CASE REPORT

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Case Report of an Unusual Use of Lidocaine During Episodes of Self Mutilation

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ABSTRACT: We are reporting on a case of polyintoxication by cocaine, lidocaine, methadone, and dextromoramide. This conclusion is supported by the analysis of a strand of hair. We note for the first time the detection of dextromoramide as well as lidocaine and desethyl-lidocaine in hair. Concentrations in hair were: cocaine = 2.4 ng/mg, benzoylecgonine = 0.3 ng/mg, methadone = 10.2 ng/mg, EDDP = 1.5 ng/mg, dextromoramide = 1.6 ng/mg, lidocaine = 115.9 ng/mg and desethyl-lidocaine = 1.6 ng/mg. The victim who was seeking an anesthesia effect without the loss of consciousness ingested cocktails during episodes of self mutilation. The wounds were of two different types and with different morphological locations: long and deep without ablation of tissue, clean lacerations found on the neck, the pectoral region, and the left upper extremity; either round or discoid with deep excavation found on the head (ears, forehead, chin, and lips) and also, on the neck and on the left upper extremity. Near the most recent wounds, needle marks were noticed indicating probable local infiltration of lidocaine.

KEYWORDS: forensic science, lidocaine, dextromoramide, hair analysis, death, self mutilation

Among the many addictive human behaviors, the pharmacological variation used by certain people demonstrates great ingenuity when seeking new sensations. If the psychotropic effect is the one most often sought (stimulant, hallucinogen, and narcotic), it is certainly not the only one. Notably, certain psychiatric tendencies can sometimes cause people to suppress the urge to eat (anorexia) or develop dependencies for aid and assistance (depressive states).

Just recently, we reported on a polydrug use developed by the concomitant consumption of heroin, cocaine, cannabis, thiopental, ketamine and chloroform (1). An analysis of a segment of hair from the person allowed us to document the toxins which have been consumed by the deceased. We are reporting now on an unusual case where the victim ingested two morphinomimetics (methadone, dextromoramide) as well as cocaine, and surprisingly, lidocaine. Indeed this local anesthetic, very often employed in reanimation interventions for its antiarrhythmic effects on the cardiac muscle and for its uses against glottal spasm during endotracheal intubation, does not produce psychotropic effects. Its only neurological effect relates to the toxicity observed during epidural anesthesia accidents in obstetrics and gynecology. In those cases, it produces vertigo, metallic sensations in the mouth, and myoclonus (2). To our knowledge, this product, which is also sometimes used for its anesthetic properties as a cutting agent for cocaine, has never been known to be a cause of drug dependence. It seems very likely, thus, that the desired effect was only its anesthetic sensations.

The analysis of hair from the deceased provides evidence of regular consumption of various products. Moeller et al. have already noted the detection of methadone in hair (3). This case, however, reports for the first time the quantification of dextromoramide and lidocaine in human hair. The analytical techniques for pharmaceuticals or drugs of abuse are well detailed elsewhere (4–6) and could be summarized as follow.

Experimental

Instrumentation

The gas chromatograph was a 6890 from Hewlett Packard (Les Ulis, France), an HP 6890 automatic injector and equipped with the HP 5973 mass selective detector. Analytical column was a CP SIL 8 CB, 25 m length, ID 0.25 mm (0.25 μm film thickness) from Chrompack (Les Ulis, France). Helium was used as the carrier gas at a flow rate of 1.3 mL/min in the constant flow mode (i.e., 59 KPa at 50°C). Temperatures were: interface = 300°C, ion source = 230°C, quadrupole = 150°C. Pulsed splitless injection (3 μL) was done at 290°C and 120 KPa during 1 min. The initial oven temperature was 50°C for 2 min and was increased to 310°C at 15°C/min and held for 3.67 min. The chromatographic run time was 23 min. Repetitive scans were acquired from 44 to 450 a.m.u.

