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Shaken baby syndrome, due process and scientific disagreement

PERSPECTIVES

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History has shown how wrong things can go when the medical community engages in groupthink without adequate scientific basis. That is our starting point for exploring the medical and forensic medical aspects of suspected shaken baby syndrome and the scientific basis for its diagnosis.

Over 60 years ago, at the direction of the healthcare sector, the Western world introduced a change in childcare practice and the advice given to mothers: From that point on, babies should be put to sleep on their stomachs. The influential originator of this advice was the American paediatrician Benjamin Spock (1903–98), who gained enormous trust among experts as a children's advocate. In the 1957 edition of his textbook *Baby and Child Care*, he advised putting babies to sleep in a prone position because he thought putting them to sleep in the supine position was associated with a risk of choking on vomit (1).

Today it is hard to understand what made the entire healthcare sector of the Western world actively participate in implementing his undocumented advice. In the years that followed, the incidence of sudden infant death increased dramatically, but it would take two to three decades to establish the connection and another five years before practice started to change (from 1990). In the meantime, as many as 1,000 babies in Norway (2) and more than 60,000 in the Western world may have died as a result of this tragic mistake (3).

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Several decades ago, great faith was placed by experts in the fact that certain findings in children's external genital organs showed that the child had been subject to sexual abuse. However, when investigated systematically, it emerged that lesions that had been thought to be diagnostic of abuse could not be used as evidence. Conversely, it was found that some children who had been proven to have been subject to penetration did not have these lesions which had been assumed to be almost obligatory after such an event. It is easy to imagine the tragedies that ensued from wrongful judgements like these as a result of the healthcare sector's and courts' handling of these cases.

Common to both these examples is that they demonstrate that the medical community as a collective can be wrong and engage in groupthink even where the scientific basis is lacking.

Topical issue

Just before Christmas 2022, a verdict was reached in the Norwegian Borgarting Court of Appeal which cleared a parent accused of having caused their child brain damage by violent shaking (shaken baby syndrome (SBS)). After having followed the trial, Hege Ulstein wrote in the Norwegian newspaper 'Dagsavisen' on 21 November 2022: 'Another legal scandal may be coming' and furthermore that 'The scientific conflict in Norway has been thrown into stark relief in court' (4).

Scientific disagreement about the causes of medical findings and symptoms is something doctors and researchers experience every day. It is attempted to resolve these disagreements by acquiring new knowledge through research and clinical experience. In cases where knowledge is lacking and research results are uncertain or conflicting, conclusions and interpretations must remain correspondingly cautious and provisional.

When conclusions about possible causal relationships are used in legal cases, where the requirement for conviction is evidence of guilt beyond all reasonable doubt, it is essential that an even greater degree of caution is exercised. Causal relationships cannot be determined by how many experts are in agreement, but rather by the robustness of the underlying science.

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A worrying practice has been seen in the SBS debate. In an article in the Journal of the Norwegian Medical Association in 2018 (5), 18 specialists from a wide range of medical specialties published a kind of manifesto in which they protested against what they refer to as 'biased, oversimplified news stories', but which actually involve scientific publications (6). A similar consensus statement was published in the journal Pediatric Radiology in 2018 (7) and supported by numerous American and European radiological and paediatric associations, including the Norwegian Pediatric Association (8).

It is unusual for large groups of specialists to decide to attack other specialists' scientific articles that suggest that current expert witness practice may have inadequate scientific foundations – without presenting any scientific evidence to undermine the basis of the other specialists' contribution. It is hard to see how the 18 authors of the article in the Journal of the Norwegian Medical Association pointed to an adequate scientific basis for establishing SBS with certainty. Furthermore, in doing so, we think they have overstepped into the court's remit.

In our view, this also applies to Stray-Pedersen et al. (9) who in their criticism of the expert review by Wester et al. of medical findings and assessments in criminal SBS cases in Norway (10) express concern that the article may have a negative impact on future expert witness activities for the courts: 'This can make it even more difficult to protect those infants who are most at risk and ensure justice for them and their parents.'

