



Physical Anthropology Section - 2014

H54 Pediatric Cranial Fracture Patterns in Cases of Head Trauma Resulting in Death

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After attending this presentation, attendees will understand cranial fracture pattern differences between pediatric homicides and severe accidents (falls from heights and crushing injuries, such as a flat screen TV falling on an infant). The distribution of fracture types, the common fracture site, the number of bones fractured in each case, the average number of fractures, and the frequency of cases where fractures crossed sutures will be presented.

This presentation will impact the forensic science community by providing medicolegal death investigation experts (such as forensic pathologists, coroners, forensic anthropologists, and medical examiner investigators), as well as child protective services professionals, very recent data that may help in the interpretation of potential causes for pediatric cranial trauma.

In medicolegal death investigations, current techniques for interpreting pediatric cranial trauma are of questionable reliability due to a lack of baseline data that matches pediatric cranial fracture patterns with known impact scenarios. The current research addresses this significant gap in best practice through a multidisciplinary effort to collect data on human pediatric deaths involving blunt force cranial fracture and known impact scenarios from current forensic case files at medical examiner offices across the country with an ultimate goal of establishing a national website of such data (The Pediatric Cranial Fracture Registry).

A total of 66 head trauma cases involving children (37 boys and 29 girls) with clear autopsy photographs and/or diagrams of sustained cranial fractures were analyzed. In 55 cases, the manner of death was homicide due to blunt force trauma and/or cranio-cerebral injury. The mean age was 11 months. In 11 cases the manner of death was accident (six cases were crushing accidents, such as a flat screen TV falling on an infant; five cases were falls from heights). The mean age of this group was 2 years.

The distribution of fracture types for homicides was: 73% multiple or complex; 22% single linear; and, 5% comminuted. In accidental cases, 100% of the fractures were multiple or complex. The frequency of accident cases with diastatic fractures was 91%, whereas only 43% of homicides displayed diastatic fractures. Basilar fractures were observed in 91% of the accident cases but in only 2% of homicides. In 91% of accident cases fractures were crossed sutures compared with only 38% of homicide cases.

The number of cranial bones fractured in each case can be a measure of injury severity. In accidents 0% of cases displayed one fractured bone, 27% two fractured bones, 9% three fractured bones, 37% four fractured bones, and 27% five fractured bones. In contrast, homicides displayed one fractured bone in 24% of cases, 29% two fractured bones, 29% three fractured bones, 13% four fractured bones, and 5% five fractured bones.

Analysis of the fracture sites in accidents indicated the parietal bone was the most commonly fractured bone (81% of cases), followed by the frontal (73%), temporal (64%), sphenoid (64%), and the occipital (45%). In homicide cases, the parietal bone was again the most commonly fractured bone in 82% of cases, followed by the occipital bone (58% of cases), the frontal bone (25%), the temporal bone (22%), and finally, the sphenoid (5%).

The percentage of accident cases by fracture number (including segments of a complex fracture) was: 27% of cases displayed one fracture; 9% two fractures; 0% three fractures; 0% four fractures; 0% five fractures; 0% six fractures; 0% seven fractures; 18% eight fractures; 9% nine fractures; and, 37% ten or more fractures. In homicides, 22% of cases displayed one fracture, 13% two fractures, 15% three fractures, 9% four fractures, 13% five fractures, 4% six fractures, 4% seven fractures, 4% eight fractures, 7% nine fractures, and 9% ten or more fractures.

This study showed that accidental pediatric deaths involving severe falls and crushing accidents involved more: basilar fractures, diastatic fractures, multiple or complex fractures, fractures crossing sutures, fractures in the frontal, temporal and sphenoid bones, total fractures, and bones fractured per case.

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