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# Fatal Heroin Intoxication in Body Packers: One Case Reports and Review of the Literature

**Abstract** It has reported a case of death due to the effects of heroin concealed in a man who was attempting to smuggle the drug within his gastro-intestinal track. He successfully escaped from the airport detection and reached the destination-Chongqing from Yunnan province in China. He was sent into the old age assistance service center because of poor health and then died after 12 hours. According to forensic procedure of sudden unnatural death, the decedent had to accept a series of examination such as CT scan, autopsy and toxicological analysis. He was found die of acute heroin intoxication due to the rupture of drug packet in the stomach. This case illustrates the challenges to airport inspectors and forensic medical examiners in evaluation of potential drug packers and therefore it needs to consider all factors involved in forensic diagnosis.

*Keywords:* Forensic science; Heroin; intoxication; Body Packer; Morphology; Case report;

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## Introduction

Body packers are smugglers who conceal narcotic for transport in their bodies. Handmade or automatically produced packets are swallowed, rectally or vaginally inserted, and transported to destination for commercially or own use [1]. The package may be wrapped in cellophane, layers of latex, rubber cots, condoms, plastic bags, aluminum foil, plastic foil, wax sealing, carbon paper or self adhesive tape [2-3]. The extent of smuggling by body packers is unknown, and little information exists regarding the fatalities that arise from this practice. However, it is thought that because of increasing sophistication in intracorporeal concealment methods, only a few body packers die of poisoning because of leakage of an internally concealed container [4]. A statistical analysis from China Narcotics Control Report 2011 reveals that Heroin is still one of the most frequently used drugs which is highly potent semi-synthetic opiate, and has been favoured in illicit drug trafficking. While drug packets are inside the stomach and bowels, they can leak or rupture causing acute substance toxicity, bowel obstruction or bowel perforation. The most severe complication of the body packer syndrome is acute fatal intoxication.

Body packers were first reported in Toronto in 1973 [5], but the first autopsy on a narcotic fatality described cerebral and pulmonary congestion in 1852 [6]. Additional signs may include portal adenopathy, track marks, renal nephropathy and leukoencephalopathy. These pathological signs are considered "typical" but "neither certain nor characteristic", thus in conducting a forensic investigation of death due to narcotism. It is important to consider all factors including decedent history, clinical manifestation, radiological results, pathological changes as well as toxicology findings [7].

It has presented a case of death caused by heroin intoxication in a body packer and retrospectively reviewed some literatures published in recent years so as to highlight the challenges in its forensic diagnosis. We hope that the information heroin will further contribute to forensic medical examiners understanding of the characters of drug packers.

## Case report

### Case history

A Chinese male came to Chongqing from Yunnan Province

in China and stayed in old age assistance service center in Yubei district because of poor health. One day before his death, he told the service center worker that he felt uncomfortable and asked for some medicine. After having the medicine, he went to his room. He was found dead about 12 hours after last being seen by the worker. After a crime scene investigation, the deceased was transferred to department of radiology of the Third Military Medical University for a total body scan and then transported to Department of Forensic Medicine at Chongqing Public Security Bureau for a medico-legal autopsy. The autopsy was performed six hours after the body was found.

### CT findings

The deceased was underwent an initial whole-body CT scan (GE Medical Systems, USA) at the Third Military Medical University. No orally or intravenously administered contrast agent was used. The scanning protocol included a collimation of 64×0.625mm, pitch of 0.984:1, rotation speed of 0.5 second, tube voltage of 120kV and tube current of 300mA. Images were retrospectively reconstructed at the CT console to a section thickness of 3.0mm. The CT images were reviewed by two experienced radiologists for the presence, distribution, and pattern of drug packets. In this study, the CT density of the packets was classed as inhomogeneous hyperdense, and homogeneous isodense (-40 ~ 30HU), homogeneous hypodense. Herein referred to a CT value lower than -40HU, which was the value obtained for fat. Methamphetamine referred to a CT value 100HU. CT manifestations of body packing included the presence of shapes, varied density and well-defined round or ovoid intraluminal foreign-body shadows that were closely arranged along the GI tract. For the heroin packets, most of them which were homogeneous isodense were located in the stomach, small intestine and descending colon & sigmoid colon area (Fig.2A-C), while another 3 packets which contained methamphetamine (Fig.2C,F) manifested numerous pellet-shaped inhomogeneous hyperdense in small intestine and sigmoid colon area. For that reason, heroin packets with homogeneous isodense density became more apparent after manipulating the image windowing (Fig.2D-F). The shape was mostly sausage like or round. The virtual distribution of drug packets was reconstructed by volume rendering (VR) (Fig.2G).

