Problems of Infant Retino-subdural Hemorrhage and Cerebral Edema with Minimal External Injury

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This contribution is offered as a final reflection- after 40 years' consideration - on a problem of apparent child abuse which has caused a lot of controversy since it was first described. Time has been wasted by confusing arguments about whether the triad of subdural hematoma, retinal hemorrhage and cerebral edema constitutes a syndrome with questions as to whether, if a syndrome exists, it is always the result of abusive behavior. For me, the triad may legitimately be classified as a syndrome, but it is not necessarily the result of shaking, or of abusive behavior.

What I have to say is therefore intended as a Serious Call - I borrow the phrase from the title of a religious treatise by the 18th century Protestant clergyman, William Law - to members of the medical and legal professions to reconsider these problems with restraint.

Unfortunately the literature on the subject is not of uniformly high quality. For example, the reader will come upon examples of allegedly direct quotation which prove to be inaccurate when one reads the cited article. Such inconsistency strongly suggests that the author has not read the article him/herself, but is passing on (without acknowledgment) a quotation from a third party. It is also regrettable to find the findings of referred research papers listed alongside extracts from newspaper articles and even hearsay, as if all these were of equal evidentiary value.

The same uneven standards prevail in the medical reports. Some of these are models of scientific objectivity, but I have also read a pathologist's autopsy report on a case of alleged shaking in which the cause of death was baldly stated as "MURDER" (in capital letters). ‘Murder’ is a legal concept: once introduced into the clinical record, it prejudices medico-legal enquiries for the indefinite future. Surely, it should be reserved, for the findings of a judge and jury after due enquiry. No less unsatisfactory is the fact that this conclusion was (apparently) arrived at without even routine sectioning of the brain! [In making this statement I adopt the usual test, that "if it's not in the record, it didn't happen"]. At the time of writing the accused parent is still in prison, after 11 years.

In what follows I suggest some specific problems which urgently require solution if both medical science and justice are to be properly served.

Problem #1. Can the name 'Shaken Baby Syndrome' be justified by the facts?

There is a growing literature which suggests that the triad of retinal hemorrhages, subdural hematoma and cerebral edema is sometimes observed in circumstances in which roughness and abusive behavior can confidently be eliminated. The epistemological difficulty is this: There are several hundred named syndromes in the medical literature. Almost all are named
either after their discoverer (e.g. Adie’s Syndrome) or for a prominent clinical feature which they present (e.g. Stiff Man Syndrome). The appellation SBS, by contrast, asserts a unique etiology. I suggest that the triad should be defined in terms of its clinical features alone. Perhaps "Retino-subdural hemorrhagic syndrome of infants" would be an acceptable designation.

Problem #2. If shaking is responsible for significant damage to the central nervous system and its coverings, why have the forces generated by humans or laboratory machines shaking a dummy, so often proved insufficient to cause the disruption of the tissues of the central nervous system observed in SBS cases?

Please note that I do not suggest that these forces are never sufficient. Mark Dias, for one, has described a successful model. But I suspect that the usual analysis of the forces applied during child abusive behavior, and their effects, is incomplete. There is evidence that trauma may cause microscopic or submicroscopic damage (Squier and Mack, unpublished), not only directly to the brain but also to the meninges and the control of their blood vessels via injury to the meningeal nerve-tissue. Such effects, caused by reflex mechanisms in the living subject, cannot easily be replicated in a laboratory model.

In my 1971 paper, I mentioned that the infant had sometimes been gripped around the chest with sufficient violence to result in bruising of the skin, leaving finger-marks which were noted when he/she was admitted to the hospital. (This bruising was not always observed, perhaps because the infant’s clothing served as padding.) Violent chest compression reverses the flow of blood to the right heart, causing a sudden rise of the pressure in the superior vena cava and its tributaries. This, in turn, distends the intracranial venous circulation, including the ophthalmic veins' to bursting point. The same venous back pressure does not burst the blood vessels within the brain, but in the dura. The observation that the dural venousplexuses are much more extensive at birth than in later life suggests that they have a role at birth and act as a safety valve for back pressure which would be expected during labour and delivery and would explain why the triad is rarely observed in infants more than 6 months old. The violent chest compressions of resuscitation after collapse of an infant from other causes may have similar effects.

