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CASE REPORT

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Methamphetamine Body Packer: Acute Poisoning Death Due to Massive Leaking of Methamphetamine

ABSTRACT: We encountered three methamphetamine (MA) body packers presenting simultaneously, one of whom died. Three Nigerian men (39, 35, and 37 years old) who attempted to smuggle were found to contain 35 (498 g), 21 (292 g), and 5 packages (73 g) of methamphetamine hydrochloride (MA-HCl) in their stomachs, respectively. Packages were wrapped with plastic film and Scotch tape. The 39-year-old man died with acute poisoning from *c.* 20 g of MA-HCl that had leaked from the packages into the stomach. His plasma MA concentration was 8.6 μg/mL when he was hospitalized (17 h before his death). Autopsy findings showed extreme pulmonary congestion and edema as well as moderate hepatic edema and several petechiae. Quantitative analysis was performed by gas chromatography/mass spectrometry. Extremely high concentrations of MA and its metabolite amphetamine (AP) were found in cardiac blood (63.5 μg/mL and 1.2 μg/mL), urine (4,518 μg/mL and 72.4 μg/mL), gastric contents (8,490 μg/mL and 16.9 μg/mL), and in all other autopsy samples. These high concentrations confirmed that the cause of death was acute MA poisoning. Furthermore, impurity-profiling analysis of the seized MA revealed that the MA smuggled by the three suspects originated from the same batch.

KEYWORDS: forensic science, methamphetamine, body packer, toxicological analysis, impurity profiling, fatal level, redistribution

Persons who attempt to smuggle illicit drugs swallowed in their gastrointestinal tract, or inserted into the rectum or vagina, are known as "body packers" or "mules." In such cases, illicit drugs are usually packed in condoms, balloons or plastic film. Many authors have reported accident cases of body packers (1–9).

The first article about a body packer was published by Deitel et al. in 1973 (1). Since then, this practice has been on the rise until today, when it has become a serious problem. Drug smuggling by body packers has especially increased since the September 11, 2001 terrorist attack in the U.S. because tightened immigration control systems have made conventional smuggling difficult (2,3). This is true not only of the U.S. but of many countries, including Japan.

At the same time, methamphetamine (MA) abuse has increased in many countries because MA is easily synthesized, affordable for users, and has a continuous effect. A number of papers have been published concerning accident cases of cocaine or opiate body packers, but very few concerning MA body packers (10–12).

We encountered three MA body packers presenting simultaneously, one of whom died. We mainly report on the accidental death of the one MA body packer.

Case Report

Three Nigerian men (suspect 1, 39 years old; suspect 2, 35 years old; and suspect 3, 37 years old), who had been residing in Japan returned from 4 days of travel in China. One week later, they were hospitalized with abdominal pain and constipation and advanced hyper-excitability. Abdominal radiography and computed tomography revealed numerous foreign bodies in their stomachs (Fig. 1). From these observations, they were suspected of drug poisoning. Soon after, suspect 1 fell into a coma and died.

In the nonfatal cases, suspects 2 and 3 (a severe case and mild case, respectively) discharged 21 and five similar virgulate packages (total weights of crystalline powder were 292 and 73 g, respectively).

Autopsy Findings

An autopsy of suspect 1 was performed at 30 h after death. The corpse measured 180 cm in length and weighed 80 kg. The external examination showed no evidence of disease.

The internal examination showed extreme pulmonary congestion and edema as well as moderate hepatic edema and many petechiae in several organs.

Thirty-five virgulate packages consisting of compressed off-white crystalline powder wrapped with two layers of plastic film and wound with Scotch tape were found in the stomach (Fig. 2). Each package was 2.0–2.5 cm at external diameter, 4.9–5.8 cm in length and weighed 0–14.9 g (net weight). The total weight of crystalline powder was 498 g. One empty package and five ruptured packages were found among the 35 packages.

Toxicological Analysis

Initial drug screening of the urine obtained from the three suspects was performed using Triage® DOA (Sysmex Inc., Koba, Japan). The screening tests showed positive results only for amphetamine (AP)-type drugs.

