AT ISSUE:

Shaken Baby Syndrome as Portrayed in Pathology Textbooks

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The controversies regarding shaken baby syndrome (SBS) continue to be widely aired and debated in the popular press, reflecting the often intense disagreement within the medical community itself, particularly between forensic pathologists and pediatricians. Among pathologists, the mere existence of shaken baby syndrome as a causal mechanism for abusive head trauma is debated. The reasons for this are unclear. Shaking as a causal mechanism for abusive head trauma continues to be noted in case series, and there is ample indirect supporting evidence. Still, the absence of *direct* evidence for shaking as a causal mechanism of head trauma in children continues to be proffered as sufficient reason to summarily discount it (Gill et al., 2009). Of greatest concern is the vehemence of pronouncements from individuals in the mainstream medical community who deny that shaking without direct impact can cause abusive head trauma, reinforcing the presumed accuracy of such claims to the uninformed.

To better understand the information available for professional practice, we reviewed what has been written about shaken baby syndrome in some currently available pathology textbooks. Legal professionals and medical students often consult textbook chapters under the assumption that they represent the best available knowledge on the topic. Yet, these books may not be consistently peer reviewed and may reflect biases of the authors or editors. In this article, we have limited our review to books that are readily available in the fields of general pathology, neuropathology and forensic neuropathology. We apologize in advance if we have overlooked other important books.

Reviewing Currently Available Texts

DiMaio, D., & DiMaio, J. M. (2001). *Forensic Pathology*, 2nd ed. Boca Raton, FL: CRC Press; Taylor & Francis.

In an older book that is still widely used, DiMaio and DiMaio unapologetically state that SBS doesn't exist. They state as fact many ideas that are unproven, such as the following: "the unchallengeable detection of impact trauma in cases alleged to be due to SBS" (p. 360). Later, they talk about the rare case of traumatic intracranial bleeding in children where there is no evidence of impact, stating, "The authors have seen numerous cases of witnessed impact involving both adults and children who subsequently died of head trauma in which there was no evidence of impact in the scalp or skull at autopsy" (p. 361). The book includes an entire paragraph on how the absence of neck injuries precludes the existence of SBS, but without explicit references or experimental evidence. The authors also assert that people charged with injuring a child would confess to shaking a baby rather than admit to slamming the baby's head against a firm surface or throwing the child "across the room like a football" (p. 360). They conclude, "The authors have grave reservations as to the existence of SBS" (p. 362).

Dolinak, D., Matshes, E. W., & Lew, E. O. (2005). *Forensic Pathology*. Burlington, MA: Elsevier.

Forensic Pathology has a well-referenced, excellent discussion of child abuse. It also has a section dedicated to the SBS controversy. This probably represents the mainstream opinion of forensic pathologists today, who believe that significant impact has occurred in most cases of inflicted head injury, whether or not it can be demonstrated. And yet, they "do not discount that severe shaking may be harmful to an infant" (p. 388). Their discussion should probably be read by anyone who testifies in court on these cases.

Whitwell, H. L. (2005). *Forensic Neuropathology*. London: Hodder Arnold.

Forensic Neuropathology was published in England. The authors have dedicated a section to the shaking versus impact controversy in their chapter on head injury in children. The tone of the review implies that shaking probably doesn't exist, but they acknowledge that some professionals believe it does exist. The authors appear to stay above the fray, and the review of abusive head trauma is otherwise adequate and surprisingly readable.

Spitz, W. U. (Ed.). (2006). *Spitz and Fisher's Medicolegal Investigation of Death*, 4th ed. Springfield, IL: Charles C. Thomas.

Among the general forensic pathology textbooks, *Spitz and Fisher's Medicolegal Investigation of Death* is the venerable old timer now available in a revised edition. It includes a comprehensive discussion of pediatric head trauma, and overall it offers a well-balanced view of the major issues in the subject, including a critique of Plunkett's (2001) oft-cited paper on short falls. The chapter, written by Marvin Platt, Werner Spitz, and Daniel Spitz, covers major autopsy findings, such as the significance of the presence or absence of skull fractures, subarachnoid and subdural hemorrhage,

injury to the brain, retinal hemorrhages, and comments on the presence or absence of a lucid interval. Although the authors tread carefully between the shaking versus nonshaking camps, a glimpse of their bias can be seen in the first paragraph of the discussion: "The mechanism associated with shaken baby (impact) syndrome is forceful shaking, causing the head to jerk back and forth followed by impact, against a surface such as a wall or floor, sometimes a piece of furniture, other times a firm cushion or other type of upholstery" (p. 376).

Oehmichen, M., Auer, R. N., & König, H. G. (2006*). ***Forensic Neuropathology and Associated Neurology***. Berlin; Heidelberg; New York: Springer-Verlag.**

Forensic Neuropathology and Associated Neurology is a German text, with ponderous language and comprehensive detail. It has a chapter on the physical abuse of children, which goes into great detail on SBS. The authors don't question the existence of SBS and, indeed, point out that SBS is a diagnostic consideration in children with intracranial findings, retinal hemorrhages, and so on. In addition, they discuss each major physical finding and the arguments for and against it being diagnostic of SBS.

