

## “Shaken baby syndrome” and forensic pathology

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The paper by Byard raises important issues surrounding the diagnosis of so-called shaken baby syndrome (SBS) [1]. Legal medicine, neuropathology, neuroradiology, and other disciplines form a large center in Hamburg, Germany for the examination of accidental and non-accidental head injuries suffered during childhood. Of the various head injuries suffered, cases of SBS, which cannot be clearly proven, are often reported for assessment; in particular, those cases which do not conform to all the criteria for the so-called diagnostic triad of SBS (encephalopathy, subdural hematoma, and retinal hemorrhages). A reliable examination of these difficult cases demands a multidisciplinary approach that takes into consideration complete review of the history, including the child's state after the incident. It is not appropriate to declare the probability of SBS based on a momentary depiction of clinical examination results, such as the existence of retinal hemorrhages. For a comprehensive assessment, all examination results relating to the child's medical history and the child's further development have to be considered. For example, how has the child developed so far? Is the alleged history of an accident plausible and consistent? What were the emergency doctor's on-site observations?

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Infants displaying the diagnostic triad, where further examination reveals numerous older hematomas and bone fractures, usually present a relatively minor problem for the expert. Difficulties arise in the less severe cases with subacute symptoms and secondary injuries that are not indicative of abuse. This also includes consideration of the origin of a subdural hygroma. The factors to consider for the definition of a subdural hygroma may cast initial doubts [2]. A pre-existing enlargement of the subarachnoid space resulting in tensile forces on the bridging veins, as would be the case in a benign enlargement of the subarachnoid space, may cause a subdural hematoma following a rather minor accidental trauma [3–5]. A hygroma, however, can also be the result and residuum of a subdural hematoma from previous shaking. In cases of doubt, the clinical presentation and the child's further development can be of vital importance. We believe that there is an argument against the diagnosis of SBS if there are no signs of encephalopathy or a consequent neurological disorder. Another consideration is the significance of a pre-existing bland and hitherto clinical occult coagulopathy that is only discovered during extended work-up following suspicion of child abuse (e.g. heterozygous factor XIII deficiency) [6]. Can such a disease lead to spontaneous bilateral subdural hematomas and retinal hemorrhages? Can it also explain an encephalopathy?

We agree with Byard that all doubts about the specificity of individual findings cannot undermine the overall concept of SBS, as was attempted previously [7]. Confessions by the perpetrator are strong evidence for the existence of SBS [8, 9].

Terminology is also a difficult issue. We believe that, on the one hand, the proposed “lethal craniocerebral trauma” is too restrictive a term, as fatalities do not result in most cases. On the other hand, however, the term goes too far because various (potentially) deadly craniocerebral

traumas can be included under such terminology, which share no characteristics with the diagnostic triad (such as a fall from a great height, gunshot wounds, and crush head injury). The latter also includes terms such as non-accidental head injury, inflicted traumatic brain injury, and abusive head trauma, to name a few. As far as we can tell, generally, most researchers and experts agree that the forceful shaking of an infant may lead to bilateral subdural hematomas, retinal hemorrhages, and severe brain damage without any external signs of force. When the court questions us on the possible cause of such findings, would we not indicate a forceful shaking of the child as the most likely possibility. From our point of view, the term “shaken baby syndrome” should therefore be adhered to in such cases.

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