G5 Cardiac Channelopathies Linked to Sudden Infant Death Syndrome/Sudden Unexplained Death Syndrome

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The goal of this presentation is to describe the use of genetic testing to assist medical examiners in determining cause of death in undetermined cases. After attending the presentation, attendees will understand the definition of sudden infant death syndrome (SIDS) and sudden unexplained death syndrome (SUDS), the procedures of SIDS/SUDS investigations, and the SIDS/SUDS genetic testing method. An example of a SUDS case investigation will be presented.

This presentation will impact the forensic science community by emphasizing the need for and use of genetic testing in the determination of unexplained deaths. Discovery of the new mutations presented here will also enrich cardiac ion channel mutation databases and hopefully lead to better understanding of the pathogenesis of these diseases, their diagnosis and treatment.

SIDS is defined as sudden unexplained death under the age of one year. SUDS is defined as sudden unexplained death from one year of age through adulthood. In both syndromes a thorough scene investigation, complete autopsy, and review of the circumstances of death and clinical history are required.

Both environmental risk factors and genetic risk factors are believed to contribute to SIDS and SUDS. Environmental factors involved in SIDS include bedding, bed sharing, and sleeping in the prone position. SUDS can be triggered by vigorous exercise, swimming, emotional stress, and auditory stimuli. Genetic risk factors of SIDS and SUDS include genes that can contribute to arrhythmias. Studies have shown that cardiac arrhythmia may constitute up to fifteen percent or more of SIDS/SUDS cases. Since mutations on six cardiac ion channel genes- KCNQ1, KCNH2, KCNE1, KCNE2, SCN5A, and RyR2 are major causes of cardiac arrhythmias, current genetic testing for SIDS/SUDS is to sequence all exons of these six genes.

Testing of SIDS and SUDS cases in the New York City Office of Chief Medical Examiner has identified genetic variants that are consistent with a cause of death due to cardiac arrhythmias. Fifty-one SIDS cases and thirty-four SUDS cases have been tested. Thirty percent of tested SIDS cases and twenty two percent of tested SUDS cases carry possible disease causing mutations on one of the six cardiac ion channel genes describe above. Among the fifty-one SIDS cases, twelve percent carry mutations on SCN5A, 8% of cases carry mutations on each KCNQ1 and KCNH2, and two percent of cases carry mutations on RyR2. Among thirty-four SUDS cases, eleven percent of cases carry mutations on SCN5A, five percent of cases carry mutations on KCNQ1, and three percent of cases carry mutations on each KCNH2 and RyR2. These results appear to confirm a link between cardiac channelopathies and SIDS/SUDS deaths.

A SUDS case investigation will be presented as an example how genetic testing could help medical examiners determine cause of death when autopsy findings are negative. It is recommended that SIDS/SUDS genetic testing become a routine procedure in undetermined death investigations.

Sudden Unexplained Deaths, Genetics, Arrhythmias

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