H25 Evaluation of the Presence and Distribution of Leptomeningeal Inflammation in Cases of Sudden Death in Infancy

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After attending this presentation, attendees will better understand the relevance of the presence of inflammatory cells and iron in the leptomeninges of infant brains.

This presentation will impact the forensic science community by providing a baseline for comparison of neuropathologic findings in infant brains, specifically the degree of inflammatory infiltrates and iron in the leptomeninges of infants with no evidence of trauma and generally covered by the Sudden Infant Death Syndrome/Sudden Unexpected Death in Infancy (SIDS/SUDI) designation.

Prior research has demonstrated that the leptomeninges of infants and late-term fetuses derived from a hospital-based (non-traumatic) cohort contain a surprisingly large number of inflammatory cells and stainable iron. These observations were present irrespective of the findings from the general autopsy and neuropathologic examination and irrespective of the mode of delivery. A similar methodology was sought to a more forensically relevant population, specifically infants whose deaths are broadly classified as SIDS/ SUDI.

Forty-two SIDS/SUDI cases autopsied between 2006-2014 by the San Diego County Medical Examiner's Office were identified. An interpretable amount of leptomeninges from one to three areas of the brain (cerebral cortex, brain stem, and/or cerebellum) in each case were evaluated. Immunoperoxidase staining of each of these sections with antibodies to CD45 and CD68 were performed. Additionally, each section was evaluated for the presence of iron utilizing Perl's method. Each slide was screened manually, immunoreactive cells were individually scored, and the density was calculated per millimeter of leptomeninges. The presence of stainable iron was similarly scored.

The cohort represented 22 males and 20 females ranging in age from 2 to 311 days. The modes of delivery were relatively evenly divided. The reported causes of death were SIDS/SUDI (62%), SIDS with bed-sharing (36%), and undetermined (2%). The assigned manners of death were 62% natural and 38% undetermined. The examined brain sections included 32 of the cerebral cortex, 18 of the brain stem, and 36 of the cerebellum. The lengths of examined leptomeninges ranged from 2mm to 40mm. In the total cohort, the mean number of CD45 and CD68 immunoreactive cells in the cerebral cortical sections was 7.5 cells/mm and 22.1 cells/mm, respectively; in the brain stem sections, 10.8 cells/mm and 16.7 cells/mm, respectively; and in the cerebellar sections, 9.9 cells/mm and 27.5 cells/mm, respectively. The ranges of the number of cells per mm, and the standard deviations of the means, were wide and varied. Overall, there was no significant difference in the number of CD45 or CD68 immunoreactive cells/mm between the three brain sites. Comparing this cohort to a subpopulation of hospitalized infants in the prior study, there were no significant differences between the density of inflammatory cells in the sections from the cerebral cortex and brain stem. There were differences in the CD68 density in the cerebellar sections which are attributable to methodological differences; however, there was a significant difference in the number of iron-containing cells between the two populations with iron identified in only a single section in the current cohort but in 30 sections in the corresponding hospital-based cohort.

Whether in a hospital-based or more forensically relevant population, the presence of inflammatory cells in the leptomeninges (even in great abundance) is common. Thus, caution must be exercised in the interpretation of this inflammation and its clinical/ diagnostic relevance. The finding of iron deposition in the leptomeninges, though, is an extremely uncommon finding in the SIDS/SUDI population, which is at odds with the prior findings in a hospital-based population.

Leptomeninges, Inflammation, Infant

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