



Young Forensic Scientists Forum— 2019

Y9 Are Intra-Alveolar Hemorrhage and Aspiration of Bacterial Colonies Pathognomonic in Asphyxia by Suffocation in Infancy?

*Cara A. Mitrano**, Midland, MI 48642; *L.J. Dragovic, MD*, Oakland County Medical Examiner's Office, Pontiac, MI 48341; *Andrew Hanosh, MD*, Oakland County Medical Examiner's Office, Pontiac, MI 48341; *Bernardino Pacris, MD*, Oakland County Medical Examiner's Office, Pontiac, MI 48341; *Ruben Ortiz-Reyes, MD*, Oakland County Medical Examiner's Office, Pontiac, MI 48341; *Kanubhai P. Virani, MD*, Oakland County Medical Examiner's Office, Pontiac, MI 48341

Learning Overview: After attending this presentation, attendees will understand: (1) histological findings present in cases of infant death due to asphyxia by suffocation, (2) the mechanism of death that supports these findings, (3) key techniques in slide analysis, and (4) how to apply these lessons in the context of death investigation.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by illuminating a relationship between intra-alveolar hemorrhage, freshly aspirated bacterial colonies, and infant death due to asphyxia by suffocation. The distinction is critical in medicolegal death investigation that is case-specific. When an infant is discovered unresponsive, it is typically rushed to the nearest emergency room facility, resulting in a disturbed scene of death. Physical findings documented at the scene are compared with those documented at the time of autopsy. The rather randomly reported microscopic findings of sub-pleural and intra-alveolar hemorrhage and freshly aspirated bacterial colonies in the alveolar space (without signs of inflammatory response) are useful in diagnosing asphyxia by suffocation. Results of this study provide an additional diagnostic tool that improves the accuracy of investigation and determination of cause and mechanism of death.

The purpose of this study was to examine intra-alveolar hemorrhage and freshly aspirated bacterial colonies as possible pathognomonic findings in cases of infant asphyxia by suffocation. To study this relationship, a review of autopsy materials (1970–2017) archived at the Oakland County Medical Examiner's Office (OCMEO) was conducted and revealed 1,161 infant deaths. Available histological slides were examined independently by multiple pathologists for evidence of intra-alveolar hemorrhage and freshly aspirated bacterial colonies. The independent review by multiple parties was necessary to determine the statistical significance of these findings in cases of infant death due to asphyxia by suffocation. The year 1992, when mandatory thorough death scene investigation was fully implemented in Oakland County, led to discontinuation of the diagnosis of Sudden Infant Death Syndrome (SIDS). This energized efforts in prevention of infant deaths through implementation of safe sleep environments and detailed documentation of evidence at the scene of death using re-enactment. In these cases, histological findings with consensus among reviewers were compared to autopsy reports and notes from scene investigations. This provided full context of each case. Cases of infant asphyxia were then compared to infant deaths due to other causes as controls.

Preliminary findings indicate that intra-alveolar hemorrhage is present in most cases of infants suspected of dying from asphyxia by suffocation. Freshly aspirated bacterial colonies are frequently accompanying, though somewhat less common. No significant morphologic difference has been observed in cases of accidental vs. homicidal asphyxia by suffocation. These findings provide additional information to pathologists and death investigators seeking clarification in cases of infant death due to asphyxia by suffocation, especially in the absence of evidence supporting another cause of death. In conclusion, intra-alveolar hemorrhage and freshly aspirated bacterial colonies are useful in determining cause of infant deaths due to asphyxia by suffocation.

Infant Death, Asphyxia, Intra-Aleveolar Hemorrhage