

Commentary on: Sauvageau A, Bourgault A, Racette S. Cerebral traumatism with a playground rocking toy mimicking shaken baby syndrome. *J Forensic Sci* 2008;53(2):479–82.

Sir,

This letter is in response to the recent manuscript listed above and written by Sauvageau et al. (1). It is clear from the description of the event and the resulting trauma that the child sustained an impact to the forehead; however, the authors additionally link the child's trauma to the preceding "intense violent rocking" of the child on the playground equipment that occurred prior to the impact event. In this way, the authors label the injury as a "shaking-impact" event. The authors devote a considerable portion of the manuscript to the description of the biomechanics of shaking and state that "to be able to evaluate if the given history could have generated similar forces to shaken baby syndrome (SBS), a good understanding of the biomechanical forces that come into play to create SBS classic triad is thus mandatory" (emphasis added).

Unfortunately, the authors do not heed their own advice. A biomechanical analysis of a specific injury-producing event requires characterizing the loading environment, understanding the injury mechanisms present in the observed pathologies, and determining whether or not the loading environment exceeds the injury tolerance values for the observed pathologies. In this way, a quantitative and objective measure of the potential for various trauma in that specific environment can be made based on the laws of physics and the underlying mechanics of the various trauma.

Although poorly documented in terms of a biomechanical analysis, this case study is clearly one of an impact event. However, against their own admonition, the authors make no attempt to quantify the loading environment or to estimate and compare the forces exerted on the child's head during the "intense violent" rocking of the ride and the forces generated during the impact. While provocative, the phrase "intense violent rocking" is meaningless from a biomechanical perspective — the accelerations generated during that activity and the subsequent impact event could be directly measured or analytically estimated. The mechanical characteristics of the rocking and impact events differentiate them physically and result in the impact event generating far greater head accelerations than the rocking or "shaking" event. This has been demonstrated in the biomechanical literature by several investigators, including the authors of this response (2–4). If one reads the biomechanical and scientific literature on the subject, one will realize that not a single study has been published that demonstrates that the loads generated during "shaking" can exceed the injury thresholds for the "classic triad." Not a single published study exists that demonstrates the necessity for shaking to precede an impact for that impact to cause injury (the so-called shaking-impact syndrome). Additionally, to our knowledge, not a single witnessed case of SBS resulting in "classic triad" injuries has been published.

It is simply false to state, as the authors do, that there are no injury tolerance values for the pediatric population. These values are published in the literature (5–15) and continue to be investigated. Are these data used routinely to develop safety systems for the pediatric population (helmets, child car seats, etc.), somehow insufficient to evaluate the potential for trauma when evaluating cases of "nonaccidental" injury? Of course they are not, and the ongoing research in this important area will continue to define and

refine these data. The same statement can be made for the use of anthropomorphic test devices in the investigation of pediatric trauma. To state that "most authors" believe that these test techniques and experimental methods are "faulty" is naïve at best. If the authors truly believe this, then they should present evidence on the contrary, with specific peer-reviewed scientific and engineering references that demonstrate the fallacy of these methodologies and technologies. To do otherwise is to repeat the current mantra of the SBS faithfully without "mandatory" understanding of the phenomenon one is reporting.

Ironically, the authors of this case study have demonstrated that a seemingly "minor" impact event (i.e., not a multi-story fall or a high-speed motor vehicle accident) can generate the fatal pattern of trauma often cited as the "classic triad" of SBS. They have also demonstrated that an ostensibly identified "shaking-impact" event can occur with a documented lucid interval, another finding thought not to occur in cases of shaking. All of this is the result of the authors' attempt to insinuate the well-worn mantra of SBS in a case of impact. In doing so, they have demonstrated that the "classic triad" is nothing more than a general collection of intracranial pathologies that result from head trauma. According to the authors, SBS has "stood the test of time"; however, their case study does nothing more than undermine the exclusivity of the "classic triad" by demonstrating that it can occur from a relatively "minor" impact event.

In the interest of brevity, we respectfully conclude these comments by stating that the peer review process has failed the Scientific Community in this instance and the authors should open their minds with regard to their approach in analyzing each case before arriving at conclusions. The death of a child is a tragic event and the records of that event should be thoroughly evaluated and not illogically shoe-horned into the SBS paradigm.

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