



H177 A Medical Examiner's Office Review of Mechanisms of Injury in Crush-Related Deaths

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Learning Overview: The goal of this presentation is to show attendees how rare traumatic asphyxia is reported and what other mechanisms of injury are named in crush-related deaths.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by indicating what mechanisms of injury pertain to crush-related deaths.

Entrapment from cars, trees, and other work-related machinery producing crushing injuries and traumatic asphyxiation are rare.^{1,2} Traumatic asphyxia, also known as crush or compression asphyxia, is caused by external pressure on one's body that compresses the chest and abdomen, preventing respiration, the uptake of oxygen, and removal of carbon dioxide.³

Typical pathological findings in such asphyxia deaths include petechiae of the face, neck, and upper chest, congestion, cyanosis, subconjunctival hemorrhaging, edema, and abrasions. In the blunt force trauma deaths, rib, sternum, and spine fractures, lung contusions, transection of the aorta, and lacerations to organs may be found. At autopsy, the pathologist may find evidence of asphyxia and blunt force trauma. This may cause discrepancies as to how the cause is to be certified. In a retrospective study of cases brought into the Dutchess County Medical Examiner's Office over a 14-year period, 17 out of 11,260 (0.15%) cases were identified in which an individual was crushed by a heavy object. This study was specifically interested in what were the mechanisms of death. In this review, this study found five cases (29%) were certified as due solely to crush/compressional asphyxia, nine cases (53%) to blunt force trauma, and three deaths (18%) attributed to a combination of the traumatic asphyxia and blunt trauma. Three examples are presented below.

Case 1: A 19-year-old male was found pinned under a vehicle after a scissor jack collapsed. The deceased was last seen alive by his grandmother 25 minutes prior to finding him. Autopsy findings noted abrasions of the upper abdomen, petechiae on the face, neck, and upper chest, and mild brain edema. The medical examiner ruled his death an accident by compressional asphyxia.

Case 2: A 57-year-old male was crushed by a cinder block-making machine on the job. The deceased was working on the machine when it trapped him between a metal brace and a metal plate holder. A coworker witnessed the event and immediately hit the emergency break to reverse the machine. Autopsy findings noted patterned abraded contusions of the chest and back, fractures of the sternum and multiple ribs, bilateral hemothoraces, bilateral lung contusions, and transection of the aorta with hemorrhaging. The medical examiner ruled his death an accident by crushing injury to the chest with thoracic fractures and injuries to the lungs and aorta.

Case 3: A 58-year-old male was pinned by a steel beam at a construction site. The deceased was operating an excavator while demolishing a building when a roof beam fell from the collapsing building and entered the cab of the excavator. A coworker filmed the event as it proceeded. Autopsy findings noted petechiae of the eyelids, conjunctivae, face, neck, and upper torso, and depressed right chest wall associated with right rib cage fractures. The medical examiner ruled his death an accident due to a combination of blunt impact injuries of the chest and compressional asphyxia.

Conclusion: Traumatic asphyxia can occur under varied circumstances. In these cases, scene investigation may help the forensic pathologist reconstruct the sequences of events, provide insights as to why the decedent was unable to escape, and how quickly the circumstances transpired. An estimate of the period of survival may be assessed by witness accounts and the injuries discovered at autopsy. In addition to hallmark features that help medical examiners determine mechanism of death, one should consider whether a reflex closure of the glottis occurred, as has been speculated by Byard et al. (i.e., when there is torso compression, the glottis closes from reflex deep inspiration).⁴ This reflex produces an increase in central venous pressure, which results in suffusion of the head.⁵ Such reconstructions and examinations into mechanisms of death have practical applications toward preventing work-related accidents as well as for future legal proceedings. For example, forensic pathologists may be called to opine in civil litigations as to whether there was conscious pain and suffering at the time of the event. In review of the cases, this study found a significant number of these deaths involved blunt force trauma and the minority purely traumatic asphyxiation.

Reference(s):

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Traumatic Asphyxia, Blunt Force Trauma, Crushing Deaths