violated my responsibility as an expert by presenting views that were contrary to 'mainstream' theory. To endorse an unproven mainstream hypothesis over the research of the past decade would not fulfil one's duty to the Court. While the Court acknowledged that 'today's medical certainty may be discarded by the next generation of experts', the research of the past decade has already established that some of the medical certainty that underlay shaken baby syndrome must be discarded; a conclusion with which the prosecution experts did not disagree.

The starkest lesson for aspiring experts arises from the consequence of this judgment rather than its content, and was completely overlooked in the commentary. As a result of Mrs Justice King's opinion, representatives of the police filed a complaint to the GMC against Dr Cohen and me. According to a public lecture, given by a representative of the police, the impetus for this complaint was falling rates of convictions in SBS cases, which was considered to be due to our presentation of science in the Courts.[11] Rather than addressing this in medical journals, open discussions or the courtroom, the police and prosecution teams preferred to eliminate any views that contradicted their own.

This strategy places all aspiring experts on notice that, should they challenge mainstream opinion, they risk being similarly faced with unwelcome publicity and a GMC investigation, with its profound professional and personal consequences.

So long as the medical and legal professions fail to recognize the discord between rapidly advancing science and the law, we are likely to continue to see false convictions of a scope far greater than Clark, Cannings, Harris and even the Cleveland cases, based on a debate in which one side has been muzzled.

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EXPERT WITNESSES

Science informs the court but tends not to provide definite proof

Marta Cohen

This commentary addresses the role of expert witnesses in the complex and controversial area of paediatric head injury. Head and brain injuries in children fall into three broad categories, namely, injuries that are:

- Definitely accidental – reliable witness accounts and pathology findings that are consistent with these accounts;
- Definitely abusive – some combination of impact head injuries (scalp bruises, fractures), the triad (i.e. retinal haemorrhages, subdural haemorrhages, brain swelling), other usually multifocal, multiphasic injuries (bruises, fractures), and an improbable explanation from witnesses;
- Of uncertain or indeterminate nature – often infants who have the triad and nothing else, with caregivers who usually describe coming across an infant in extremis and who may make panicked attempts at resuscitation.

It is the third group that causes most of the difficulties regarding causation. The presence of the triad is taken as

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inferential evidence that the infant has been shaken or subjected to a head impact or impacts that leave no trace. The problem is that, in these cases, there is no direct evidence of the child having been grasped and shaken, or having been subjected to head impacts that had left no marks. The 'proof' of abusive head injury in such cases, therefore, relies on indirect or inferential evidence.

This indirect evidence of causation includes:

- The presence of the triad in definite abusive head injury cases allows an analogy of causation to be extended to cases in the 'indeterminate' group;
- The triad can be reproduced by 'shaking' actions in animals – the problem being that the forces involved in these experiments greatly exceed the forces that can be generated when humans shake infant models;[1]
- Shaking is described in many confession accounts. Lawyers are often suspicious of 'confessions', fearing they may be coerced or conceal other more important information. However, pathologists need to consider these accounts and address whether they match the pathological evidence, leaving the courts to deal with legal niceties;
- There have been hardly any accounts of the triad developing in an infant in a public place. The problem with this observation is one of confirmatory bias – an infant presenting with the triad that appeared to evolve publicly is assumed to have been previously abused and the carer's account of an acute onset of a life-threatening condition is summarily dismissed;
- There is nothing else that can account for the injuries. This 'proof' should never be used. It is better framed as 'I do not know for certain what caused these injuries'.

The reliance on such indirect evidence should be subjected to continuous and critical appraisal in order to avoid miscarriages of justice. Recent observations have established that two aspects of the triad, specifically brain swelling and small subdural haemorrhages, can occur in infants who die of natural causes and who have sustained prolonged cardiopulmonary resuscitation after cardiorespiratory arrest.[2,3] Detailed information regarding this syndrome has yet to be established (for example, the presence and/or extent of retinal and optic nerve sheath haemorrhages), but the similarities between the findings in such cases and some cases of alleged abusive head injury are sufficiently worrying that the courts should be aware of these new developments when they are trying a case of alleged child abuse that falls into the 'indeterminate' category.

In addressing difficult cases, it is also important to understand the tension between the scientific method – which the judiciary sometimes mistakenly believes to be employed by medical experts – and the courts. In general terms, science deals with populations and comparisons of cohorts, and its method attempts to refute established theories; the longer a theory can resist such attacks, the more 'reliable' it is. The scientific method on which this process is based is well-known and the difficulties in applying the method to a single case in court should be obvious. Scientifically 'upheld' theories are used by the pathologist to analyse a given case, but variations between individuals and the many uncertainties in medical diagnosis rarely produce certainty. Thus, through the reports and testimony of experts, science informs the court but tends not to provide definitive proof for the court, particularly when dealing with many types of pathological evidence. The role of the pathologist who reviews an apparent homicide is to present the court with rational and reasonable explanations that could account for the death and to explain to the court the strengths and weaknesses of the various options. Given the complexities, the scientific method rarely provides a single answer in any given case – the 'n-of-1' conundrum that, reminds us that rare things rarely happen but they do happen. This is particularly true in developing areas such as paediatric head injury. It is then up to the court to decide, partly from expert evidence, where – to use a legal term which should perhaps be avoided by the expert – a 'reasonable degree of certainty' lies. In this, judges and juries – and experts – may differ.

Returning to the 'shaken baby', judges and juries should be advised that shaken baby syndrome is a hypothesis that has not been validated and whose original tenets have been undermined (or in some instances disproven) by research, analysis and biomechanical experiments. The mistaken belief that shaken baby syndrome has been scientifically 'proven' has led to profound misunderstandings by the public, the police, the prosecutors, the medical community and the courts, resulting in a shift in the burden of proof from 'innocent until proven guilty' to 'guilty until proven innocent'.

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