Plasma samples of three suspects drawn at the time of hospitalization and the autopsy samples from suspect 1 (cardiac blood, urine, gastric mucus, brain, myocardium, heart, lungs, spleen,

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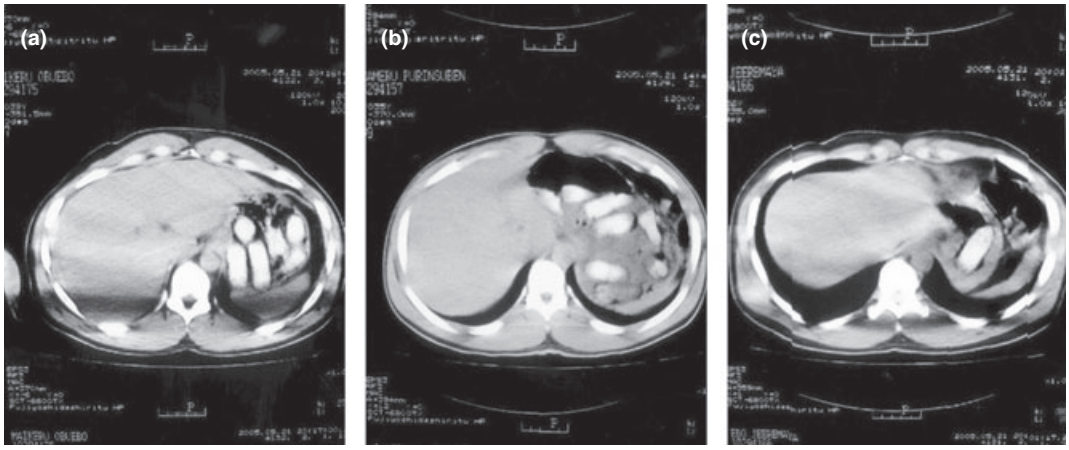

FIG. 1—*Images of abdominal plain computed tomography. (a) Suspect 1 (fatal case, contained 35 packages), (b) Suspect 2 (severe case, 21 packages), (c) Suspect 3 (mild case, 5 packages).*

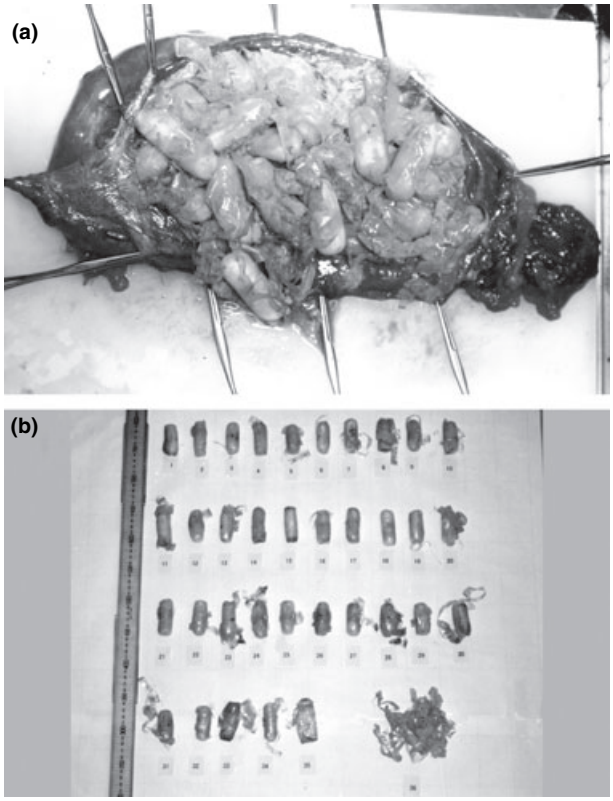

FIG. 2—*The methamphetamine packages removed from suspect 1. (a) Opened stomach of suspect 1 containing 35 methamphetamine packages. (b) The methamphetamine packages removed from the stomach.*

pancreas, stomach, and kidney) were also used for toxicological analysis. The biological samples were stored at −20°C without preservative treatment until analysis.

