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FORENSIC EVALUATION OF CARDIAC PATHOLOGY IN CASES OF SUDDEN DEATH

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Abstract

Unexpected cardiac death remains a significant concern in forensic medicine due to its high frequency and complex diagnostic nature. Establishing a cardiac origin of death requires a multidisciplinary approach involving autopsy examination, microscopic tissue analysis, and toxicological testing. Forensic specialists play an important role in identifying structural or functional cardiac abnormalities that may lead to fatal outcomes. This paper discusses the principal cardiac disorders associated with sudden death and emphasizes their relevance in forensic investigations [1].

Introduction

Determining the exact cause of death is one of the primary responsibilities of forensic medicine, especially when death occurs suddenly and without a clear clinical history. Cardiovascular diseases represent one of the most common causes of unexpected mortality across different age groups [2]. In many situations, individuals may not show obvious symptoms prior to death, which makes post-mortem investigation essential.

The heart performs a vital function in maintaining circulation and supplying oxygen to tissues. Various pathological processes affecting cardiac structures can disrupt this function and result in fatal consequences. Therefore, careful assessment of the heart during forensic examination is necessary to detect abnormalities responsible for sudden death [3].

Cardiac Conditions Associated with Sudden Death

One of the leading contributors to sudden cardiac death is **coronary artery disease**, which develops due to progressive atherosclerotic plaque formation within coronary vessels. Such narrowing reduces blood supply to the myocardium and can trigger myocardial infarction or lethal arrhythmias [4].

Another clinically significant condition is **hypertrophic cardiomyopathy**, a disease characterized by abnormal thickening of the heart muscle. This disorder is frequently detected in young individuals and athletes and may remain undiagnosed until a sudden fatal episode occurs [5].

Inflammatory damage to the myocardium, known as **myocarditis**, is also an important cause of unexpected death. Viral infections are often responsible for this condition, leading to myocardial injury and disturbances in cardiac electrical activity [6].

Additionally, congenital structural abnormalities of the heart and coronary arteries must be considered during forensic assessment. Such anomalies can impair normal cardiac function and increase the risk of sudden arrhythmic events [3].

Forensic Autopsy and Cardiac Examination

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A thorough forensic autopsy involves detailed evaluation of the heart using both macroscopic and microscopic methods. The examination typically includes measuring the weight of the heart, inspecting coronary arteries for obstruction, and assessing the thickness and condition of myocardial walls [1].

Histopathological analysis provides valuable information about cellular and tissue changes that may not be visible during gross examination. Findings such as fibrosis, inflammatory infiltration, or myocardial degeneration can help explain the mechanism of death [3].

In certain cases where no obvious structural abnormalities are detected, additional investigations such as toxicological analysis and molecular autopsy may be required. Genetic testing can reveal inherited cardiac channelopathies, including long QT syndrome and Brugada syndrome, which are known to cause sudden death [7].

Medico-Legal Importance

Identifying cardiac causes of death has substantial medico-legal significance. Accurate determination of the cause and mechanism of death is crucial for legal documentation, insurance matters, and epidemiological data [2]. Furthermore, detecting hereditary cardiac disorders can assist in protecting family members by enabling early medical evaluation and preventive measures.

Conclusion

Sudden cardiac death continues to represent a complex issue in forensic pathology. Comprehensive examination of the heart during autopsy, combined with histological, toxicological, and genetic investigations, significantly improves diagnostic accuracy. A better understanding of cardiac pathology in forensic practice contributes not only to reliable medico-legal conclusions but also to broader efforts aimed at preventing sudden deaths in the population.

Keywords

Forensic pathology, sudden cardiac death, autopsy investigation, cardiomyopathy, coronary artery disease.

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