HPLC apparatus consisting of a quaternary low-pressure pump Waters 600 (Saint Quentin en Yvelines, France) an autoinjector Waters 717 plus and a PDA spectrometer Waters 996. The system was interfaced and monitored by the software Millennium. The analytical column was a Waters Symmetry C_8, 250 mm length × 4.6 mm ID (5 μm particle size). The guard column was a Waters Symmetry C_{18}, 20 mm length. The drugs elute following a gradient elution mode thermostated at +30°C. The mobile phase consisted of acetonitrile/pH = 3.8 phosphate buffer (15:85, v/v) which was linearly increased to (35:65, v/v) at time 6.5 min and to (80:20, v/v) at time 25 min and held for 3 min. The chromatography time was 28 min. The phosphate buffer 50 mM, pH = 3.8 of the mobile phase was prepared by dissolving 6 g of NaH_2PO_4 in 1l of distilled

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water and adjusting to pH = 3.8 with orthophosphoric acid 10%. The flow rate of the mobile phase was 1 mL/min until 6.5 min and was linearly increased to 1.5 mL/min at time 25 min and held for 3 min. The equilibration time between two consecutive samples analyzed in series was set at 7 min. Injection volume was 20 μL. Full UV spectra from 200 to 350 nm (resolution 1.2 nm) are recorded on-line during the chromatographic run. Solute identification may be automatically performed by comparison of analytical data, retention times and UV spectra, with reference of 818 pharmaceuticals, pesticides, toxicants and drugs of abuse stored in a computerized personal library (available on request addressed to Waters Company).

For SPE, we used C_{18}, 200 mg/3 mL (Isolute) cartridges from IST supplied by Touzart et al. Matignon (Courtaboeuf, France), and a Vac Elut sample processing station (Analytichem International) from Prolabo (Paris, France). The ball mill (type MM2) was purchased from Retsch (Haan, Germany).

Sample Collection and Decontamination

Hair collection procedures for analysis for drugs of abuse or pharmaceuticals have not yet been standardized. Nevertheless, hair is best collected from the back of the head—an area called the vertex posterior—which exhibits less variability in hair growth rate than other areas. The sample size collected should be at least 150–200 mg.

Environmental contamination by drugs of abuse has been extensively studied and reviewed by a number of authors. However, no universal procedure seems to adequately eliminate all types of contamination (7,8). While passive exposure to smoke or to a pulverulent environment is common for drugs of abuse, these factors appear to be insignificant for pharmaceuticals since they must be taken by a classic therapeutic route. However, in the absence of more information, we performed the same decontamination protocol we observe for opiates and cocainics (6). It includes two washes during a 3 min span with dichoromethane followed by two 3 min long washes with a phosphate buffer (0.01 M, pH 5.6). The dichoromethane washes offer the advantage of removing fat from the hairs before acidic solubilization. Since the length of the hair of the deceased was very short, i.e., 1.2 cm, a segmental analysis was not possible, therefore the whole sample was subjected to investigation.

Quantitation

Quantitation was realized using a multi-point calibration table based on the peak area ratio between analytes and IS and is exhaustively described elsewhere (4,6).

Extraction Procedures

Basic Drugs

75 mg of powdered fortified hair or unknown samples are weighed in a conical vial where 30 μL of the IS solution (10 μg/mL of prazepam) are added together with 2 mL of 0.1 M hydrochloric acid. After incubation at 56°C for 12 hours, the vials are centrifuged at 1500 g for 5 min. The supernatant was transferred to a clean vial, neutralized with 1 M sodium hydroxide and buffered with 2 mL of sodium bicarbonate 0.2 M containing 10% methanol. The columns were conditioned with 4 mL methanol followed by 2 mL bicarbonate buffer (1680 mg of sodium bicarbonate in 100 mL of 10% methanol in water, pH = 8.6). Prepared sample was then applied and allowed to drain under vacuum. The columns were washed with 1 mL water and then 1 mL methanol 10% in water and dried by passing air through for 10 min. The analytes were eluted with three volumes of 500 μL of methanol containing 0.5% of pure acetic acid. The eluate was evaporated under a stream of nitrogen at 40°C. Next, the residue was dissolved in 30 μL of ethanol, 3 μL were injected in the gas chromatographic system while 20 μL were injected in the liquid chromatographic system.

Drugs of Abuse

50 mg of powdered fortified hair or unknown samples are weighed in a conical vial where 20 μL of the IS solution (10 μg/mL of trideuterated analogues of 6-acetylmorphine, benzoylecgonine, cocaethylene, cocaine, codeine, EDDP, methadone, methylecgonine ester and morphine) are added together with 2 mL of bicarbonate buffer. The preceding solid-phase extraction procedure applies to basic drugs as well, except that the dried residue was derivatized with 20 μL of BSTFA at 80°C for 15 min, and 1 μL was injected in the GC-MS system.