The drugs were extracted with diethylether from serum, cardiac blood, urine, gastric mucus, and from the tissues samples homogenate, after addition of *N*-butylbenzylamine (internal standard). The extracts dissolved with ethylacetate were incubated with trifluoroacetyl anhydride at 55°C for 15 min for trifluoroacetyl-derivatization. After careful evaporation, the residues were dissolved in 200 μL of ethylacetate. The drugs in biological samples were analyzed by gas chromatography/mass spectrometry (GC/MS) system using a Thermo Electron TRACE gas-chromatograph (Thermo Electron, Waltham, MA) equipped with an AS 2000 auto-sampler and interfaced to a Polaris Q mass spectrometer. The GC conditions were as follows: column, DB-5 capillary column (30 m × 0.25 mm i.d., film thickness 0.25 μm); column temperature, 160°C; injection port temperature, 230°C; carrier gas, He (0.9 mL/min). The MS conditions were follows: ionization mode, EI; ionization energy, 70 eV. Quantitative analysis of MA and its metabolite AP was performed by selected ion monitoring and target ions were *m/z* 154 (MA), *m/z* 140 (AP), and *m/z* 190 (internal standard), respectively. MA concentrations in the plasma samples of three suspects drawn at the time of hospitalization were 8.6 μg/mL (suspect 1), 7.8 μg/mL (suspect 2), and 0.8 μg/mL (suspect 3), respectively. AP concentrations were 0.3 μg/mL (suspect 1) and 0.4 μg/mL (suspect 2), respectively, with only a trace amount of AP detected in suspect 3.

Extremely high concentrations of MA and its metabolite AP were detected in all autopsy samples (Table 1).

All of the crystalline powder in 60 packages taken out of the three suspects was qualitatively analyzed by infrared spectrometry (IR) using Shimadzu FTIR-8600PC infrared spectrometer (Shimadzu Co., Kyoto, Japan). All crystalline powders were identified as MA·HCl.

Impurity-profiling analysis of the seized MA was carried out by capillary gas chromatography, after liquid–liquid extraction with ethyl acetate, containing tetratriacontane (0.05 mg/mL) as an internal standard, under basic conditions according to Inoue's method (13). The results of impurity-profiling analysis are shown in Fig. 3. Each of three gas chromatograms showed nearly the same pattern.

TABLE 1—*Distribution of methamphetamine and amphetamine (μg/mL* or μg/g).*

Sample	Methamphetamine	Amphetamine
Cardiac blood*	63.5	1.2
Myocardium	87.2	1.4
Brain	162.4	3.0
Lung	236.7	4.5
Liver	149.9	3.4
Pancreas	241.1	2.5
Spleen	244.2	2.5
Gastric wall	1,145	5.0
Gastric contents	8,490	16.9
Kidney	210.5	3.8
Urine*	4,518	72.6

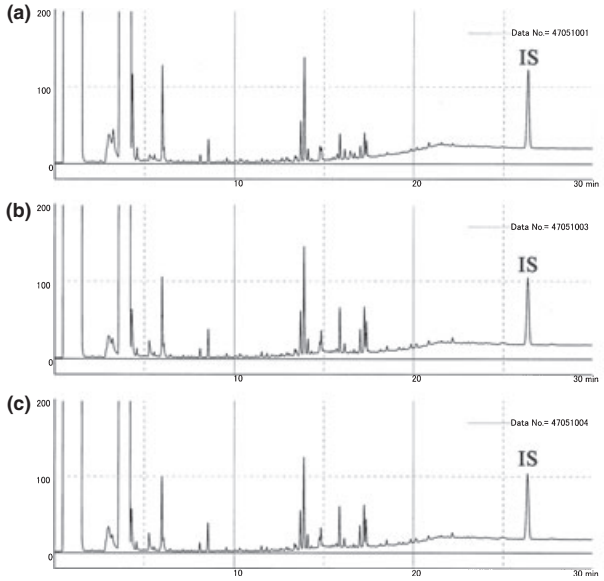

FIG. 3—*Gas chromatograms for impurity profiling analysis of methamphetamine samples removed from the three body packers. (a) Chromatogram of methamphetamine obtained from suspect 1 (fatal case). (b) Chromatogram of methamphetamine obtained from suspect 2 (severe case). (c) Chromatogram of methamphetamine obtained from suspect 3 (mild case).*

From this result, we estimated that the MA smuggled by the three suspects originated from same batch.