This cannot be stated clearly enough: It is not the medical expert's duty to ensure due process protection of the parties. That is the duty of the court.

How certain is the causal relationship?

There is extensive literature in this area, with conflicting conclusions. A comprehensive Swedish literature review concluded as follows (11): 'There is insufficient scientific evidence on which to assess the diagnostic accuracy of the triad in identifying traumatic shaking (very low-quality evidence).' Whilst this study was met with harsh criticism, calls for its withdrawal and claims that it was putting children's lives at risk (12), it is hard to see how this criticism casts doubt on its conclusions (13).

The statements by Stray-Pedersen et al. (5) that 'a finding of the so-called triad is not in itself sufficient proof of child abuse...' as well as 'when focus is placed solely on the triad, this implies a choice to disregard the fact that there are usually other accompanying findings such as skeletal fractures, bruises and skin lesions' are not reassuring. '*Usually*' in this context must mean that in some cases a conclusion of SBS was reached *without* there being other accompanying medical findings. That this is the case is substantiated by a review of 17 cases in Norway in which the court reached a conclusion of SBS as the cause of the medical findings (10). In several of these cases, there were no external signs of head injury or fractures, so the interpretation must be that the medical findings were limited to the triad.

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It is hard to understand this in any way other than that the conclusion of SBS was reached, in some cases at least, on the basis of the triad as the only medical findings, contrary to what Stray-Pedersen et al. claim (5). The issue with definite conclusions about causal relationships is also illustrated by the fact that the triad can undoubtedly have non-traumatic causes (8, 10, 14–16). Even if this were to apply to a minority of cases, the possibility of other non-traumatic causes makes it impossible to draw definite conclusions in individual cases.

Further uncertainty about how often SBS causes the triad is raised by a study of children where shaking was either admitted or witnessed (described as forceful in 16 cases, while the force was unknown in the others) (17). None of these 36 children who had been shaken had subdural haematoma or retinal haemorrhage, which are two of the three criteria in the triad.

Circular reasoning

Several of the publications that argue for the triad's causal relationship with SBS are marred by circular reasoning (12), meaning that the hypothesis about causal relationship is accepted to be true as a starting point.

For example, Stray-Pedersen et al. (5) open as follows: 'Violent shaking of infants may lead to a triad of serious injuries to the head and eyes.' What was originally put forward as a hypothesis with no scientific evidence 50 years ago (18, 19) has become a truth accepted by the vast majority of Norwegian (5) and American (20) doctors involved in examining children in cases of suspected abuse. The American study was then used in an editorial article in the Journal of Pediatrics as a powerful argument for SBS being the cause of the triad (21).

Unlikely biomechanical relationship?

Further contributing to the uncertainty about a causal relationship between SBS and the triad are biomechanical considerations that raise doubt about whether SBS can cause intracranial injury without injury also occurring in the upper cervical spine. This conclusion is based on both straightforward biomechanical and anatomical considerations and on theoretical and experimental biomechanical studies (22–24).

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This strongly suggests that the intracranial forces caused by shaking are not on their own sufficient to cause haemorrhage. There has been increased interest with regard to examination of the neck region in cases of suspected violence against babies (25, 26). In one study, 60–80 % of children who were examined with MRI for suspected abusive head trauma had soft-tissue injuries in the upper cervical spine. It would appear that this is not recognised in the Norwegian expert community. The possibility of neck

injuries is not mentioned by Stray-Pedersen et al. (5), and these type of findings also seem not to have been recorded in the 17 cases in which the medical findings were reviewed (10, Table 2).

'Getting it right'

We end with a quote from the paediatric neurosurgeon Norman Guthkelch (1915–2016), who originally put forward the hypothesis about SBS being the cause of the triad in 1971 (18), but who later became extremely concerned about the uncritical acceptance of this (27):

''Getting it right' requires that we distinguish between hypotheses and knowledge. Shaken baby syndrome and abusive head trauma 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'.'

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