### Autopsy findings

The deceased was a 55-year-old Chinese male. There were no violent wounds found on the body or injection sites. The brain had outstanding features of increased intracranial pressure including



Fig.1 25 drug packages swallowed orally were hand made. The packets are 2cm in diameter and 3-5cm in length. There were 14 condom balls of white powder in the stomach and one of them (red arrow) was split open at the gastro-oesophageal junction (A). 11 condom balls were found in small intestine and descending colon & sigmoid colon, 3 colon balls (red star) contained red pellets (B).

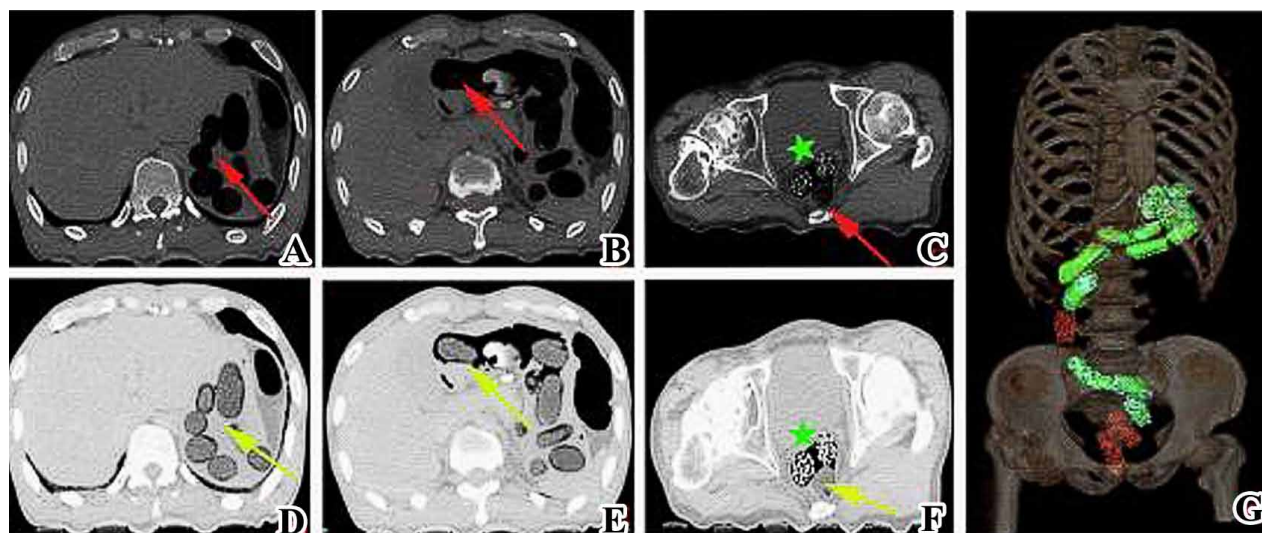


Fig.2 Homogeneous isodense packets on abdominal CT with different CT windowing, some round homogeneous isodense foreign-body shadows (red arrow) in the GI track with standard abdominal windowing (level 40 / width 400) (A-C) were classified as indefinite. After manipulating the windowing (level-175 / width 600) (D-F), they (yellow arrow) became conspicuous by the round shape and smooth edge that was seen, and were easily differentiated from residual bowel contents. Heroin packets were homogeneous isodense (arrow), but methamphetamine (star) manifested pellet-shaped inhomogeneous hyperdense (C, F). Drug packets distribution along GI track by VR (G).

flattened gyri, consular herniation and uncal grooving. There was marked congestion of cerebral vessels, but no evidence of intracranial haemorrhage. Pulmonary edema and congestion were observed in both lungs. At autopsy 25 condom balls were retrieved from his body (Fig.1). In the stomach, a turbid solution was seen with some small pieces of plastic and gastric mucosa was markedly congested with no ulcerations. There were 13 condom balls of white powder in the stomach and another 1 condoms had been split open at the gastro-

oesophageal junction (Fig.1A). There were 2 condom balls containing respectively red pellets and white powder in small intestine. In descending colon & sigmoid colon another 2 intact condom balls of red pellets and 7 balls of white powder were found (Fig.1B). The pattern of packing was such that the powder ( pellets) was wrapped inside a white rectangle plastic sheet. It was not tied, but only twisted on the surface by string. Each package was then put into a condom. The ball was enclosed by a knot tied at the end of the condom. All

of the drug packets were produced manually. The maximal package was 2cm in diameter and 5cm in length and the minimal was 2cm in diameter and 3cm in length. The commonest sizes of the packets were approximately 4\*2\*2cm.

