith, PhD, former chair of the head injury model committee at the National Institutes of Health and a professor at the University of California, Berkeley and its 2001 Distinguished Engineering Alumnus Award recipient, has stated unequivocally: *"I am absolutely convinced that in order to do serious or fatal damage to an infant by shaking you have to have soft tissue neck damage*." Goldsmith has calculated that a fall backward from three feet onto a hard surface, like concrete, can produce nearly 180 Gs of acceleration — 180 times the force of Earth's gravity — enough to cause a subdural hematoma. Shaking a child once a second through a range of one foot produces only 11 Gs, at the most. "There is an order of magnitude difference between shaking and falling," he says, "From the point of view of the brain, shaking is a much, much milder form of braking than a fall." To complicate matters, between five and 10 percent of children are born with undiagnosed subdural hematomas, and 30 percent are born with retinal bleeding. "If you get a rebleed, you may get something that looks like shaken baby syndrome…. *You should be able to show neck damage to prove shaken baby syndrome*." (6)

In most of the cases I have reviewed, an MRI of the neck had been ordered and every time, it was normal. Yet, in every one of those cases, accusations were still made and charges were still filed. There is no doubt that the ordering physicians would have considered positive cervical findings as uncontestable proof of SBS and yet, not one of those physicians has ever accepted a totally normal MRI of the neck as proof of innocence and against shaking as demonstrated by Goldsmith. It seems strange to send an infant near death into a tube halfway across the hospital to get an expensive MRI and then to ignore the results of that study.

Obviously everyone knows that a passenger in a stopped car (whether a child or an adult) who is rear-ended by another car or truck going at least 40 miles an hour is likely to suffer a severe whiplash injury to the neck without brain damage, retinal bleeding and/or a brain hemorrhage.

A rush to judgment

As a rule, regardless of the history — past and present — the symptoms and the laboratory findings, if an infant or a child is discovered to have retinal hemorrhages and intracranial bleeding (subdural hemorrhages or subarachnoid hemorrhages), the case is immediately labeled "shaken baby syndrome" and other diagnoses are not even considered. Social Service is consulted and the Child Abuse Team promptly endorses

the notion that the infant *must have been shaken* and the adult, who happened to be there at the time, must be the perpetrator — even when objective evidence of other causes is glaring. From that moment on, the unfortunate parent is considered guilty, till proven otherwise, which is not easy if he or she is poor and uninformed.

John Plunkett, a renowned forensic pathologist at Regina Medical Center in Hastings, Minnesota, wrote in a 1998 letter to the *American Journal of Forensic Medicine and Pathology*: "Too many of my colleagues (and most other physicians and almost the entire general public) think our profession is the "whodunit" discipline. It is not. Forensic pathology is the "what happened" specialty. When our focus is on the "who," we forget the "what" or may consider it unimportant. Worse, we may alter our explanation/interpretation of the "what" to make it conform to our opinion of the "who." The need to consider alternative explanations ceases, doors to further inquiry close: Do not go beyond, you will find nothing there. Objectivity fails because we are forced to defend an advocacy role, be it for the state or for the defendant. We must not forget that our only responsibility is to bear witness within the limits of science."

The most tragic thing about our present obsession with SBS is not only that an *innocent* adult ends up in jail, but that often valuable time is lost, appropriate investigations of the real causes are not undertaken, the correct diagnosis is not even considered, and important and urgent treatment is not provided to the infant who is certainly *innocent*. Most often, trying to "nail the guilty party," instead of focusing on helping the baby in the hospital, further injures the infant and compromises recovery.

In March 2004, Plunkett co-authored a landmark editorial in *The British Medical Journal* with British neuropathologist J. F. Geddes titled "The evidence base for shaken baby syndrome." (7) I suggest that interested Red Flags readers review that editorial because it is certain to become a major reference on SBS.

Important Information

In the cases that I have reviewed, important events and findings during the pregnancy and delivery have rarely if ever been considered by the admitting staff. A thorough examination and analysis of every detail is essential to discover the truth and arrive at a scientific and not an impulsive diagnosis.

Radiological examinations should be judicious and carefully ordered. Exposing the infant to an inordinate amount of irradiation and sending him or her from the close observation of the intensive care unit to the x-ray department repeatedly trying to prove that a distal hair line fracture exists is immoral and borders on malpractice. Such investigations can be done more appropriately when the child improves and, by then, the presence or absence of a callus will clarify the diagnosis.

Laboratory examinations must include bleeding/clotting studies and liver function tests in addition to the routine admission orders. Sometimes, extensive testing may be required to assess nutritional status, enzyme levels and liver, gut and kidney function. The results should then be interpreted properly and the tests repeated to demonstrate a trend — if needed. The diagnosis of SBS should not be made till all the results are considered.

On admission, blood should be drawn for a PIVKA -II test to rule out late-onset hemorrhagic disease (8) and for a blood histamine and serum vitamin C levels to rule out subclinical scurvy and histaminemia. (9)

Recent vaccinations

In addition to details of the recent past history including illnesses, antibiotic use, exposures, feeding problems, etc., it is essential to list and date vaccinations given in the 21 days preceding admission. (10)

The following statement by Australian pathologist-hematologist and SBS expert Michael Innis summarizes his beliefs and is shared by many of us now: “They will have successfully demolished my explanation if they can document a *single* case of shaken baby syndrome or “inflicted shaking/impact injury” (as they prefer to call it), which occurred outside the 21-day period and in which a disorder of haemostasis, nutrition or liver disease was convincingly excluded. I repeat, the diagnosis of shaken baby syndrome or inflicted shaking/impact injury is a proven figment of the imagination of some in the medical profession and should be relegated to the scrap heap of history before it causes any more shame to the profession and disaster to innocent families." (10)

Retinal hemorrhages

For more than 30 years, it has been assumed that the presence of retinal hemorrhages in an unconscious child is “evidence” of shaking or shaking impacting. The unquestionable scientific fact is that although retinal hemorrhages with or without intracranial bleeding can occur after abuse, *they are not seen only in cases of SBS*.