Discussion

We encountered three MA body packers presenting simultaneously, one of whom later died. The packages seized from the three suspects were approximately the same in size, weight and wrapping. In addition, the result of impurity profiling analysis suggested that the samples originated from the same batch.

The amounts of MA·HCl that had leaked from the packages into their bodies were estimated based on the number and weight of ruptured packages removed from their bodies. As a result of this calculation, the weight of leaked MA·HCl was estimated to be about 20 g in suspect 1 (death case), about 18 g in suspect 2 (severe case), and a few grams in suspect 3 (mild case). As described above, the plasma concentrations of MA were 8.6 μg/mL (suspect 1), 7.8 μg/mL (suspect 2), and 0.8 μg/mL (suspect 3), respectively, at hospitalization. That is, the MA concentrations clearly corresponded to the estimated amounts of intake.

According to Logan et al. (14), blood MA levels inducing fatality range from 0.23 to 40 μg/mL. Molina et al. (15) reported the results of review articles, in which fatal MA blood levels were estimated to range anywhere from 1.4 to 13 μg/mL. According to Nagata's report (16), the MA concentration in fatal cases ranged from 3.2 to 34 μg/mL while that in severe cases ranged from 2.2 to 7.0 μg/mL. Thus, the plasma MA levels of suspect 1 (8.6 μg/mL) and suspect 2 (7.8 μg/mL) were interpreted as reaching the fatal level although only suspect 1 died.

Methamphetamine concentrations in the autopsy samples obtained from suspect 1 were extremely high (Table 1). These values probably do not represent the MA concentrations at the time of death, however. The high concentrations were attributed to redistribution after death because the autopsy was performed at 30 h after death.

Barnhart et al. (17) and Moriya et al. (18) reported that postmortem MA redistribution depends on the organ. Barnhart et al. reported that MA concentration in the cardiac blood was higher than that in the peripheral blood of all examples in their study. They attributed those differences to postmortem redistribution from the myocardium to the cardiac blood (17). On the other hand, Moriya et al. (18) said that MA distributed in the lungs at high concentration was redistributed rapidly into the blood of the left cardiac chambers. Moreover, they pointed out that the high concentration of drug contained in the stomach may diffuse to the surrounding tissues (19). According to their conclusion, the MA concentration of the peripheral blood and the right cardiac chambers blood probably reflect more accurately the MA concentration of whole body blood at the time of death. Thus, they recommended peripheral blood and right cardiac chamber blood for quantitative analysis.

Our analytical data were not sufficient to presume the MA concentration of circulating blood at the time of death because we used neither peripheral blood nor right cardiac chamber blood for quantitative analysis.

The MA concentration of circulating blood of suspect 1 at 17 h before death was 8.6 μg/mL; that concentration had increased to 63.5 μg/mL (7.3 times) at 30 h after death. We considered that the cause of high concentration was postmortem redistribution following continuous absorption of MA until death. The MA concentration in the myocardium and lungs were higher than in the cardiac blood. In a human study of postmortem redistribution of MA, the MA concentration ratio of the myocardium to cardiac blood was reported to be 0.96 to 2.00 (17). In the present case, the ratio calculated was 1.37, and this value was consistent with literature. Moreover, not only the gastric contents (8,490 μg/mL) but also the gastric wall (1,145 μg/g) contained extremely high concentrations of MA. Thus, we assumed that diffusion of MA to the surrounding tissues through the gastric wall also occurred.

We could deduce from the toxicological data that the cause of death was due to acute MA poisoning and that postmortem MA redistribution had occurred.

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