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Case reports

Fatality due to fentanyl-cocaine intoxication resulting in a fall

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Summary. This is the first report of fatal intoxication by fentanyl and cocaine outside the USA. The case involved a fall caused by toxic psychosis. The circumstantial, clinical, anatomical, histopathological and toxicological framework is interpreted.

Key words: Fentanyl – Cocaine – Psychosis – Fatal fall

Zusammenfassung. Dieses ist der erste Bericht über eine tödliche Intoxikation durch Fentanyl und Kokain außerhalb der USA. Der Bericht betrifft einen Fall, der durch eine toxische Psychose verursacht wurde. Die Umstände, die klinischen Daten, das anatomisch-pathologische und toxikologische Gesamtmuster werden interpretiert.

Schlüsselwörter: Fentanyl – Kokain – Psychose – Tödlicher Sturz

Introduction

Reports by international [1–3] and American [4–9] agencies have indicated that abuse of fentanyl and its analogs is a North American phenomenon. In clarifying some of the numerous medical, toxicological and forensic aspects linked to this specific form of abuse, the scientific literature [10–20] has promptly stressed the risk that fentanyl abuse may spread to other countries.

This paper describes the first report of fatal intoxication by fentanyl outside the USA.

Case report

The case is presented of a 21-year-old man, with no police record, who was not known to use psychoactive substances.

During an evening with friends in July 1992, he complained of severe abdominal pain, with nausea and vomiting, and underwent intense psychomotor agitation. On his return home, alone, he deliberately threw himself from a balcony 10 m above ground level.

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He was quickly hospitalized, and the following diagnosis was made: multiple trauma, with fractures of facial and cervical bones and of the right femur. He was given pharmalogical therapy (plasma expander, cerebral anti-oedema drugs, sedatives) and put on an artificial respirator, but died of acute cardio-circulatory failure one hour later.

Autopsy and laboratory findings

An autopsy requested by the judicial authorities was performed 3 days after death, during which period the body was not refrigerated. The following transformations and/or lesions were found: black facies, extensive putrefaction of the rete venosum, lacero-contusional wound to the chin, multiple ecchymosis and abrasions to the head, thorax and limbs, comminuted fracture of the facial bones, complete compound fractures of the sixth cervical vertebra, right radius, ulna and femur, generalized visceral congestion, and acute pulmonary oedema. All lesions showed vital morphological characteristics.

External inspection, autopsy and histological results excluded pathological changes and did not exhibit signs of occasional/habitual use of psychoactive substances.

Chemico-toxicological analyses carried out using RIA [21], GC-HS [22] and GC/MS-SIM [23–25] techniques

Table 1. Concentrations of fentanyl, cocaine, benzoylecgonine (BE), and ethyl alcohol in post-mortem biological samples

Sample	Fentanyl (ng/ml/g)	Cocaine (ng/ml/g)	BE (ng/ml/g)	Ethyl alcohol (mg/100 ml)
Whole blood	0.74	720	60	50
Stomach content	0.30	N.D.	N.D.	N.D.
Brain	0.86	320	28	
Heart	0.79	120	N.D.	
Lung	1.50	150	N.D.	
Liver	1.40	120	N.D.	
Kidney	0.95	190	N.D.	

N.D., Not detected

on blood, stomach contents, brain, lung, heart, liver and kidney, revealed the presence of fentanyl, cocaine, benzoylecgonine and ethyl alcohol (see Table 1).

Analyses could not be extended to other biological fluids, either due to their absence (urine, bile) or to post-mortem autolysis (vitreous humor).

Discussion

Overall evaluation of the circumstantial, clinical, anatomical, histopathological, and toxicological data indicated that the acute cardiocirculatory failure was partly due to post-traumatic hemorrhages, and hyperkinetic cardiac arrhythmia as a consequence of multiple intoxication by fentanyl, cocaine and ethyl alcohol.

Although death was due to 2 factors (multiple trauma and multiple intoxication), there was only a single cause for the voluntary fall: acute intoxication by fentanyl, cocaine and alcohol.

The following findings wer made with regard to *fentanyl:*
– the blood level was lower than the therapeutic range in anaesthesia (1–3 ng/ml; [16]) and, obviously, than those found in cases of acute intoxication with respiratory failure (4–27.5 ng/ml; [11, 12, 15, 16–23, 26]);
– parenchymal levels were lower than those found in cases of acute intoxication with respiratory failure (from 8.6 ng/ml in kidney to 9.7 ng/ml in liver; [15]; from 41.5 ng/ml in kidney to 83.4 ng/ml in liver; [26]);
– presence of fentanyl in the stomach content was probably due to gastric excretion through the stomach wall [27];
– the greater concentration in the pulmonary parenchyma was probably due to intake by inhalation or sniffing;
– the blood level, compared with the short half-life (3.7 hours [28]), indicated that fentanyl was taken about 2 hours before death.

The following findings were made with regard to *cocaine* and *benzoylecgonine:*
– the blood level of cocaine, higher than those (< 600 ng/ml, [29]) found in occasional users, was in the range observed in cases of toxic psychosis [30–35];
– the extremely low levels of benzoylecgonine in blood and organs and the high ratio between cocaine and benzoylecgonine indicated that cocaine (half-life 60 minutes, [36]) was taken about 2 hours before death.

Apart from the interpretation of toxicological data, fentanyl plus cocaine were probably inhaled or sniffed, since no anatomopathological signs (e.g. needle marks) were found indicating other routes of intake. Moreover, North American surveys [3, 5, 8] also report that the oral or nasal route is popular for the simultaneous intake of powder containing fentanyl and cocaine.

As regards the pharmacological interaction between fentanyl, cocaine and alcohol, the following must be noted:
– fentanyl and ethyl alcohol exert a synergic depressive action on the cardio-circulatory system, due to a neurovegetative mechanism;
– cocaine excites the cardio-circulatory system, constricting the arteries and inducing hyperkinetic cardiac arrhythmia.

In this case, these effects interacted synergically, enhanced by loss of blood after the multiple trauma sustained in the fall. The precarious hemodynamic equilibrium gave rise to acute irreversible cardio-circulatory decompensation, as also shown by the acute pulmonary oedema caused by failure of the left ventricle.

The acute abdominal syndrome in the hours preceding death was an expression of the pharmacological action of fentanyl [28] through both a central (excitatory effect on chemoceptors in the CNS trigger zone, causing nausea and/or vomiting) and a peripheral mechanism (pyloric spasm with resulting gastric hypersecretion).

These symptoms, described by witnesses as causing intense pain, were probably amplified due to the contemporary intake of cocaine which may also induce nausea, vomiting and psychophysical agitation, sometimes leading to a psychotic state characterized by sensations of grandeur, paranoia and hallucinations [30, 31, 37], mainly tactile and visual [38]. In turn, visceral changes caused by fentanyl may have concomitantly caused a "kinesthesic hallucination" which led to the fall.

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