### Toxicological analysis

Urine, blood and gastric contents were collected and sent to the toxicology laboratory in the department of forensic medicine. Using thin layer chromatography, heroin and 6-monoacetylmorphine (6-MAM) were identified in the gastric content along with white powder. In the blood, 6-MAM, morphine and codeine were detected using the thin layer chromatography technique. The serum levels of 6-MAM measured by LC-MS/MS (AB Company, USA) were 29.786µg/ml. Morphine, 6-MAM and codeine also were identified in the urine using thin layer chromatography and by LC-MS/MS.

The intact powder (pellets) packets were submitted to the police department and then sent to the government laboratory for measurement of its purity. The report revealed that the heroin powder was 210g with purity of 59.9%, and red pellets contained methamphetamine with weights and purity of 55g and 13.3%.

The cause of death in the victim was a heroin overdose and the estimated quantity of heroin that leaked into his stomach was 4g.

### Discussion

Concealment and transit of heroin is a major business worldwide. During the last decade, increased rates of drug trafficking have resulted in more creative methods being adopted by smugglers. One of these methods of illicit drug smuggling is body packing. However, The detection of these packets is not only a challenge to customs officials and police interested in preventing the importation and trafficking of illegal drugs but also to physicians and forensic medical examiners responsible for identifying and managing drug packers [8-10]. Therefore, it is very important that how to recognize potential body packers including how to interpret radiological appearance of possible body packers, of patients with symptoms of intoxication, and of people coming from abroad with signs of an ileus.

Heroin is a chemical product of opium which is refined out of the milky juice of the poppy capsule. Usually, the heroin powder has a bright or white color, but depending on the admixture of substances, color and consistency may vary [11]. Heroin is well absorbed from the gastrointestinal track. Tolerance develops rapidly, but there is

marked individual variation in sensitivity to the drug. Consequently the acute lethal dose varies between individual and within individuals depending upon their previous exposure to opiates. Symptoms and signs of opiate toxicity include nausea, vomiting, constipation, depression of consciousness, respiratory depression, coma and death. The decedent died of the effects of acute heroin toxicity that could not be medically reversed. This occurred immediately leading to irreversible pathophysiological changes that caused coma and resulted in death. The minimum lethal blood level of heroin is at 0.2mg/L [12-13]. Opiate absorption occurs mostly in the gastrointestinal track to reach peak plasma level after 30-90minutes [6]. Tissue redistribution of heroin and its metabolites is very rapid [12,15]. Once the conversion of heroin to morphine is completed, the measurable detection of the morphine is limited to 12 hours [12,14-15]. Thus even with the most sensitive methods the maximum limit of detection does not exceed 48 hours in plasma [14-15].

The main findings at autopsy were pulmonary edema, congestion of the cerebral vessels, hyperemic gastric and colonic mucosa, and epicardial haemorrhage. These are consistent with pathological finding from similar cases reported of narcotic fatalities [6,16-19]. The mechanism of death is usually related to respiratory failure secondary to the direct suppressor effects of the opiate metabolites on respiratory centers leading to hypoxia, hypercapnia and pulmonary edema. The actual pathophysiology of pulmonary edema is unclear, but is thought to arise as a direct result of hypoxia, capillary permeability and fluid extravasations into the alveoli [6, 20-21]. Epicardial haemorrhage as documented in this case result as a sequel of pulmonary edema as well as injury caused directly by hypoxia and heroin toxicity to the coronary capillaries. No specimens were taken for histology, because we did not foresee any additional value from histology in this particular case having been limited by constraints previously explained elsewhere [20].

The size and form of foreign bodies depend on the way drug-filled packets have been produced and how they have been inserted into the body. Commonly, Drug packets are hand made or mechanically produced. Generally, there are two or three layers used as wrappings, but eight different layers were found in one case of a surviving person [16]. Condoms, latex, cellophane, and other synthetic materials are formed to balls or oval-shaped objects usually 2-4cm in size. The swallowed packets (2cm in size, spherical in shape) are smaller than the rectally or vaginally inserted drug packets



(4-6cm long and 2-3cm wide, oval form) [11], a ball-like form of packets inserted into the rectum with a diameter of 5.5cm and a length of 8cm is not rare [22]. Mechanically produced packets have a uniform shape, mostly round and 2cm in diameter, whereas handmade ones each look a little bit different each. Yang et al. [22] reported 124 cases of heroin body packets which were produced mechanically. In our study all drug packets are hand made, so the size of each packet is different.

