Tidsskriftet Tidsskrift for Den norske legeforening

The doctors' role in cases of suspected child abuse

OPINIONS

ARNE STRAY-PEDERSEN

E-mail: arne.stray-pedersen@medisin.uio.no
Department of Forensic Sciences, Oslo University Hospital
Faculty of Medicine, University of Oslo
Arne Stray-Pedersen, forensic pathologist, senior consultant in forensic pathology and clinical forensic medicine in the Department of Forensic Sciences, Oslo University Hospital, associate professor at the Faculty of Medicine, University of Oslo, and member of the Norwegian Board of Forensic Medicine.
The author has completed the ICMJE form and reports the following conflicts of interest: He receives remuneration for his work on the Norwegian Board of Forensic Medicine and serves as a forensic medical expert for Norwegian and international courts.

CLAUS MØLLER

Children and Youth Clinic
Haukeland University Hospital
Claus Møller, specialist in paediatric diseases with particular expertise in paediatric pulmonary diseases, neonatology and social paediatrics, and senior consultant in the Children and Youth Clinic, Haukeland University Hospital. He is semi-retired.
The author has completed the ICMJE form and reports the following conflicts of interest: He has served as an expert witness in numerous criminal cases and delivered paid lectures on child abuse for the County Social Welfare Boards in Hordaland and Sogn og Fjordane counties in 2017.

CHARLOTTE DE LANGE

Department of Radiology and Nuclear Medicine
Oslo University Hospital

Charlotte De Lange, radiology specialist with particular expertise in paediatric radiology, especially musculoskeletal disorders in children, and senior consultant in the Department of Radiology and Nuclear Medicine, Oslo University Hospital.
The author has completed the ICMJE form and reports no conflicts of interest.

BERNT J. DUE-TØNNESSEN

Department of Neurosurgery
Oslo University Hospital
Bernt J. Due-Tønnessen, specialist in neurosurgery with particular expertise in paediatric neurosurgery and genetic deformities of the cranium and facial region, and head of section in the Department of Neurosurgery, Oslo University Hospital.
The author has completed the ICMJE form and reports no conflicts of interest.

JENS B. GRØGAARD

Jens B. Grøgaard, specialist in paediatric diseases and former medical director of the Children's Hospital, Oslo University Hospital.
The author has completed the ICMJE form and reports no conflicts of interest.

OLAV H. HAUGEN

Department of Ophthalmology, Haukeland University Hospital
University of Bergen
Olav H. Haugen, specialist in ophthalmology with particular expertise in paediatric ophthalmology and strabismus, senior consultant in the Department of Ophthalmology, Haukeland University Hospital, and professor at the University of Bergen.
The author has completed the ICMJE form and reports no conflicts of interest.

OMAR HIKMAT

Child and Youth Clinic, Haukeland University Hospital
University of Bergen
Omar Hikmat, specialist in paediatric diseases with particular expertise in paediatric neurology, senior consultant in the Child and Youth Clinic, Haukeland University Hospital, and researcher at the University of Bergen.
The author has completed the ICMJE form and reports no conflicts of interest.

RUBY MAHESPARAN

Department of Neurology, Haukeland University Hospital
Department of Clinical Medicine (K1), University of Bergen
Ruby Mahesparan, specialist in neurosurgery with particular expertise in paediatric neurosurgery, head of the Department of Neurosurgery, acting clinical director of the Department of Neurology, Haukeland University Hospital, and associate professor in the Department of Clinical Medicine (K1), University of Bergen.
The author has completed the ICMJE form and reports no conflicts of interest.

LIL-SOFIE ORDING MÜLLER

Department of Radiology and Nuclear Medicine
Oslo University Hospital
Lil-Sofie Ording Müller, specialist in radiology with particular expertise in paediatric radiology, especially musculoskeletal disorders in children, and senior consultant in the Department of Radiology and Nuclear Medicine, Oslo University Hospital.
The author has completed the ICMJE form and reports no conflicts of interest.

ARNE KRISTIAN MYHRE

Department of Children and Youth, St. Olavs Hospital
Norwegian University of Science and Technology
Norwegian Board of Forensic Medicine
Arne Kristian Myhre, specialist in paediatric diseases with particular expertise in social paediatrics, and senior consultant in the Department of Children and Youth, St. Olavs Hospital, associate professor at the Norwegian University of Science and Technology and member of the Norwegian Board of Forensic Medicine.
The author has completed the ICMJE form and reports the following conflicts of interest: He has received various lecture fees.

