CASE REPORT

Silent Cocaine Poisoning

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Abstract

Background: Cocaine poisoning is known for causing severe clinical effects such as tachycardia, hypertension, agitation and confusion. Absence of clinical manifestations in cocaine poisoning is unusual.
Case report: A 26-year old man, known to be a cocaine addict, declared that he was forced by cocaine dealers to swallow many tablets of cocaine, six hours prior to admission to emergency department. Clinical examination, cardiac, hematological and biochemical checkups were unremarkable. The patient was clinically stable and left the hospital seven hours after admission by self-discharge. Blood and urine toxicological screening tests for benzodiazepines, barbiturates, tricyclic antidepressants and ethanol were negative. Patient's blood sample was not sufficient for analysis of cocaine and its metabolites. Using high-performance liquid chromatography, urine and gastric lavage samples were positive for cocaine. Quantification of cocaine and its metabolites including benzoylecgonine (BZE) and ecgonine methyl ester (EME) in urine was done using gas chromatography-mass spectrometry. Results revealed high levels of cocaine and its metabolites (cocaine: 360 mg/L, BZE: 1350 mg/L, EME: 780 mg/L).
Discussion: Cocaine poisoning is generally accompanied by various clinical effects. In our case, despite the confirmed poisoning, no clinical sign was noticed. Fatal poisonings were reported with cocaine urinary concentrations of lower than that found in our patient.
Conclusion: Asymptomatic cocaine poisoning with high cocaine levels in urine is of note.

Keywords: Cocaine; benzoylecgonine; ecgonine methyl ester; Gas Chromatography-Mass Spectrometry; Poisoning

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INTRODUCTION

Cocaine is a natural alkaloid that is being extracted from a Latin American shrub, *Erythroxylon coca*. The alkaloid has been first isolated in 1861 by Albert Niemann who described its medicinal properties as a local anesthetic. During the 20th century, cocaine became an illicit substance with an increasing consumption all over the world. There are many forms of this substance including coca leaves, powder or cocaine chlorhydrate, free base and crack (1). Three main routes of abusing this substance are smoking, intranasal inhalation and injection. In addition, this substance can be used orally by "body-packers" or "body-stuffers" who swallow several packs/packets for drug trafficking purposes or by people who chew leaves of coca in their natural form (1,2).

Cocaine is rapidly metabolized while less than 5% of the dose is excreted unchanged in the urine, with an estimated elimination half-life of 0.5 to 1.5 hour. The two principal metabolites that result from esterase action on cocaine are benzoylecgonine (BZE) and ecgonine methyl ester (EME) (3). They can be detected in urine up to 3 weeks after absorption if cocaine is regularly consumed in high doses. Other urinary metabolites of cocaine have also been described (3-5).

In general, cocaine poisoning induces clinical signs such as tachycardia, mydriasis, increased blood pressure, chills, sweating, vomiting, agitation and mental confusion (6,7). Following massive cocaine poisoning, the absence of clinical manifestations is unusual.

We report a case of cocaine poisoning without any clinical manifestations. Biological samples of patient that were analyzed using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-tandem mass spectrometry (LC-MS-MS) revealed highly positive results for cocaine and its metabolites.

CASE REPORT

A 26-year old man, known to be a cocaine addict, presented himself to emergency department. He declared that he was forced by cocaine dealers to swallow 10 tablets of cocaine (each tablet: 2-3 grams) six hours earlier. Clinical examinations, cardiac (including electrocardiogram), hematological and biochemical checkups were unremarkable. The patient was clinically stable and left the hospital seven hours after admission by self-discharge. He refused to file a lawsuit against the offenders.

Samples of venous blood in lithium heparinized tube, urine and gastric lavage were sent to toxicology laboratory.

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As the blood sample was of small quantity (one tube of 5 mL), it was used only for initial immunoassay screening analysis of benzodiazepines, barbiturates, tricyclic antidepressants and ethanol. When the laboratory requested another tube of blood, the patient had already left the hospital. All other toxicological analyses were done on urine and gastric lavage fluid. Using immunological methods, blood and urine toxicological screening tests for benzodiazepines, barbiturates, tricyclic antidepressants and ethanol were negative. A wide screening test for xenobiotics was performed on gastric lavage fluid and urine after liquid-liquid extraction in two different pH buffers (3.5 and 8.5) with 5 mL of dichloromethane, ether, hexane and isoamyloalcohol mixture (3/5/2/0.05) (v/v); using high-performance liquid chromatography (Waters 2695 HPLC, Waters Corp., Milford, MA, USA), coupled to mass spectrometer (Quattro premier XE mass spectrometer, Waters Corp., Milford, MA) in the electrospray mode (positive and negative) at different cone voltages. The analysis of the gastric lavage sample confirmed cocaine ingestion. The urine sample revealed the presence of cocaine and its major metabolites including BZE and EME in addition to its minor metabolites including hydroxy-BZE, nor- BZE, and hydroxy- nor- BZE.

Quantification of cocaine, BZE, EME and cocaethylene was performed with a GC-MS (Agilent GC 6890 coupled to a Agilent 5973 Network Mass Selective Detector, Agilent Technologies, Santa Clara, CA, USA) according to the previous described method (8): cocaine and its metabolites were extracted from 1 mL of urine at pH 8.5 (phosphate buffer) using a mixture of dichloromethane and isopropanol (9/1: v/v). Organic layer was evaporated to dryness and derivatized by adding 50µl of (trimethylsilyl) trifluoroacetamide (BSTFA) for 15 min at 60°C. A capillary column BPX 5 MS 25m × 0.25 mm was used for separation. Deuteried homologues were used as internal standards.