In 1997, Rohrbach stated: *“Intraretinal hemorrhages alone are typical, though not pathognomonic for the battered-child syndrom*e.”

Renowned neurosurgeon Ronald Uscinski recently wrote in the *British Journal of Neurosurgery* (12) “prior to 1972, the presence of retinal hemorrhages was a diagnostic aid in detecting the presence of chronic subdural hematoma in children,

and has long been known among neurosurgeons to reflect an abrupt increase in retinal venous pressure."

There are three important statements about retinal hemorrhages:

1. The actual mechanism of retinal hemorrhages is unknown. (Riffenburgh 1991)
2. There have been no controlled studies supporting a purely mechanical etiology for retinal bleeding.
3. There is no agreement on what specific pattern or appearance of retinal hemorrhages absolutely suggests inflicted trauma by shaking.

Retinal hemorrhages have been associated with asphyxia, hypoxia, increased venous pressure and cerebral venous spasm. Studies by Jacobi (1986) have shown that increasing intracranial pressure and subarachnoid hemorrhage lead to retinal hemorrhages. In 1998, Jayawant reported an 80 percent association between subdural hemorrhages and retinal hemorrhages and postulated that retinal hemorrhages are not independent risk predictors, but simply markers of the extensiveness and severity of intracranial bleeding.

Retinal hemorrhages can occur with increased intracranial pressure and following subarachnoid and other intracranial hemorrhages (Terson Syndrome). A number of studies (Giangiacomo 1985, Weingeist 1986, Jacobi 1986, Keithahn 1993, Poepel 1994) point out the similarities between Terson's syndrome and the retinopathy of SBS. Retinal hemorrhages have been reported following accidents, with infections, with coagulopathies and bleeding disorders, in cases of vitamin C and K deficiency, following a third of normal vaginal deliveries (Kaur), and after vigorous cardiopulmonary resuscitation (Goetting).

Subdural hemorrhages

It is now almost always assumed that subdural hemorrhages in the absence of a witnessed fall or injury are also an indication of child abuse and the result of acceleration-deceleration by shaking or shaking impacting.

This is not true.

Subdural hemorrhages are not exclusively the result of intentional trauma and can be caused by a multitude of biomedical disorders.

Because of their open fontanels, young infants with a subdural bleed may remain neurologically asymptomatic for some time. Babies with subdural hemorrhages often have seemingly unrelated symptoms such as crankiness, restless sleep, poor feeding, vomiting, and failure to thrive.

In a 1998 British retrospective study, Jayawant reported that 60 percent of the children with subdural hemorrhages, which he reviewed, exhibited signs of other trauma (bruising, fractures, etc.). Duhaime (1987), Alexander (1990) and Lancon (1998) reported that *in cases of severe cerebral damage and death*, overt signs of trauma and abuse were reported even more frequently.

Scientific documentation exists that subdural hemorrhage can and does complicate many medical — non-traumatic — disease entities including non-specific coagulopathies, coagulopathies secondary to bacterial endotoxemia, certain enzyme defects, liver, blood and connective tissue disorders.

Sometimes, the identification of a chronic, as well as an acute, subdural hemorrhage makes the well-paid "prosecution experts" jump to the conclusion that this finding *must* mean recurrent abuse, when, in fact, the opposite conclusion may be more appropriate. The simple fact that the baby was well-cared for and had no visible external injuries when seen repeatedly for routine pediatric care, while having a subdural hemorrhage, is strong evidence *against* inflicted trauma.

When such cases are later reviewed with an open mind, other more plausible non-traumatic causes are easily discovered and become the basis for successful appeals.

The infant may have spontaneous and separate acute and chronic subdural hemorrhages or may have a re-bleed in a chronic subdural hemorrhage. The appearance of acute and chronic subdural hemorrhages is different on CT-scans.

In 1977, Bergstrom et al reported: *"The histories reveal no new traumas in association with onset of symptoms. Spontaneous rebleeding may well explain the onset of symptoms as well as the attenuation values being so much higher than those of CSF and serum."* (12)

Ommaya, Goldsmith and Thibault in a comprehensive review (22 pages, 126 references) published in 2002 in the *British Journal of Neurosurgery* wrote: *"*The five categories of CT imaging were as follows: Layering type SDH hyperfibrinolytically active with a highest tendency to rebleed. The mixed density type has also a high tendency to rebleed but with lower hyperfibrinolytic activity."(13)

Also in 2002, Uscinskiwrote: "Rebleeding in subdural hematomas may occur, with minimal *or no trauma,* owing to the nature of the membranes and the process of resorption…. Common sense would seem to indicate that not all the subdural hemorrhages in children are inflicted injuries and prior to 1972 the presence of retinal hemorrhages was a diagnostic aid in detecting the presence of chronic subdural hematoma in children and has long been known among neurosurgeons to reflect an

abrupt increase in intracranial pressure. Lastly, a simple point of consideration: When an adult presents with a chronic subdural hematoma, abuse is rarely a diagnostic consideration. Given the similar pathology of the subdural hematoma in adults and children, why, logically, should the opposite be true in a child? (11)

Conclusion:

Shaken or not: That certainly is the question.

"Injustice anywhere is a threat to justice everywhere" ------ *Martin Luther King Jr.*

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