Case Report

This case involves a 28-year-old male found dead in his domicile. In the well maintained apartment, the investigators discovered $^1/_2$ g of cocaine as well as many empty boxes of injectable PALFIUM (dextromoramide) and injectable XYLOCAINE (lidocaine which was in the present case, not associated with adrenaline). Two syringes were discovered in the bathroom. Next to the body, investigators found two empty packs of PALFIUM as well as an empty syringe. A small letter found nearby left clear indications of a suicide. The man had been under psychiatric care for several years for schizophrenia with episodes of mutilation. He was a heroin addict for 7 years and had replaced his illegal drug use during the past seven months with methadone and dextromoramide consumption. He obtained these drugs legally by consulting numerous medical doctors. An external examination of the body revealed a significant number of recent injection marks, as well as old and recent cutaneous lesions resulting from mutilations. The lesions were of two varieties: long and deep without ablation of tissue, clean lacerations; either round or discoid with deep excavation (excoriation). Cuts of approximately 1.5 to 5 cm long and of 1 to 1.5 cm deep were found on the neck, the pectoral region, and the left upper extremity. The excoriations of 3 to 25 mm in diameter were found on the head (ears, forehead, chin, and lips) and also, although to a lesser degree, on the neck and on the left upper extremity. Near the most recent wounds, tracks were noticed indicating local needle marks which were presumably infiltrations of lidocaine though this hypothesis could not be verified. Furthermore, on the left arm and forearm were numerous foci of infection, 6 abscesses were noted in evolution. Blood, urine and hair were taken at the autopsy for further toxicological analysis.

Results and Commentary

The following compounds were identified in the blood: dextromoramide = 1.31 μg/mL, hydroxy-dextromoramide = 0.86 μg/mL, lidocaine = 2.51 μg/mL, and ethanol = 0.21 g/L. Urine was also subjected to analysis and revealed the presence of: dextromoramide, hydroxy-dextromoramide, lidocaine and oxazepam. Quantification was not realized in this medium. The coroner determined the cause of death to be a self provoked overdose of dextromoramide.