This effect of venous hypertension is also a plausible explanation of why the association between retinal and subdural hemorrhage seems to be higher in SBS cases than in head trauma in general. Also, when the anterior fontanel closes, usually at the age of 6 months, a previously open box becomes a closed one. This restricts the displacement of the brain when the intracranial pressure rises. [Whether the venous hypertension which would arise under such circumstances is sufficient and lasts long enough to cause brain edema, is uncertain.]

Problem #3. Can we assume that there is a constant linear (or any other) relationship between the violence of shaking and the amount of resulting damage to the body tissues, particularly those of the nervous system and its coverings?
Let me say at once and categorically that to raise this question does not, and is not intended to, offer any excuse for failure to investigate, with all due diligence, any case of suspected violent or abusive treatment of a child. But it is relevant in considering the propriety of a frequently used line of questioning of a medical witness, who is asked to quantify the degree of force used by the alleged perpetrator. Sometimes the question incorporates a comparison to a high-speed motor-vehicle crash or a fall from a high building. Or the witness may be asked "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?" There is ample evidence that the effects of injury can vary greatly in apparently similar circumstances. Perhaps some consideration should be given to the possibility of treating the medical witnesses as witnesses of fact and appointing an expert medical assessor to advise the judge and jury on matters of interpretation. This would tend to relieve the medical witnesses of the feeling that if they concede a point of interpretation, they are letting the side down.

Conclusion

Geoffrey Jefferson, the distinguished British neurosurgeon, writing about the attitude to head injuries which prevailed during the First World War, complained that "the eye has rested upon the fractured skull, and the mind has traveled no further". Only when neurosurgery emerged as a specialty under the leadership of Harvey Cushing and his pupils, was brain damage given the importance it deserved. Even then another 20 years elapsed before Holbourn pointed out that one could predict, on biophysical grounds, that the damage caused by rotation-acceleration injuries of the head following automobile accidents, would be concentrated on the frontal, temporal and occipital poles of the brain. This is where the thin-walled ‘bridging’ veins leading from the cerebral cortex to the dural venous sinuses are concentrated. New work on the neuropathology of cerebral trauma (Mack and Squier, unpublished) emphasizes the complexity of the mechanisms involved. We cannot expect to find a constant relationship between the amount of violence believed to have been used in the infliction of abusive trauma, and the brain damage it causes.

Society is rightly shocked by any assault on its weakest members, and demands retribution. But there seem to have been instances where both medical science and the law have gone too far in criminalizing alleged acts of violence of which the only evidence has been the changed clinical state of the infant. Rather, there seems to have been inadequate enquiry into the possibility that the picture resulted from natural causes. In reviewing a number of cases where the alleged assailant has continued to proclaim his/her innocence, I have been struck by the high proportion of these in which there was a significant history of previous illness, and of abnormalities of structure and function of the nervous system. Yet these matters were hardly, if at all, considered in the medical reports. Tuerkheimer has pointed out the fallacy of assuming criminal intent, simply because signs of the classic SBS triad have been found or because no one can think of any other explanation of the infant's injuries, an expert medical witness who answers such a question as "Have you any doubt that given the appalling injuries which this unfortunate infant sustained, they were inflicted, in complete disregard of the danger to his/her life?" in the negative, is exceeding his/her authority.

Perhaps some consideration should be given to the possibility of “neutralizing” the whole
procedure for obtaining medical evidence in these cases, so that the expert witness can advise
the judge and jury without a nagging feeling that just by testifying, he/she is taking sides.

Finally, since this is a swan song, may I be so bold as to suggest that as members of learned
professions, we should never forget two dicta of the great Canadian physician, William Osler?
The first is this: "More mistakes are made in medicine by not looking than by not knowing".
The second is equally brief: "As is our pathology, so is our practice". To these I would add a
favorite saying of CP Scott, the revered editor of the Manchester Guardian for most of the first
half of the 20th century. “Comment” Scott used to say "is free, truth is sacred."

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