MIA CATHRINE MYHRE

Department of Paediatric Medicine, Oslo University Hospital
Norwegian Centre for Violence and Traumatic Stress Studies
Mia Cathrine Myhre, specialist in paediatric diseases, senior consultant in the Department of Paediatric Medicine, Oslo University Hospital, and senior researcher at the Norwegian Centre for Violence and Traumatic Stress Studies.
The author has completed the ICMJE form and reports no conflicts of interest.

BÅRD NEDREGAARD

Department of Radiology and Nuclear Medicine, Oslo University Hospital
Bård Nedregaard, specialist in radiology with particular expertise in neuroradiology, senior consultant in the Department of Radiology and Nuclear Medicine, Oslo University Hospital.
The author has completed the ICMJE form and reports no conflicts of interest.

SOLVEIG MARIANNE NORDHOV

Department of Paediatrics, University Hospital of North Norway
Solveig Marianne Nordhov, specialist in paediatric diseases with particular expertise in neonatology and social paediatrics, and senior consultant in the Department of Paediatrics, University Hospital of North Norway.
The author has completed the ICMJE form and reports no conflicts of interest.

TORLEIV OLE ROGNUM

Department of Forensic Sciences, Oslo University Hospital
Norwegian Board of Forensic Medicine
Torleiv Ole Rognum, forensic pathologist, senior consultant and head of the Section of Paediatric Forensic Medicine, Department of Forensic Sciences, Oslo University Hospital. He is a professor emeritus from the University of Oslo and group leader for the Norwegian Board of Forensic Medicine.
The author has completed the ICMJE form and reports the following conflicts of interest: He has served as an expert witness in court, participated in numerous research projects with external funding and received various lecture fees.

KAREN ROSENDAHL

Section for Children and Youth, Department of Radiology, Haukeland University Hospital
Department of Clinical Medicine (K1), University of Bergen
Karen Rosendahl, specialist in radiology with particular expertise in paediatric radiology, especially musculoskeletal disorders in children, senior consultant in the Section for Children and Youth, Department of Radiology, Haukeland University Hospital, and professor in the Department of Clinical Medicine (K1), University of Bergen.
The author has completed the ICMJE form and reports no conflicts of interest.

TOMAS SØRBØ

Child and Youth Clinic, Haukeland University Hospital

Tomas Sørbø, specialist in paediatric diseases with particular expertise in social paediatrics at the Child and Youth Clinic, Haukeland University Hospital.
The author has completed the ICMJE form and reports no conflicts of interest.

MARY JO VOLLMER-SANDHOLM

Department of Paediatric Medicine, Oslo University Hospital
Regional Service Centre for Violence and Sexual Abuse of Children and Adolescents, Southern and Eastern Norway Regional Health Authority
Mary Jo Vollmer-Sandholm has a master's degree in forensic nursing and special expertise in forensic medical examination of children. She is a medical adviser in the Department of Paediatric Medicine, Oslo University Hospital, and is affiliated with the Regional Service Centre for Violence and Sexual Abuse of Children and Adolescents, Southern and Eastern Norway Regional Health Authority.
The author has completed the ICMJE form and reports no conflicts of interest.

STEIN MAGNUS AUKLAND

Department of Radiology, Haukeland University Hospital
Department of Clinical Medicine (K1), University of Bergen
Stein Magnus Aukland, specialist in radiology with particular expertise in paediatric radiology and paediatric neuroradiology, senior consultant in the Department of Radiology, Haukeland University Hospital, and professor in the Department of Clinical Medicine (K1), University of Bergen.
The author has completed the ICMJE form and reports no conflicts of interest.

Violent shaking of infants may lead to a triad of serious injuries to the head and eyes. The question of whether the triad can be used to establish child abuse has been raised. But is the matter that simple?

The term 'shaken baby syndrome' (SBS), which was introduced almost 50 years ago (1), denotes a serious pattern of symptoms and injuries in children under three years of age that is likely caused by inflicted trauma (2). Typical symptoms are lethargy, poor appetite, vomiting or retching, epileptic seizures and reduced consciousness. Most of these children have subdural haematoma, possibly combined with subarachnoid bleeding. Other findings include bruising, skin lesions and retinal haemorrhages in one or both eyes. Fractures to the skull, ribs and long bones are common. In the most serious cases, there is evidence of brain injury, accompanied by a high risk of neurological sequelae or

death. The child's caregiver rarely offers an adequate explanation for the child's injuries, and the story presented often contains inconsistencies. Incongruence between the injury severity and the history presented by the caregiver, in addition to a distinctive pattern of injuries, should lead healthcare personnel to suspect that the child has been subject to physical abuse.