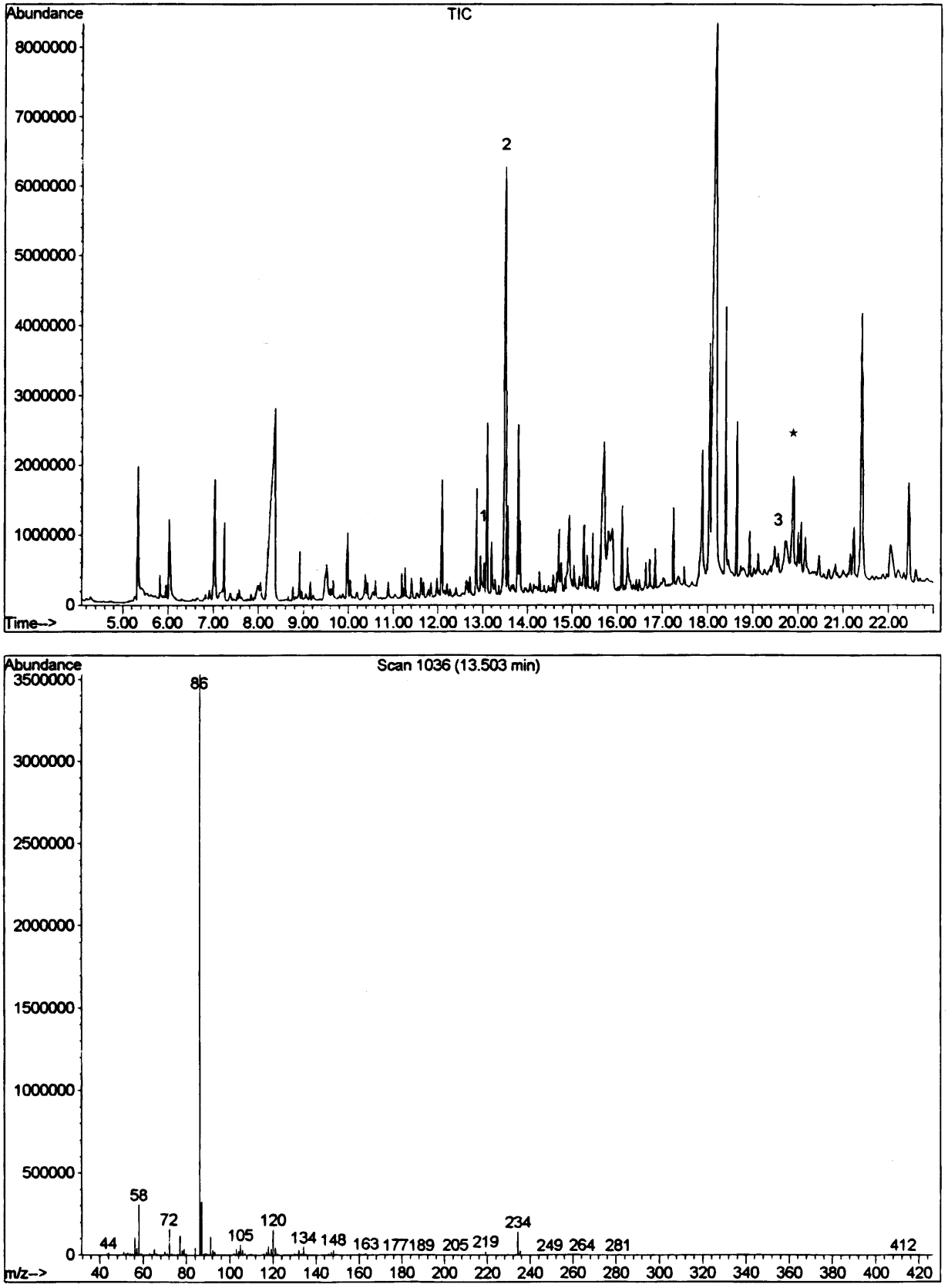

FIG. 1—*Chromatogram of an extract of 75 mg of powdered hair using basic solid phase extraction. (above) Total Ion Chromatogram collected from 44 to 450 a.m.u. (below) full scan mass spectrum of lidocaine. Identified peaks were: 1 = desethyl-lidocaine (1.57 ng/mg), 2 = lidocaine (115.89 ng/mg), 3 = dextromoramide (1.55 ng/mg),* = IS.*

An analysis of a 1.2 cm hair segment taken from around the *vertex posterior* detected the presence of: cocaine = 2.35 ng/mg, benzoylecgonine = 0.31 ng/mg, methadone = 10.17 ng/mg, EDDP = 1.52 ng/mg, dextromoramide = 1.55 ng/mg, lidocaine = 115.89 ng/mg and desethyl-lidocaine = 1.57 ng/mg (see Fig. 1).

When compared to cocaine levels which are only 2.3 ng/mg, the presence of lidocaine at a concentration of approximately one hundred ng/mg clearly indicates that this local anesthetic is not a cutting agent for cocaine, and furthermore, that its consumption was done in a repetitive manner through injections of Xylocaine. Desethyl-lidocaine was the only metabolite found in the hair, at a fraction approximately $^{1}/_{100}$ of its original product. Hydroxy-dextromoramide was not detected in hair by the tests. Even though the route of administration was not established, it would seem that the drug was administered through local injections, this being demonstrated by tracks around certain recent wounds. Tracks in the antecubital fossa indicate intravenous injection of toxins—certainly the case for dextromoramide—although one can not exclude the possibility that lidocaine might have been administered by this route as well. There was a localization of wounds to the face (excluding cheeks and nose), and the upper left extremity. The cuts were mostly located on the neck, torso, and left upper extremity. No wounds were noted on the lower extremities, genitalia, or back.

Conclusion

In the described case of self mutilation the victim, according to statements from those around him, could not tolerate pain in any form; thus, he seems to have used lidocaine by local injections to be able to inflict wounds on himself. The wounds tend to be of two types, straight cuts and discoid excoriations. It is certain that the desired goal was to obtain the most comprehensive analgesia possible without loss of consciousness in order to facilitate self mutilation. Hair testing for lidocaine supported regular drug use. Dextromoramide, methadone and cocaine were certainly mixed in or used alternately to complete the pharmacological arsenal.

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