

The Evidence Base for Shaken Baby Syndrome: Response to Editorial from 106 Doctors



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EDITOR—In challenging the diagnosis of shaken baby syndrome in their recent editorial Geddes and Plunkett make a number of serious errors in interpreting the research on this issue, and they display a worrisome and persistent bias against the diagnosis of child abuse in general.¹

In their opening sentence Geddes and Plunkett describe shaking a child to "produce whiplash forces that result in subdural and retinal bleeding," omitting the most important element in this condition: brain injury itself. They elaborate that the "theory" of shaken baby syndrome rests on some core assumptions, including that "the injury an infant receives from shaking is invariably severe."

This is in conflict with the research of Alexander et al, Ewing-Cobbs et al, Kemp et al, and Jenny et al, who found that 30%-40% of newly diagnosed shaken baby cases had medical evidence of previously undiagnosed head injury.²⁻⁵ These infants had such mild or non-specific symptoms and signs that their trauma was previously not diagnosed. The diagnosis was ultimately made when the children had subsequent severe episodes of abuse, with computer tomographic evidence of both acute and older subdural haematomata and brain injuries. Retinal Haemorrhages

Geddes and Plunkett then consider retinal haemorrhages. Lantz et al, in the same issue, question the specificity of perimacular folds in abusive head trauma in infancy.⁶ They conclude from a literature review that there was no support for the contention that perimacular folds are pathognomonic for abusive head injury. Geddes and Plunkett applied these authors' conclusions not only to perimacular folds but also to retinal haemorrhages.

Although research on the subject of inflicted childhood neurotrauma—over 600 peer reviewed articles—does not claim that retinal haemorrhages are pathognomonic for abuse, it does show that retinal haemorrhages are, overwhelmingly, more common in abuse than in non-inflicted injury. When massive retinal haemorrhages are seen in carefully studied children with non-inflicted major injuries, such as from motor vehicle crashes, crushing head injuries, as in Lantz et al's report, and falls from several storeys, child abuse is not a consideration.

One study analysed these obviously non-inflicted injuries and compared them with abusive head injuries in children under 6 years of age. Severe retinal haemorrhages were seen in 5 of the 233 (2%) children in the non-inflicted group and in 18 of the 54 (33%) in the abuse group.⁷ Retinal pathology from major trauma mimicking shaken baby syndrome is old news.⁸⁻¹⁰ Its

incidence is dramatically lower than that resulting from inflicted head injury and because of the obvious major trauma history it does not present a diagnostic dilemma.

Literature on shaken baby syndrome

To discredit the literature on shaken baby syndrome over the past 30 years, Geddes and Plunkett rely on an article by Donohoe.¹¹ In so doing they have erred in their assessment of the status of the science in the field.

Donohoe's purpose was to examine trends in the quality of scientific evidence. Donohoe used evidence based medicine (EBM) criteria for weighting evidence to judge the comparative merit of published studies published before such criteria were widely embraced by authors, reviewers, and journals. He also plans to apply this process to more recently written articles. He explicitly did not challenge the existence of shaken baby syndrome and, to our knowledge, his review of more recent work has not yet been published. The cited paper reviewed studies published up to six years ago and purposely did not include research that has been published since that time.

One striking limitation of the Donohoe paper is that he used only the keywords "shaken baby syndrome" to search the literature whereas many of the articles on the subject use keywords such as "inflicted childhood neurotrauma," "childhood head injury," "craniocerebral trauma," "inflicted traumatic brain injury," as well as several others. We know of a number of qualified studies that were not included. If the search had been appropriately more inclusive, the resulting conclusions would likely have been quite different.

The application of EBM criteria to judge articles is intended to help physicians discern truth among competing works. The absence of clinical trials and definitive population based studies means lower EBM scores when the work is compared with more definitive work. Low EBM scores, in the absence of more highly regarded work, do not mean that the work is wrong, only that there is room for further research to learn more and that prior conclusions may not be definitive. Many aspects of clinical practice and medical knowledge have not been established with certainty by EBM criteria.

The comparative paucity of well-done population based cohort studies, in the face of a rather large literature of case reports, case series, cohort studies, and case-control studies underscores how hard research in this area is to complete. It also emphasises the need for more research and more government research assistance. Child abuse is a particularly difficult area in which to conduct research. Issues of informed consent, inadequacy of animal models, and the potential legal consequences of participation and telling the truth make this a complicated field.

Short falls in childhood

Geddes and Plunkett claim that "the recent literature contains a number of publications that disprove traditional expert opinion in the field" about short falls in childhood. However, they cite only two publications, and neither disproves the evidence presented in over 25 other studies of short falls in infancy and childhood.

Plunkett cites his own article on fatal falls from short distances in playgrounds, using archived data from various sources.¹² His study has significant problems: the determination of the distances of the falls in the 75 000 cases presented relies on information supplied by the original sources of data and is thus open to question; no infants were studied; several of the falls were

from 7 feet (that is, they were not "short" falls); several of the children had crush injuries or pre-existing conditions; and none of the children had "formal retinal evaluation." Nevertheless, Plunkett and others assert that this study "proves" that short falls can kill and cause retinal haemorrhages.

Contact subdural and epidural haemorrhages may, however, result from short falls.¹⁰ w1 They can occasionally cause severe illness or death from space occupying lesions. Occasionally children with contact injuries due to short falls develop malignant cerebral oedema. Plunkett's fatal cases seem to fall into these categories, as opposed to the whiplash brain injuries associated with immediate concussions seen with severe inflicted head injuries.^{w2} Even if one were to accept his conclusions despite these methodological flaws, the study found that death from short falls was still exceedingly rare ($18/75\ 000 = 0.02\%$). The only other article cited is a review by Ommaya et al that provides no new data and makes sweeping editorial observations unjustified by the literature cited.^{w3}

Biomechanical studies

Geddes and Plunkett end by dismissing animal model studies unless they are "validated against the known mechanical properties of the human infant." How are these properties to be known? How can an investigator measure the tensile strength of the living infant dura, skull, bridging veins, cerebral cortex, and neck musculature? Although more appropriate studies of the mechanical properties of infant animal brain are beginning to be done,^{w4-w7} no current studies reflect the response of infant animal brain tissue to harmonic forces, such as those likely occurring with infant shaking. Although more biologically faithful mechanical models of infants are being constructed,^{w8 w9} they will still only approach the response of living infants to shaking.

Asserting that shaking cannot cause infant brain injury, on the basis of current biomechanical studies is premature. Juxtaposed with these mechanical approximations, there is extensive clinical experience and an emerging literature of confessed shaking causing brain injury in infants.^{w10}

Conclusion

Child abuse is an enormous social, medical, and mental health problem and its evaluation and treatment have far-reaching implications for children, families, and society. To provide optimal diagnosis and treatment, careful objective research and intellectual honesty are needed and must prevail over the entrenchment of ideological schools of thought and "winning" in court. Unfortunately, there remains considerable difficulty for some doctors to accept that children are abused. We must look at these cases using all of the information available, including collected clinical experience and the synthesis of the best literature on the subject.^{w11}

Details of the other 105 signatories are available on bmj.com, as are details of references w1-w11 This letter is signed by another 105 doctors (see bmj.com for details).

Competing interests: None declared.

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