This method is validated and routinely used in the laboratory of Lille, France. Calibration curves generated for all compounds (20-500 ng/mL) showed a good linearity ($R^2 \geq 0.99$). The lower limit of detection was 4 ng/mL for cocaine and 8 ng/mL for BZE and EME. The extraction recovery of all compounds was over 80%. Important findings of urinary analysis were as follows (Table 1): cocaine = 360 mg/L, BZE = 1350 mg/L and EME = 780 mg/L.

Table 1. Results of urine analysis by gas chromatography-mass spectrometry

Compound	Level (mg/L)
Cocaine	360
BZE	1350
EME	780
Cocaethylene	Undetectable

BZE: Benzoylecgonin
EME: Ecgonine methyl ester

DISCUSSION

Cocaine poisoning is generally accompanied by various clinical effects. Time to peak concentration after cocaine ingestion is 50 to 90 minutes, and it follows first-order elimination with duration of action of 30 to 60 minutes (7). In case of poisoning, most patients develop symptoms within this time frame (9). In our reported case, despite the confirmed poisoning, no clinical sign was noticed. The quantification of urinary cocaine, BZE and EME showed very high levels. Compared to previously described cases in the literature, these values are considerably higher (10-12). Furnari et al., reported a body packer who swallowed 99 packages of ten gram of 86% cocaine powder and deceased due to rupture of 4 packages. High levels of cocaine and BZE were found in his blood (4 mg/L and 17 mg/L, respectively) and urine (152 mg/L and 512 mg/L, respectively) (10). These concentrations are lower by half than those we found in our reported case. Baselt et al. in a study on the elimination kinetics of cocaine found that an oral dose of 25 mg of cocaine can result in a peak urinary cocaine concentration of 0.269 mg/L in first hour and a peak BZE concentration of 7,940 mg/L in 12th hour. Urine BZE concentration was in excess of 0.3 mg/L for 48 hours (11). Elsohly et al. reported BZE urinary concentration of 1.3 mg/L two hours post-ingestion of 2.15 mg of cocaine in an herbal tea (12).

In urine, cocaine can be chemically hydrolyzed under alkaline condition to both BZE and EME (10). However, other minor metabolites in urine namely meta-hydroxy-BZE, para-hydroxy-BZE and nor-BZE could be used to confirm the cocaine ingestion because they are presumed to be solely in vivo cocaine metabolites (13). These minor metabolites were identified and characterized by daughters' ions spectrum in the urine sample of our patient. Cocaethylene which was undetectable in our patient is formed when cocaine and ethyl alcohol are ingested simultaneously (14). However, it is difficult to compare our results to those reported in other studies, as the urine sample on his admission corresponds to the 6th hour post-ingestion of cocaine. Another problem is the inter-individual variability in the urinary excretion of cocaine and its metabolites. Nonetheless, our results remain high compared to those reported in the aforementioned studies and are potentially lethal.

Moreira et al. have proposed that patients with high amount of cocaine ingestion can be discharged after a 6-hour observation period, if there is complete resolution or absence of clinical symptoms (9). Nevertheless, other experts have advocated much longer observation periods of 48 to 72 hours (15,16). Our case was clinically stable 7 hours post-admission and left the hospital by self-discharge.

LIMITATIONS

This observation has some limitations. Only urine sample was used for quantification of cocaine and its metabolites. Blood is the most useful sample for determination and quantification of cocaine while urine is commonly used in qualitative tests and is an ideal sample for screening approaches, and also it is of limited use for quantitative

analysis (17). There is also a weak correlation between urine and blood concentrations of cocaine (18). Indeed, many factors affect urine concentration, such as fluid intake, rate of metabolism, glomerular clearance, urine pH and voiding times related to the dose (17). However, the quantification of cocaine, BZE and EME in urine confirmed the poisoning and gave us an approximate idea of the level of poisoning. It has been shown that clinical manifestations are associated with the urine level of cocaine in poisoned subjects (5,12,13).

Unfortunately, follow up of our patient was not possible post-discharge; however, some scientists have suggested that observation in hospital is no longer required if the patient has been asymptomatic for at least 6 hours and severe adverse effects are unlikely to develop in patients who have been asymptomatic during this timeframe (9,16). Our patient was asymptomatic for at least 13 hours after cocaine ingestion with confirmed poisoning documented by analysis of urine and gastric fluid. Hence, we believe that development of clinical manifestations after leaving the hospital was unlikely in our patient.

The reason for being asymptomatic and clinical course of our case especially with lack of data on the physiology and genetic studies associated with the metabolism of cocaine cannot be explained. However, this case is noteworthy to be reported because of high urinary cocaine and the metabolites and for its originality.

CONCLUSION

In our study, we reported a case of forced cocaine ingestion without clinical manifestations. Toxicological tests did not reveal other drugs. Urinary quantification of cocaine and its major metabolites using GC-MS demonstrated levels higher than those found in fatal cases. Absence of clinical manifestations with such levels is unusual and of note.

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