

## A89 Differentiating the Skeletal Trauma Resulting From Pediatric Simple Short Falls Compared With Physical Abuse: A Retrospective International Multicenter Pilot Study

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**Learning Overview:** After attending this presentation, attendees will have an improved understanding of the differences in skeletal fracture patterns and types that result from Simple Short Falls (SSFs) compared with physical abuse.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by strengthening the evidence base for the interpretation of traumatic injuries resulting from blunt impact loads in complex fatal pediatric cases. This presentation will also highlight the value, and necessity, of multidisciplinary and multicenter approaches to trauma analysis in forensic anthropology and create awareness of the Registry of Pediatric Fatal Fractures (RPF).

Differentiating the skeletal trauma that results from accidental SSFs with physical abuse is complex, as both events result in a blunt impact load and thus are biomechanically alike. Due to the relative rarity of these events resulting in fatality, the evidence base for skeletal trauma resulting from these blunt impact loads has remained limited to anecdotal studies; with many of the current findings non-substantiated or unclear. As such, it remains difficult to differentiate the skeletal trauma resulting from fatal SSFs with fatal physical abuse blunt impact loads. The aim of this pilot study was to use a multicenter approach to investigate if there were differences in the patterns and types of fractures resulting from physical abuse and SSF blunt impact loads.

Cases of fatal pediatric (<10 years) blunt impact loads resulting from physical abuse and SSFs ( $\leq 1.5$ m) were retrospectively collected from the Victorian Institute of Forensic Medicine (Australia), Institut Médico-Légal de Paris (France), Great Ormond Street Hospital (England), and University of Pretoria (South Africa). Postmortem computed tomography scans and/or skeletal surveys were reviewed for each case to document the location and morphology of fractures. Intrinsic and extrinsic variables were recorded from forensic pathology and radiology reports, police reports and, where relevant, coronial findings. Fractures were analyzed using descriptive statistics.

Five SSFs and 18 physical abuse cases met the study inclusion criteria. Fractures occurred in 2 (40%) of the SSFs and 11 of the physical abuse blunt impact loads. The SSF cases exhibited fractures only to the skull, while physical abuse cases exhibited cranial and post-cranial fractures; 73% ( $n=8$ ) located only in the skull, 9% ( $n=1$ ) only in the post-cranial, and 18% ( $n=2$ ) located in both. In the cases of SSFs, only a single skull bone fractured as a result of the blunt impact, while in the physical abuse cases, fracturing involved more than one skull bone in 60% of the cases with skull fractures. Skull fracture types were simple linear in cases of SSFs, while comminuted, simple linear, multiple linear and diastatic fractures were found to result in the physical abuse cases.

Fatal blunt impact loads resulting from SSFs and physical abuse are rare events. Given the relative rarity of such cases, this pilot sample was small and, consequently, conclusions drawn from the data may only be considered anecdotal. At the simple descriptive level, fractures identified in this pilot study strengthen the current anecdotal evidence base that, while different types of fractures may occur to all aspects of the skeleton in cases of physical abuse blunt impact loads, typically only linear fractures of the skull result from SSF blunt impact loads. To move beyond an anecdotal evidence base, the data collected from this pilot ( $n = 23$  cases) form the foundation of the RPF. Augmentation of the RPF with additional multicenter contributions would allow the descriptive findings of this pilot to be validated.

### Pediatric Skeletal Trauma, Blunt Impact Load, Multicenter Trauma Registry