Drug packages in the body can result in mechanical complications such as gastro-intestine obstruction, perforation and consequent peritonitis [11]. Obstruction has been described at the gastro-oesophageal junction, pylorus, ileo-caecal valve and colonic flexures. Package rupture can result in systemic drug absorption and cause drug toxicity and overdose [8]. There are some factors that cause package rupture or leakage, firstly most of materials wrapping drugs are vulnerable to gastric acid; secondly the packages are easily damaged by mechanical movement especially in vomiting; thirdly fluid from the GI tract may permeate the walls of the packet and result in rupture; fourthly the constipating effect of heroin will lengthen bowel transit time contributing to rupture of packets; finally laxatives and paraffin oil may favor packet rupture and drug intoxication [23-24]. However, the relationship between the rupture of drug packets and the factors above mentioned is still further explored.

The history provided by potential drug traffickers is often unreliable, so radiographic imaging play an essential role in identifying body packers and monitoring packet evacuation. To date, Plain X-ray film, Ultrasound, CT and MRI are the most commonly used methods to examine people suspected of being body packers.

Plain X-ray of the abdomen (AXR) in an upright and supine position is the most commonly used radiological examination to detect drug-filled packets, and is considered to be the gold standard screening tool [1, 8, 11, 25-26]. The sensitivity of AXR to detect drug packets has been shown to be around 85-93.5% in the literature [22, 26]. False negatives may arise due to difficulties delineating the packet margins from residual bowel contents [22]. A few papers report on the typical appearance of the different drug depending on their density [27-29] that hashish is described to appear on the X-ray film as a very dense substance in comparison with stool; both are denser than water. Cocaine should have an attenuation lesser than water, whereas heroin should look like air. However, the density of these drugs may vary depending on their composition, the degree

of purity and the materials & techniques used in packaging [11, 30-31]. The most common radiographic findings in the body packers are spherical or cylindrically shaped densities throughout the abdomen, sometimes surrounded by thin rims of air or clearly outlined by dense wrapping material. Occasionally, they are arranged in parallel within the bowel lumen [22].

Computed tomography is the most sensitive method for detecting ingested drug packages. It should be used when an AXR is negative, but drug packing is still strongly suspected [8, 11, 22, 30]. Unenhanced CT has been shown to be a fast, accurate and easily reproducible imaging modality for the detection of ingested drug filled packets. Sensitivity is generally excellent, ranging from 95.6-100% [22, 32]. At the same time, CT is also useful for the identification of any associated complications like intestinal obstruction and perforation [26]. There is a report [28] about using CT measurement of drug packets in the bowel that hashish has a density like bone, cocaine is less dense than fat, and the Hounsfield units of heroin are situated between fat and air. Identifying the homogeneous isodense heroin packets is really a tough problem. The homogeneous isodense packets in the GI tract may go undetected if the window width and level settings typically employed for abdominal CT (window width 400HU, window level 40HU) are used. We therefore recommend, in cases of suspected homogeneous isodense drug packet ingestion, manipulating the windowing (level -150 ~ -300/width 600 ~ 800) in addition to those commonly used for abdominal CT. In our study, some heroin packets with homogeneous isodense became apparent on manipulation of image windowing.

Magnetic resonance imaging does not have any diagnostic value for the detection of drug packets in the bowel because there are no free protons and the packets are tight against water, packets should appear as geometrically formed bodies without any signal in a fluid-filled bowel provided the bowel has been immobilized with spasmolytics. The MRI is diagnostically useless in an air-filled bowel with normal peristalsis [11].

## Conclusion

It has recommended a protocol for the identification of body packers.

1. A detailed initial history focuses on ascertaining the type of drug, the number of packets ingested should be obtained from drug

packers or their attendants.

2. Clinical manifestations induced by drug packets inside their bodies.

3. Toxicological analysis as fast as possible in decedent being suspicious of drug packers.

4. Plain X-ray of the abdomen (AXR) is initial recommendable method; CT should be used when an AXR is negative, but CT is the first-choice tool in cases of sudden unnatural death.

5. Autopsy is essential for the decedent to ascertaining a potential body packer.

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