Critique of evidence base and practice

In a 'Perspectives' article in the Journal of the Norwegian Medical Association, Knut Wester expresses his concern about the uncertainty involved in diagnosing 'shaken baby' cases (3). He claims that a number of people may have been convicted of having shaken a child based on insufficient medical evidence. He is currently working on a research project in which he will review previous court convictions to see whether this could be the case. Wester bases his assertions partly on a Swedish literature review from 2016 that appears to conclude that there is insufficient scientific evidence for shaken baby syndrome (4).

Wester's concerns must be taken seriously. It is our opinion, however, that the medical evidence for the diagnosis of physical abuse of children in general, and abusive head injury in particular, is far stronger than he proposes. In our view, both Wester and the authors of the Swedish literature review have used definitions that deviate from the real issue in the diagnostic workup.

Wester defines the diagnosis of the shaken baby as a triad of medical findings: subdural haematoma, extensive retinal haemorrhages and encephalopathy. This is a drastic oversimplification of the clinical presentation, and it is completely misleading when used as the sole grounds for the diagnosis. A finding of the so-called triad is not in itself sufficient proof of child abuse. It is true that in a forensic setting the triad has been used as an indicator that violent shaking may have been the mechanism of injury (5, 6). This assumes, however, that other findings point in the same direction and that an extensive workup has been conducted that critically assesses other potential mechanisms of injury and differential diagnoses. The three triad variables have distinctive features that may indicate abuse, but they cannot be used as binary yes-no variables.

Firstly, a *subdural haematoma* has a distribution, form, size and a radiological/pathological pattern that varies from case to case depending on the injury mechanism, pathophysiology, coexisting pathology and age. In a typical case of traumatic shaking, the haematomas are multifocal/bilateral and occur over the hemispheres, posteriorly and/or along the falx cerebri (7). There are often signs of injury to bridging veins at the midline (tadpole signs). At autopsy, injury to bridging veins can also be noted by careful dissection (8, 9).

Secondly, in typical cases of traumatic shaking, *retinal haemorrhages* have a characteristic appearance with numerous haemorrhages in multiple layers of the retina, located both centrally and peripherally in all four quadrants, but with a normal optic nerve papilla (10). This is substantially different from the retinal haemorrhages described in relation to an acute increase in intracranial

pressure in which the haemorrhages are typically found only centrally and papilloedema is clearly present (11). In a prospective, population-based study with 45 cases of known/admitted traumatic shaking, there was a specificity of 97 % for traumatic shaking in cases of major preretinal haemorrhages together with other extensive retinal haemorrhages with or without retinoschisis (formation of folds around the macula) (12).

Thirdly, the term *encephalopathy* encompasses any conceivable type of brain injury. Very few shaken children have structural signs of brain injury (2). When disclosed, such signs often entail rapid development of cytotoxic oedema and diffuse brain tissue damage that may indicate a hypoxic-ischemic mechanism related to trauma. Such brain injuries may be asymmetrical, but are most often bilateral. In some cases an MRI may reveal a resemblance to hypoxic-ischemic injuries subsequent to circulatory failure resulting from a specific incident or illness (7). The child's medical history must be carefully reviewed to rule out such incidents. Less frequently, traumatic shaking can lead to more widespread/extensive brain injury of the type known as 'diffuse axonal injury' associated with high-energy trauma (6, 7).

When focus is placed solely on the triad, this implies a choice to disregard the other accompanying findings such as skeletal fractures and bruises as well as signs of caregiver neglect. (2). The Swedish literature review from 2016 concluded that there was insufficient scientific evidence to claim that children with the triad of findings had been violently shaken (4). However, the committee that conducted the study ignored all other clinical aspects and findings that are given weight when making a diagnosis (13). Since its publication, the Swedish report has been criticised for its methodological weaknesses and flawed reasoning (14, 15), and the Royal College of Paediatrics and Child Health in the UK has urged the authors to withdraw the publication or allow it to be subjected to international scrutiny (14).

