G72 Investigations and Eye Findings in Crush and Other Accidental Traumas in Lethally Injured Infants and Children

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After attending this presentation, attendees will understand the extent of systemic and ocular findings in a group of injured children as well as the histories and investigations leading to the conclusion that the children were accidentally injured as a basis for comparison with their cases. Crush injuries of the head are a subset of accidental trauma but in this group they did not have extensive ocular injuries.

Observations have been the basis of the scientific study of phenomena for many years. Presentation of these observations allows others to consider and compare the material with personal experience and the literature, validate the observations, use them as a basis for making determinations in their own cases. Our "cases" impact the family members of that part of humanity which is affected by our determinations. The more scientific they are, the better our determinations should be for the forensic sciences and humanity.

Attendee can know the extent of systemic and ocular findings in a group of injured children as well as the histories and investigations leading to the conclusion that the children were accidentally injured. Attendee can be aware that crush injuries of the head may be a subset of accidental trauma with more extensive ocular injuries.

Concerns are sometimes raised because infant and child deaths are attributed to abusive injuries when explanations of caretakers are not accepted as sufficient to cause death. The following is a review of 35 cases in which the explanations of the events leading to the fatal injuries were regarded as adequate. It was concluded that the children were accidentally injured.

A prospective ocular and systemic study of infants and children was undertaken at the Southwestern Institute of Forensic Sciences between 1981 and 1989. The study group included 169 infants and children. Death was attributed to accidental injuries in 35 of the children.

Most of the accident deaths were attributed to non-abusive head injury, 18 cases. Six children were unrestrained passengers involved in motor vehicle collisions. The heads of two of these six were partially out of the vehicles during rollovers. Four other children were run over by motor vehicles, two were ejected from the vehicles prior to being run over. The other two were upright pedestrians. Four children fell: one fell from a second story window to concrete, another from an unknown height to a conglomerate patio. Two others were standing, on a washing machine and a bed above concrete floors, and fell onto their heads. One was ejected from a motorcycle. One child was being carried on a bicycle by an adult who fell on top of her when the bike hit an obstacle. A child's stroller rolled downhill and collided with a wall; a respiratory tract infection contributed to that death. The eighteenth child suffered a gunshot wound of the head and the ipsilateral eye was examined.

Analyzing the pattern of autopsy findings by the mechanism of injuries allows the identification of a subset of children with crush injuries of the head. Crush injuries were defined by the presence of extensive skull fractures and head deformity. Five of the six passengers had such injuries including the two with heads out of the vehicles during rollovers. All four of the children who were run over by vehicles had crush injuries. None of the other nine children had such extensive head injuries ©© one of the passengers in a motor vehicle collision, the four children with falls, the child ejected from the motorcycle, the child on the bicycle, the child in the stroller, and the child with the gunshot wound.

However, only four of the children with crush injuries had ocular hemorrhages. Retinal hemorrhages were seen near the optic disk in one of the two children whose heads were partially out of the vehicle when it rolled. Impact was a significant component of the injury mechanism in this child. More extensive retinal hemorrhages were found in three children. The hemorrhages included the superficial retina under the internal limiting membrane and the macula in two children who were run over at relatively low speeds and one of the unrestrained back seat passengers. Impact probably contributed to the injuries in the two children who were run over. Impact was a more significant component of the injury mechanism in the back seat passenger.

Although extensive skull fractures and head deformity was not seen with falls, two of the four had retinal hemorrhages — the two who fell the greatest distance. One of these two had hemorrhages at the ora serrata and under the internal limiting membrane as well as the disk and macula. The other's retinal hemorrhage were limited to the optic disk and macula. Similar findings were seen in one of the unrestrained passengers. The child who was ejected from the motorcycle and the child who fell from the bicycle both had retinal hemorrhages limited to the optic disk. All of these children had significant impact components in the mechanisms of injury

The other seventeen accidental deaths were attributed to less traumatic but equally lethal injuries. Nine children had asphyxial deaths: four positional, three overlays, and two aspirations. Eight children drowned: three were unattended in bathtubs, two were in pools, and one each into a bucket, a creek, and a live birth into a commode. Not surprisingly, none of these children had ocular injuries, subdural hemorrhages, or skull fractures.

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Conclusions: Thorough investigation of history and scene circumstances coupled with a complete autopsy including ocular examination will allow identification of patterns of accidental injury. In this group approximately half of the deaths (eighteen) were the result of head injuries. A subset of more severe head injuries with multiple fractures and deformity were seen in nine of the children involved in motor vehicle collisions as passengers and as pedestrians in this series. Retinal hemorrhages were found in four of these children. Impact as well as crush mechanism was involved in the injuries. Five of the other nine head injured children also had retinal hemorrhages and all of these had significant impact injuries. In this group impact injuries were a confounding variable.

Head and ocular injuries were not found in the other seventeen deaths in this series. The presence of such injuries would be inconsistent with the explanations of the traumatic mechanisms and would have required additional explanations before the deaths could be regarded as accidental.

Retinal Hemorrhages, Accidental Head Injury, Accidental Injury

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