

E10 Three Cases of Traumatic Death?

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Learning Overview: The goal of this presentation is to emphasize the difficulty of differential diagnosis between natural and traumatic deaths, especially when the circumstantial data is misleading. In such cases, histology proves to be useful in the identification of the real cause of death.

Impact on the Forensic Science Community: This presentation will affect the forensic science community by showing that although in some cases the manner of death may appear evident from circumstantial data, an underlying cause could be hidden, and only a thorough scene investigation and complementary analysis such as histology can reveal the true manner of death.

The first case regards a 31-year-old male found dead in his car at the bottom of river at a depth of 10 meters. An initial investigation by local police suggested the man lost control of the car, hit the barrier of the bridge, was thrown 25 meters from the impact point, and fell into the water. Toxicological analyses showed a high blood alcohol level (2g/l).

The second case, a 22-year-old male who was swimming in a camping pool, suddenly collapsed and fell underwater. Cardiopulmonary Resuscitation (CPR) was attempted by the lifeguard and, upon arrival of the ambulance, defibrillation was performed, without results.

The third case deals with a 21-year-old girl found dead by her motorcycle at the road side, still wearing her helmet. In all cases, postmortem Computed Tomography (CT) and toxicologic examinations were performed. CT scans revealed no signs of trauma, and toxicologic analysis was positive only in Case 1 for alcohol.

In Case 1, external examination revealed no remarkable findings. At section, heavy, edematous and congested lungs, with foam inside the bronchial branches, and a heavy heart were discovered. In Cases 2 and 3, external examination showed frothy fungus at the nostrils and oral cavity, and bilateral subconjunctival petechiae (Case 2) and perioral and zygomatic superficial abrasions, an oily, blackish material on the left knee, and zygomatic abrasions on both hands (Case 3). At section, both cases revealed heavy, edematous, and congested lungs, with foam inside the bronchial branches.

In all cases, Hematoxylin-Eosin (H&E) and Masson's trichrome staining were performed. Histologic examination documented massive lymphocytic infiltration associated with some histiocytes in full thickness sections from both ventricles (including endocardium and pericardium), and acute emphysema in Case 1. In Case 2, myocytic hypertrophy with myocardial disarray and fibrosis, especially in the antero-lateral wall of left ventricle (>5% of total heart samples), and some areas of myocardial bridging were found. In Case 3, diffuse myocytic hypertrophy with myocardial disarray (>5% of total heart samples), endomyocardial clefts, contraction bands, fibrosis, and some areas of myocardial bridging were discovered.

In two of the cases, death was attributed to hypertrophic cardiomyopathy, not, as hypothesized, a traumatic cause. Case 1 is still doubtful as the man could have died by drowning (significant pulmonary findings, such as edema, acute emphysema) or by the accident due to the high alcohol level or by myocarditis.

Sudden and unexpected death in otherwise healthy individuals is probably the most difficult differential diagnosis in forensic pathology, especially with the presence of misleading circumstantial data.¹ In such cases, histology, along with complementary investigations, is fundamental to identify the real cause of death.

Myocarditis may cause sudden death. The reported incidence is higher than expected in younger age groups (less than 35 years of age), with 12% of sudden cardiac deaths attributed to myocarditis in young Australians and 34.7% in a Chinese autopsy case study.^{2,3} Therefore, myocarditis should be suspected in cases of sudden unexpected death in otherwise healthy young people. Representative sections from anterior, lateral, and the posterior wall of the atria and ventricles, as well as sections from the ventricular septum, should be submitted for microscopic examination. Histological diagnosis is defined by Dallas criteria. The presence of an inflammatory infiltrate in the myocardium (>14 lymphocytes/mm²) with degenerative and/or necrotic changes of adjacent cardiomyocytes are not typical of ischemic damage.⁴

Another frequent cause of sudden death, especially in young subjects (12–35 years old) is hypertrophic cardiomyopathy, characterized by myocardial hypertrophy, usually asymmetrical, located in the septum and, less frequently, left ventricle; recent studies have also described an involvement of the right ventricle in cases with a worse prognosis.^{5,6} At histology, the most specific finding is myocardial disarray (in >5% of histologic samples), with myocardial bridging and interstitial fibrosis. Physiopathological mechanism of death is usually arrhythmia, due to unstable electric conduction through disarrayed myocardial areas.

Circumstantial data could sometimes be misleading; thus, a careful autopsic and histological investigation are fundamental, as highlighted in these three cases.

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