



### H138 Sudden Cardiac Death Due to Anabolic Androgenic Steroids (AAS): Autoptic, Histopathological, and Toxicological Findings in Four Cases

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The goal of this presentation is to examine the cardiovascular effects of AAS chronic abuse. In all cases of sudden death in apparently healthy bodybuilders, an accurate circumstantial investigation is fundamental in order to confirm the AAS abuse; the autopsy, histological, and toxicological investigation can ascertain the cardiac pathological features correlated to the abuse of this group of substances.

This presentation will impact the forensic science community by providing the pathological relationship between androgenic-anabolic steroid abuse and sudden cardiac death.

**Introduction:** Bodybuilders use AASs to increase strength, lean body mass, and, in some cases, to improve physical appearance. This class of substances is able to increase the risk of sudden cardiac death. Here four fatal cases are reported.

**Case 1:** A 32-year-old bodybuilder suddenly lost consciousness and died during a weightlifting workout at the gym. For several months, he had taken testosterone propionate (700mg/week) and nandrolone (200mg/week) parenterally; he had also taken stanozolol (70mg/wk) orally. His medical history was unremarkable.

**Case 2:** A 29-year-old bodybuilder was found unconscious during the morning lying on the bed in his apartment. Family members and friends reported he had been using anabolic steroids parenterally (250mg/week of nandrolone and 350mg/week of stanozolol) for several months.

**Case 3:** A 30-year-old competitive bodybuilder, who worked out regularly at the gym, suddenly collapsed at home and died. In an ashtray near the body, a 2ml vial of nandrolone decanoate was found along with a used 2.5ml syringe. All witnesses confirmed that the subject had started using AAS approximately six months before his death.

**Case 4:** A 28-year-old amateur bodybuilder was found dead by his father lying on the bed in his bedroom. Family members reported that he had a long history of AAS abuse.

For these four cases, a complete postmortem examination as well as histological and toxicological analyses were performed.

**Results:** *Case 1:* The body was that of a well-built man (height 189cm, weight 90kg) with a prominent muscular build. The 450g heart was normal in shape, with no cavity dilatation. Its dimensions (14x14x4cm) and wall thicknesses all fell within the normal ranges. The coronary arteries were unremarkable. A grayish area in the internal half of the anterior-lateral wall of the left ventricle was found. Histologically, the grayish area corresponded to typical infarct necrosis with a histologic age of approximately 15 days. *Case 2:* The body was of a well-built man (weight 72kg, height 166cm). All organs were normal. In particular, the dimensions of the heart were 11x10x5cm, the weight was 390g. Histology did not reveal any pathological changes, only focal myocardial cells with contraction bands and segmentation of the myocardial cells similar to those seen in case 1, were found. *Case 3:* The body was that of a well-built man (weight 90kg, length 178cm). The autopsy revealed abnormal muscle development, testicular atrophy, and hepatomegaly. The heart weight was 400g. The wall thicknesses were normal. The coronary arteries showed scattered fatty streaks. Histopathological examination of the heart revealed focal myocardial fibrosis. The liver showed cholestasis and vascular gaps compatible with the diagnosis of peliosis hepatis. *Case 4:* The body was that of a well-built man (weight 87kg, length 176cm). The heart had a normal shape and was normal in size (13cmx11.5cmx3.5cm) but weighed 470g. The left and right coronary showed 75%-80% lumen reduction. Histologically, the myocardial samples showed wide fields of myocardial necrosis characterized by hypercontraction of the myocells. In all cases, a complete toxicological analysis confirmed the presence of AAS in the biological specimens, whereas other recreational drugs or ethanol were not detected.

**Conclusions:** The morphologic findings and the toxicological results are able to explain the deaths of the four bodybuilders, as related to the cardiac effects of AAS abuse. Therefore, the warning against the use of these drugs by athletes is reinforced and heightened surveillance for AAS-related death that may be under-recognized and under-reported in the medical literature is encouraged.

#### Anabolic Steroids, Sudden Death, Toxicological Findings

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