

# 'Shaken babies' – the doctor's role must be distinguished from that of the judicial system

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## DEBATT

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The author has completed the ICMJE form and declares no conflicts of interest.

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Along with four other colleagues, the two authors constituted the group of experts that undertook the systematic review of literature pertaining to 'shaken baby syndrome'.

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It is worrisome that researchers disregard serious methodological flaws in the available academic literature on 'shaken babies'. Circular reasoning has no place in academic studies, and doctors should refrain from making judgements about intent, which is a strictly legal issue.

We agree with Arne Stray-Pedersen and his 17(!) co-authors who in a comment (1) to the article by Knut Wester on 'shaken babies' (2) point out that failing to detect evidence of violence against a child may entail fatal consequences. For the sake of the infant, it is obviously important to detect child abuse and protect the infant from a dangerous and risky environment. However, it is also in the interest of the infant not to be unnecessarily placed in foster care, not to have their family broken up for wrong reasons and that an innocent parent not be given a custodial sentence. Such is the dilemma between the risk of underdiagnosis and the risk of overdiagnosis, meaning that diagnosing of child abuse needs to be as correct as possible. This dilemma formed the basis for the Swedish study of the diagnostic accuracy of *the triad* (subdural haematoma, retinal haemorrhage and encephalopathy) to determine whether an infant had been violently shaken (3). This research question was chosen because academic studies, clinical guidelines and a number of court proceedings have claimed that findings of the triad indicate with a high degree of likelihood that the infant has been violently shaken. The study was initiated and funded by the Swedish Agency for Health Technology Assessment and Assessment of Social Services,

whose task it is to assess, for example, the evidence of accuracy in diagnostic methods.

As pointed out by Knut Wester, the main problem in nearly all previous studies of 'shaken babies' is their high risk of bias due to circular reasoning, which stems from the use of the assessments made by child protection teams both as a *diagnostic test* and as a *reference test*. In this way, *all false-positive and false-negative cases are eliminated*, and the diagnostic accuracy amounts to 100 %, which is clearly absurd (4, 5).

Stray-Pedersen and colleagues (1), however, disallow the Swedish report, with reference to the criticism that was raised against it. The main conclusion in the Swedish report was that there was insufficient scientific evidence ('very low quality') to ascertain that an infant had been violently shaken when the triad was the only finding (3). We who participated in the Swedish study were aware that this result would be deemed controversial. Since the report disallowed virtually all studies that have been undertaken to determine a diagnosis of 'shaken baby' over the last 30 years, the ensuing criticism was hardly surprising. However, Stray-Pedersen and colleagues nevertheless point out certain issues that merit comment.

## Does the triad normally appear in isolation?

The Swedish report focuses on cases of the triad in which there were no external signs of trauma, since such isolated cases are precisely the most interesting. They are interesting partly because these cases are totally free from traditional signs of external violence, partly because it would be expected that when an adult grips an infant and shakes the child violently, this would at least give rise to bruising (subcutaneous haematoma).

Stray-Pedersen and colleagues claim, however, that the focus on the triad fails to reflect reality, since most reported cases with a finding of the triad also include signs of head trauma. This latter assertion is correct, but isolated findings of the triad account for as much as one-third of all cases (6). Within this one-third, perhaps one may find some of the overdiagnosis that has been pointed out in a number of epidemiological studies (7, 8, 9)? The authors also claim that 'it is completely misleading when [the triad is] used as the sole grounds for the diagnosis'. Indeed, this argument is forcefully underscored in the Swedish report! However, in contrast to the author's statement that the triad is not used in this way, many academic studies, clinical guidelines and numerous court proceedings have claimed that the triad constitutes clear diagnostic evidence of a 'shaken baby'.

## Are retinal haemorrhages specific?

Stray-Pedersen and colleagues claim that both subdural haematoma and retinal haemorrhage in 'shaken babies' have a 'typical' appearance, referring to authors including Vinchon et al., who found a specificity of 97 % and a positive predictive value of 96 % for the retinal haemorrhages (10). These values are so high as to give grounds for immediate scepticism as to how they were obtained. Vinchon has in fact admitted as much (11), but added that such results are what judges want! When Vinchon and colleagues later estimated the specificity and positive predictive value of *the triad*, both these measures were a totally unreasonable 100 %! The reason was that the encephalopathy of the traditional triad had been replaced by 'absence of external signs of trauma'. Since most (all?) infants who have been in a traffic accident – in contrast to the suspected 'shaken babies' – show external signs of trauma, *all false-positive cases were eliminated*, and both the specificity and the positive predictive value were thus perfect (10, 12).

For other reasons as well, retinal haemorrhages are hardly specific to 'shaken babies'. When ophthalmologists who were unaware of the circumstances of the cases (i.e. 'blinded') were asked to determine whether a RetCam image of retinal haemorrhage was the result of a suspected violent shaking, a disease or an accident, their diagnosis was only marginally better than random selection (13). As pointed out by Knut Wester, it seems more likely that the retinal haemorrhages are secondary to increased intracranial pressure (2, 14).

# What is the effect of delivery-related subdural haematoma?

The mechanisms behind the retinal and subdural haemorrhages merit closer study, and Knut Wester has raised the question of whether benign external hydrocephalus may be a possible alternative explanation (2). Another aspect concerns delivery-related subdural and retinal haemorrhages (15). Subdural haematoma occurs in approximately 40 % of all normal vaginal deliveries (15). These haematoma have the same appearance as those in suspected 'shaken babies', but are assumed not to result in any symptoms and are normally reabsorbed within 1–3 months after the delivery. In assisted deliveries, the prevalence of subdural haematoma increases to 57 %, while in scheduled Caesarean sections they occur only in 1.7 % of cases (15). These subdural haematoma are also unlikely to cause any complications, although this has not been unequivocally established (16). In rare cases, however, such a haematoma may develop into a chronic subdural haematoma with a risk of rebleeding that may produce symptoms spontaneously or following a minor trauma (17). Bearing in mind that a subdural haematoma may persist for three months, it is also relevant to point out that 'abusive head trauma' most often is diagnosed at the age of two months (18).

## Circular reasoning has no place in scientific studies

We are concerned that researchers in this area choose to disregard fundamental methodological flaws in the existing scientific literature on 'shaken babies'. Circular reasoning has no place in scientific studies, irrespective of how many doctors, researchers and organisations are prepared to accept such logical pitfalls. More research is needed on the mechanisms that cause both subdural and retinal haemorrhages to occur – for example by monitoring the prevalence and spontaneous course of subdural haematoma for the first six months after delivery. There are numerous competing hypotheses, but until now, *a single one* prevails, which in addition is replete with paradoxical phenomena and defensive supporting hypotheses (19).

We agree with Knut Wester that new approaches are needed in continuing research into 'abusive head trauma' – a designation that insidiously includes an assertion about both the mechanism of injury and intent with regard to symptoms that we cannot unequivocally determine to have been caused by violence. The scientific community must be open to testing of new hypotheses, using methods that completely eliminate the deleterious effects of circular reasoning, and should obviously refrain from making judgements about intent, which is a strictly legal issue.

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