Shaking and other abuse

The term 'shaken baby' suggests that the children have been violently shaken, presumably held around the upper torso with both hands and shaken back and forth multiple times. The mechanism implies that the child's head has been subjected to powerful jerks (acceleration and deceleration forces). Many children, however, also show signs of blunt force trauma to the head/face (2, 16). On this basis, the term 'shaking-impact syndrome' was introduced (16). Later on, the American Academy of Pediatrics proposed the term 'abusive head trauma' (AHT) (2). This term indicates that the injuries are caused by inflicted trauma, but gives latitude for variations in the mechanism of injury. When the typical characteristics of the triad are present, they may point to violent shaking as the mechanism of injury, but there are also other physical injuries that may indicate violent shaking, such as external injuries from harsh gripping and fractured ribs and long bones (1, 2, 6, 13, 14).

In order to be convicted in a criminal case, culpability must be proven beyond a reasonable doubt, and the courts rely on medical forensic experts in such cases. Although it may be obvious in some cases that the child was injured through abuse, it may be difficult for the experts (and the court) to determine *when* and *how* this occurred and how much force was involved. It is notable that even a child who shows no external signs of injury may have been subjected to violent abuse, causing severe injuries to the brain and eyes. Individuals who have confessed report that the shaking which resulted in injury to their children was part of a repetitive pattern of behaviour; the children were shaken as a reaction to prolonged/inconsolable wailing and crying (17). According to these admissions, the intensity and length of time that the children are shaken before they sustain severe injuries varies. Perhaps it is the individual differences in children that determine how much violent jerking, pushing and/or shaking they can 'tolerate'.

Workup, diagnosis and interdisciplinary teamwork

A number of conditions and differential diagnoses must be ruled out in the workup for potential abusive head injury. Birth-related injuries, congenital diseases, haemorrhagic conditions and unrecognised traumas may produce symptoms that resemble those seen in abusive head injury. The clinical workup must therefore be highly specialised and interdisciplinary, involving specialists such as paediatricians, ophthalmologists, radiologists, neurosurgeons and specialists in medical biochemistry. In our view, doubt based on an incomplete understanding of the situation could prevent healthcare personnel from making an important diagnosis. Current legislation requires healthcare personnel to report suspected child abuse to the child welfare services and to consider filing a report with the police as well. Failing to recognise that a child has been a victim of abuse can have major and fatal consequences for the child.

Knut Wester's clinical alternative explanation for violent shaking is the condition 'benign external hydrocephalus' (BEH), also known as macrocrania and 'benign enlargement of subarachnoid spaces' (BESS). This has been included for more than 20 years in the differential diagnostic considerations that medical forensic experts should consider in their assessments. There is evidence that this condition may result in spontaneous subdural leakage of blood components and fluid (18). Thus, it is crucial for the attending doctors and medical forensic experts to know whether this condition is present when an infant is diagnosed with subdural haematoma. In such cases, increased fluid in the subarachnoid space is present alongside the subdural haematoma. The boundary between normal and potentially pathological amounts of subarachnoid fluid, which indicates a diagnosis of benign external hydrocephalus, has been previously documented in a prospective study of 120 healthy neonates who were followed up at eight months with cerebral ultrasound (19). Rarely are there pre-incident images available showing that benign external hydrocephalus was present prior to detection of subdural

bleeding. In such cases, it is important to compile an overview of previous head circumference measurements and neuroradiological assessments of CT/MRI images.

It is clear, however, that benign external hydrocephalus is not associated with bruising or bone fractures, nor can it explain widespread retinal haemorrhages, hypoxic-ischemic brain injury or other serious outcomes (2).

Abusive head injury is not a specific medical diagnosis that can be ascertained through a medical workup alone. The difficult decision for the clinician is whether the medical findings give grounds for notifying the child welfare services and possibly the police. This assessment must be made on the soundest possible basis and by competent healthcare personnel with knowledge about and experience with sick/injured children. It is the prosecuting authorities – *not* the doctors – that decide whether there are grounds for police investigation and possible criminal charges.

Sufficient evidence

It is good to question established medical 'truths', and we welcome all research in this area. However, we are concerned that biased, oversimplified news stories will have major consequences for children's safety and legal protection in the future. In our opinion, the current evidence base is so sound that it enables violent shaking and other rough handling of children to be established through an extensive medical workup by competent experts. It is essential that we work in an interdisciplinary manner with these difficult cases and that we as medical doctors concentrate on our tasks – to prevent illness and injury, reach diagnoses, alleviate suffering and treat patients. Doctors who perform tasks as medical/forensic experts must be cautious, precise and objective so that the courts have the best conditions under which to weigh the evidence.

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Publisert: 21 December 2018. Tidsskr Nor Legeforen. DOI: 10.4045/tidsskr.18.0922
Received 28.11.2018, accepted 17.12.2018.