H83 A Retrospective Study of the Histologic Features and Scene Investigation in the Differential of Homicidal and Accidental Childhood Asphyxial Deaths

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After attending this presentation, attendees will understand that an autopsy and investigation of childhood asphyxial deaths can likely benefit from a better histologic examination.

This presentation will impact the forensic science community by narrowing the gap of uncertainty when certifying childhood asphyxial deaths.

Childhood asphyxial deaths, one of the leading causes of trauma deaths in this age group, present many challenges for forensic pathologists and investigators.[1]

Distinguishing between childhood homicidal and accidental asphyxial deaths requires an exhaustive investigation. While extensive external injuries may be present to raise the suspicion of homicidal asphyxia, often these injuries are minimal or absent. In addition, no set of histologic criteria is pathognomonic for asphyxial deaths, nor are there distinct findings to differentiate between homicidal and accidental deaths. Rather, the diagnosis is often based on scene investigation, including suspect and witness statements.

In an attempt to identify histologic features that can better aid the forensic pathologist in assigning the cause and manner of death, this pilot study looked at routine lung sections taken from childhood asphyxial deaths (ages three days to five years old). Hematoxylin and Eosin (H&E) and iron stains from 20 homicidal cases, 16 accidental cases, and 18 non-asphyxial cases (controls) were blindly assessed by three forensic pathologists. Eight specific lung histologic features were graded with a score from zero to four, based on published criteria.[2,3] The eight graded features include hemosiderin-laden macrophages, intraalveolar hemorrhage, intraalveolar hyperexpansion, pulmonary edema, septal/interstitial hemorrhage, interstitial edema, interstitial emphysema, and alveolar collapse.

Three histologic features (presence of hemosiderin-laden macrophages (average scores of 1.17, 0.42, and 0.74 for homicidal, accidental, and control cases, respectively; septal/interstitial edema (0.87, 0.44, and 0.26 for homicidal, accidental, and control cases, respectively); and interstitial emphysema (0.82, 0.42, and 0.57 for homicidal, accidental, and control cases, respectively)) were more prominent in homicidal asphyxia cases compared to accidental and control cases in the pilot study. While this data is not quite statistically significant between homicidal and accidental cases (p-values of 0.06, 0.06, and 0.08, respectively), the reviewers reliably demonstrated increased agreement on these three features. The five remaining histologic features did not demonstrate clear differences between homicidal, accidental, and control cases.

Due to the limited specific findings during an autopsy or investigation, childhood asphyxial cases continue to present many challenges to the forensic pathology community. Definitive evidence, scene investigation, and witness statements are needed to correlate with the autopsy findings. Currently, the only definitive evidence when assigning homicide as the manner of death is a confession by the suspect or credible witness statements, if a confession is not given. If neither a confession nor credible witness statements are given, pathologists and investigators must rely solely on their autopsy and scene findings to best determine the cause and manner of death. The same is true of accidental asphyxia.

The eight histologic features described here prompt further evaluation and comparison in a larger cohort to see if the presence of these specific features can help forensic pathologists when assigning the cause and manner of death. In addition, further studies are warranted to determine if particular autopsy techniques, such as inflating the lungs with formalin before cutting sections to be submitted for histologic evaluation, can help forensic pathologists better certify asphyxial deaths.

In summary, as one of the leading causes of traumatic deaths in children, evaluation of asphyxial deaths can likely benefit from a better histologic examination. This pilot study attempts to narrow the gap of uncertainty when certifying childhood asphyxial deaths.

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