



## Pathology Biology Section - 2012

### G81 Death Due to an Acute Cocaine Intoxication and a Man With a Precedent Violent and Aggressive Behavior: Is it an Excited Delirium?

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The goal of this presentation is to show an unusual fatal case of cocaine related death in a long-term abuser with symptoms of excited delirium. Postmortem findings with a complete histological, immunohistochemical, and proteomics study (Western blotting) on brain and heart and toxicological analysis of cocaine distribution in fluids and tissues are discussed.

This presentation will impact the forensic science community by describing the importance of a careful crime scene investigation, toxicological, and histological examinations in every drug-related death in order to clarify the exact mechanism of the death.

Excited delirium is a state of mental and physiological hyperarousal commonly associated with the use of cocaine. The actual pathophysiology of patients who have been previously identified with signs and symptoms of excited delirium syndrome is complex and poorly understood. Patients suffering from excited delirium can be extremely hostile and violent. The fundamental manifestations are delirium with evidence of psychomotor and physiologic excitation. There are several different potential underlying associations or causes, including stimulant drug abuse especially cocaine. The literature shows a high risk of developing psychosis in psychotropic substance abusers; psychotic symptoms, and experience of paranoia and suspiciousness are reported during the use of cocaine.

**Case Report:** April 24, 2011, at 11.00 a.m., a woman called the police and said that she found her husband dead at his home. A crime scene investigation was performed by forensic pathologist and police, who found the body of a 34-year-old Caucasian man in the kitchen. The man lived alone after a quarrel with his wife. The corpse was lying supine on the floor, wearing blood stained clothes. Close to the head, the floor was covered in blood. On the floor near the corpse, the following was found: a plastic handle length of 11.5cm; broken knife blade total length of 18.7cm; scissors with the blades length of 8.5cm; a bloodstained pillow; a spoon smeared with white powder; and, broken glasses. In the bedroom, next to the bed, a surgical patch and gauze were found. The entire house was in disarray, the furniture was upturned and broken. The man was known for his cocaine use as well as for his violent and aggressive behavior. The wife told to police about previous episodes of mental and physiological hyperarousal, anxiety, exaggerated startle responses, psychomotor agitation, destruction of inanimate objects, insomnia, and fatigue.

A complete autopsy was performed 48-hours after death. Multislice computed tomography (MSCT) was performed prior to autopsy. External examination recorded multiple superficial and parallel incised wounds to the neck and the flexor surface of left arm and were interpreted as hesitation marks. Abrasions, contusions, and lacerations were noted on the head and face and on both hands. Extensive loss of bilateral ala, destructive lesions of nasal septum, and hard palate perforation were observed. Section of the neck revealed thin hemorrhages in the subcutaneous tissues and muscles; but neck blood vessels were intact. Internal examination revealed cerebral edema, the brain weighed 1,522g, measured 18.5x16.5x7.8cm; the heart weighed 380 g, measured 12.5x11.5x5.5cm. The coronary arteries, the myocardium and the valvular apparatus were normal. Into the esophagus surgical gauze was found. An ectopic formation of pharyngeal tissue was showed. The other organs did not showed specific alterations except for an intense vascular congestion.

Routine histological investigations, applying hematoxylin and eosin staining, were performed on all organs samples. Brain samples presented subarachnoid and perivascular hemorrhages, vasogenic edema; lungs showed a massive pulmonary edema. Myocardium presented foci of fragmentation of entire myocells in anomalous cross bands formed by segments of hypercontracted sarcomeres and myofibrillar rhexis, pach-fibrosis, loss of the usual parallel alignment of myocardial cells, with a star-like disposition, defined as disarray. Between the disarrayed myocytes an increased interstitial matrix and a myofibrous hyperplasia of arterioles was observed. Liver showed a microvesicular liver steatosis. The ectopic neoformation of pharyngeal tissue was constituted by skin, fat and hair. The examination of other organs was unremarkable except for generalized hemostasis. To characterize and identify excited delirium "markers," an immunohistochemical study was confirmed using the Western Blotting analysis, performed on brain and heart tissue using the principal markers of programmed cellular death, apoptosis (NF- $\kappa$ B, bcl-2, bid, Smac/Diablo, TNF- $\alpha$ , TUNEL assay), alteration of dopaminergic transmission (antibody anti - Tryptophan hydroxylase), Heat Shock Proteins, and  $\beta_1$  -  $\beta_2$  cardiac receptors.

Cocaine was detected in the subject's urine through immunoenzymatic screening. Toxicological analysis by solid-liquid extraction and gas chromatography/mass spectrometry (GC/MS) analysis, was carried out to identify and quantify the individual substances present in the biological fluids and organs. Cocaine concentration was as follows: blood 23.76mcg/mL/g, liver 332.95mcg/mL/g, urine 230.42mcg/mL/g, and kidney 49.38mcg/mL/g. Ecgoine methyl ester concentration was: blood 12.56mcg/mL/g, liver 18.37mcg/mL/g, urine 154.82mcg/mL/g, and kidney 4.82mcg/mL/g. Benzoylcegoine concentration was: blood 6.57mcg/mL/g, liver 58.34mcg/mL/g, urine 737.27mcg/mL/g, and kidney 3.28mcg/mL/g. Examination of nasal swabs was performed and it was positive for cocaine. No other drugs or alcohol were detected.



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According to the crime scene data, autopsy, histological and toxicological findings, death was attributed to an acute cocaine intoxication in a subject with symptoms of excited delirium.

**Cocaine Abusers, Oxidative Stress, Excited Delirium**