Itabashi, H. H., Andrews, J. M., Tomiyasu, U., Erlich, S. S., & Sathyavagiswaran, L. (Eds.). (2007). *Forensic Neuropathology: A Practical Review of the Fundamentals*. Burlington, MA: Academic Press.

Forensic Neuropathology: A Practical Review of the Fundamentals is a modern book written by staff at the Los Angeles County Medical Examiner-Coroner's Office. It is a comprehensive review of all aspects of neuropathology, and it has sections that are technical to the point of being hard to read. Rather than discussing the controversies on abusive head trauma, the chapter on child abuse is a lengthy exposition on the process to be used when evaluating these cases, including an entire section on the best approach to writing the report. It even includes a list of questions to ask in individual cases. The authors suggest the importance of going to conferences, including the bi-yearly conference on SBS, to maintain up-to-date knowledge on the state of the blunt impact versus shaking controversy. They appear to want readers to know what information is current, but seem not to want the responsibility of guiding a reader's conclusions in individual cases. They also seem to assume a position of neutrality, apparently not wanting readers to conclude they favor one position over the other.

In the chapter on child abuse, the section on subdural hemorrhage consists of one paragraph that refers to other chapters in the book, or directs readers to the medical literature to the latest trend in the SBS controversy (p. 205). The discussion on the various pathologic findings in abusive head trauma does not have a specific focus on child abuse, with the exception of retinal hemorrhages. The references are comprehensive, but they exclude authors who have published data contradicting SBS, such as Plunkett and Leestma.

Love, S., Louis, D. N., & Ellison, D. W. (Eds.). (2008). *Greenfield's Neuropathology*, 8th ed. London: Hodder Arnold.

Among the specialized neuropathology titles, an often-consulted and comprehensive book is *Greenfield's Neuropathology*. This is a traditional, weighty two-volume text with at least a cursory mention of "everything" a neuropathologist needs to know. The chapter on trauma was written by two neuropathologists and a neurosurgeon and covers the basics of traumatic syndromes and the molecular consequences of trauma. However, its discussion of shaken baby syndrome is cursory and noncommittal. It does say that current concepts of the syndrome are being reviewed, that it is rare, and that each case should be analyzed on its individual circumstances.

Leestma, J. E. (2009). *Forensic Neuropathology*, 2nd ed. Boca Raton, FL: CRC Press; Taylor & Francis

Forensic Neuropathology unabashedly argues against SBS. The chapter titled "Child Abuse: Neuropathology Perspectives" is really Leestma's critique of the literature and his reasons for not believing that SBS is a serious diagnostic consideration in the absence of impact injury to a child. The section on SBS is titled "The So-Called Shaken Baby Syndrome" (p. 596). He goes into exquisite

detail outlining what he thinks are the flaws in the papers supporting SBS. He describes in even more detail the content of papers that do not support SBS. He also says that research experiments do not prove the existence of SBS and are hampered because of ethical issues associated with studying real babies rather than dummies or computer models.

He does allow himself some wiggle room when he says, "Does this criticism mean that there is no such thing as injury in connection with shaking (in the absence of impact)? Not at all" (p. 606). He finishes with a description of all the rare conditions that could cause what are, at first impression, traumatic head injuries, and how, when an infant is brought to medical attention, these rare diseases "become less so in the context of the evaluation of child abuse…" (p. 607). This also contradicts his past work, when he wrote that SBS was a noncontroversial entity (Chapter 11, "Forensic Neuropathology," in *Neuropathology: The Diagnostic Approach*, edited by Julio Garcia, Mosby, 1997).

Troncoso, J., Rubio, A., & Fowler, D. (Eds.). (2009). *Essential Forensic Neuropathology*. Philadelphia, PA: Lippincott, Williams & Wilkins.

Essential Forensic Neuropathology is an edited text written by multiple authors. The chapter on abusive head trauma and the neuropathology of brain trauma in infants and children was written by Dragovic and makes no attempt to obscure its slant. In discussing the controversy between nonimpact versus impact in SBS, he writes the following: "The concept, albeit not supported by an adequate objective postmortem evaluation, has grown into a major misconception among professionals in clinical medicine, with a rather widespread notion of its absolute prevalence as the most important form of brain injury in physically abused infants and small children" (p. 181). In one fell swoop of the pen, and without citing any evidence, he essentially claims that clinicians are imagining things.

Considering the currency of this book, his failure to cite important recent studies is distressing. Such studies include the work of Roth, Raul, Ludes, and Willinger (2007), which uses mathematical models to demonstrate that subdural hemorrhage can plausibly occur after shaking. Dragovic does stop short of saying that SBS doesn't exist, but he preferentially cites papers that argue against diffuse axonal injury, subdural hemorrhage, and retinal hemorrhage being indicators of SBS.

Implications for Practice

The discussion of abusive head trauma and, in particular, SBS, varies widely in the currently available pathology textbooks. Medical students, residents, practicing physicians, and attorneys are confronted with significant variations in the information about SBS in these sources. If professionals rely solely on the textbooks, they are left in a state of limbo, believing there is legitimate controversy regarding SBS as a causal mechanism in severe head trauma in children. Clearly, all concerned will need a much deeper understanding of SBS beyond that which is currently being provided if the dynamic science regarding SBS is to be properly understood and integrated into practice.

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