W23 Cardiovascular Pathology for Medical Examiners and Coroners: Basic and Advanced Techniques for the Investigation of Sudden Cardiac Death

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After attending this presentation, attendees will: (1) understand basic cardiac anatomy relevant to the investigation of sudden cardiac death; (2) be able to apply basic and select advanced cardiac dissection techniques useful for the investigation of sudden cardiac death; (3) identify situations in which postmortem genetic testing may be useful; (4) appreciate the challenges of interpretation of genetic testing results with respect to determining mechanism of death, underlying cause of death, and contributory cause of death; and, (5) recognize situations in which consultation with a cardiovascular pathologist is warranted.

This presentation will impact the forensic science community by providing up-to-date knowledge and practical techniques in cardiovascular pathology and molecular genetics that will assist medical examiners, coroners, death scene investigators, and others involved in the investigation of sudden death.

The spectrum of cardiovascular disease which may present in the forensic setting ranges from common entities such as coronary artery atherosclerosis and hypertension to less common entities such as infective endocarditis or viral myocarditis, and more esoteric entities such as various congenital heart diseases, the dilated, hypertrophic, and arrhythmogenic forms of cardiomyopathy, arrhythmia syndromes such as Long QT syndrome or catecholaminergic polymorphic ventricular tachycardia (CPVT), and aortopathy syndromes such as Marfan Syndrome or Loeys-Dietz Syndrome. It is especially important for medical examiners and coroners to be familiar with inheritable cardiovascular diseases, which may be treatable in surviving family members, thereby directly fulfilling the ultimate goal of quality death investigation — to help the living.

The diagnosis of many cardiovascular diseases at autopsy has become increasingly complicated. Critical morphologic information suggestive of a particular disease may be observed at the time of autopsy, but confirmation of the disease usually requires a comprehensive evaluation incorporating medical history, scene investigation, and multiple diagnostic modalities, which may include histologic examination, microbiology testing, enzymatic assays, and genetic testing. The increasing use of postmortem genetic testing in the evaluation of sudden unexplained death in the young is a particularly challenging area for medical examiners and coroners and is potentially subject to error due to misinterpretation of genetic variants whose significance is unknown. The failure to consider the presence of inheritable disease and retain appropriate specimens for genetic testing or subspecialist consultation remains a persistent risk for medical examiners and coroners who are not familiar with the spectrum of cardiovascular disease which may present in a forensic setting.

This workshop is intended to be a practical introduction to the investigation of sudden cardiac death. The presenters include practicing cardiovascular and forensic pathologists with extensive experience in autopsy pathology, death investigation, surgical cardiovascular pathology, and molecular genetics. The basic foundations of cardiovascular pathology, including normal cardiac anatomy and histology, normal anatomic variants, and standard cardiac dissection methods, will be reviewed. Advanced dissection techniques will also be taught, including long-axis cuts (four-chamber and left ventricular outflow cuts), base of heart dissection for demonstrating valvular heart disease, gross dissection and histologic examination of the cardiac conduction system, and histologic examination of valves, myocardium, and aorta. Both common and rare entities in the differential diagnosis for sudden cardiac death will be discussed, including atherosclerotic coronary artery disease, hypertensive heart disease, hypertrophic cardiomyopathy, dilated cardiomyopathy, arrhythmogenic cardiomyopathy, inherited arrhythmia syndromes, and inherited aortopathy syndromes.

The role of genetic testing in the diagnosis of inherited cardiomyopathy, arrhythmia, and aortopathy syndromes will also be discussed, including the challenges associated with the interpretation of genetic test results that are equivocal for pathogenicity, or when pathogenic variants are discovered in the setting of alternative and equally compelling causes of death. A framework for communication of results to families will also be provided. Guidelines for specimen retention and cardiovascular pathology subspecialist consultation will also be discussed. This session will incorporate didactic lectures, informal question-and-answer sessions with questions solicited from the audience, and hands-on tutorials utilizing 3D scanned and printed models.

Forensic Pathology, Cardiovascular Pathology, Sudden Cardiac Death

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