

Inflicted head injury in infancy and the wisdom of King Solomon

The timing, mechanism and force, and the likelihood or otherwise of an innocent explanation of inflicted head injury in early childhood was thrown into doubt by three papers by Geddes et al. published in 2001 and 2003. They challenged the generally accepted position that the forces involved in the generation of subdural and retinal haemorrhages in infants are always considerable, and proposed in its place the hypothesis that an infant might suffer a craniocervical injury that caused respiratory disturbance leading to global cerebral hypoxia. The resultant hypoxia, brain swelling, and rise in central venous pressure could cause subdural leakage of blood from intracranial vessels and retinal haemorrhages.

The earlier two (2001) papers looked at patterns of brain damage and neuropathology in a series of 53 children with inflicted head injury who died. The authors reported evidence of microscopic damage to the lower brainstem and upper cervical spinal cord in 13 out of 37 infants less than one year of age within their series of 53. This was in contrast to the relative absence of microscopic changes of diffuse traumatic brain injury in the same infants.

The third (2003) paper reported neuropathological findings in a series of 50 cases comprising 17 intrauterine deaths, three spontaneous abortions, 21 perinatal or neonatal deaths, and nine infant deaths. Although to the naked eye the dura merely looked congested, there was, in many cases, microscopic evidence of bleeding both into and under the dura. The authors present this as evidence that hypoxia was sufficient, in both perinatal and infant cases, to produce bleeding in and below the dura. They suggested that the microscopic bleeding produced by this mechanism could be more severe, if accompanied by hypoxic brain swelling with raised intracranial pressure, features not seen in this series. This exacerbation of the effects of hypoxia was, they suggested, exemplified by microscopic examination of the dura in three cases of inflicted head injury taken from the 53 cases described in their first two papers.

This hypothesis has recently been critically examined by Punt et al.¹ They challenged the reliability of the neuropathological distinction between traumatic and ischaemic injury. They also pointed out that severe non-neurological injuries (41%), skull fractures (43%), and sub-scalp bruising (73%) were very common in the 37 babies in the series of inflicted head injury described by Geddes et al., including all of the three cases of subdural haemorrhage that were scrutinized for microscopic subdural haemorrhage. It seemed highly probable that their deaths were due to violent handling. Punt et al. also point out that the proposed causal chain of events (hypoxia then brain swelling then subdural haemorrhage) was absent in the non-traumatic cases in the 2003 paper of Geddes et al., and that it was clear, in cases of traumatic injury conventionally attributed to shaking or shaken impact, that these complications frequently occurred in the reverse temporal sequence. They

also noted that subdural haemorrhage was not a feature of cases of raised intracranial pressure of any known non-traumatic cause at any time in infancy.

Geddes et al. have now responded² to this analysis by making it clear that they had not suggested that the infants described in their series had died as a result of apnoea leading to hypoxia and brain swelling and then subdural haemorrhage, but merely that their investigations suggested that such a sequence was theoretically possible. Eleven of 37 cases of infants in their 2001 study had either trivial or no sub-scalp bruising and no skull fracture or contemporaneous extracranial injury and in none of these could the authors find evidence that allowed them to be certain that violence had occurred. The authors also maintained that apnoea might have occurred for different reasons such as laryngeal spasm or gastro-oesophageal reflux. 'Non-traumatic events culminating in catastrophic apnoea could, however rarely, produce an identical clinical picture to trauma.'

Geddes et al. have raised important questions even if at times they appear to retreat into non-disprovable hypotheses. This may be frowned upon as science, but it may, nevertheless, be pertinent to criminal proceedings where guilt has to be proved beyond reasonable doubt. With this standard of proof, inappropriate convictions will be avoided but it is also inevitable that some perpetrators will literally get away with murder. Judgements in child care proceedings, by contrast, are decided more on the basis of a balance of probabilities of how the child's interests are best served.

Recent legal judgments in the UK suggest that those outside the medical profession feel that medical certainty in these matters may have been overstated and possibly led to one or more inappropriate convictions. Those who disagree with this view may learn from King Solomon.³ He was considering the case of a child, the child's mother, and another woman whose child had 'died in the night: because she overlaid it'. This woman had subsequently left her dead child with the mother of the living child, taking the living child for herself. King Solomon's judgement, still remembered for its wisdom thousands of years later, concentrated on the interests of the surviving child and not on crime or punishment. Juries need to be certain; paediatricians need to be wise.

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References

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3. The Holy Bible, 1 Kings 16: 28. (King James version)