
PICTORIAL ESSAY

Radiological Features of Liquid Cocaine Body Packing on Plain Abdominal Radiography: a Pictorial Essay

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INTRODUCTION

Body packing is the concealing of illicit drugs in the abdominal or pelvic cavity of the human body.¹ It is a frequently used method for drug trafficking to avoid detection at border crossings or airport customs. Body packers may ingest packets of varying size and containing various illicit drugs, including cocaine,² amphetamine,³ 3,4-methylenedioxymethamphetamine (“ecstasy”),⁴ marijuana,⁵ and heroin.⁶ They may present to an accident and emergency department (AED) for acute complications from the body packing, including acute drug toxicity and bowel obstruction, or most often for medical examination after custody by the customs officers and police.⁷

Plain abdominal radiography is the most commonly adopted screening tool to detect body packing of illicit drugs. In general, plain abdominal radiography has a high reported sensitivity of up to 90%.⁸ Sensitivity is affected by several factors, including the type and purity of drugs, packet material, number of packets, location within the intestines, presence of bowel gas, and the experience of radiologist.¹ Well-recognised radiological signs in plain abdominal radiographs include multiple radiopaque foreign bodies and the ‘double-condom’ sign.¹

Liquid cocaine body packing is a new method for drug smuggling. The radiological properties of liquid cocaine are different from those of illicit drugs in powder or solid

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Ethics Approval: The patients in this study were recruited from the data set of an earlier study (Tsang PH, Wong KC, Wong OF, Chan WW, Ma HM. Radiological features of body packers: an experience from a regional Accident and Emergency Department in close proximity to the Hong Kong International Airport. *Hong Kong J Emerg Med.* 2018;25:201-10.), which was approved by KWC Research Ethics Committee (Ref KW/EX-18-011(119-11)) and secondary analysis of those patients with liquid cocaine body packing was performed.

form, posing a challenge in detecting body packing on plain abdominal radiographs. Liquid cocaine packets have lower density and irregular borders resembling faeces in the bowel.⁹ Some subtle radiological signs for intra-abdominal liquid cocaine packets have been purposed in the literature, including the 'thin lucent lines' which are the thin layers of intestinal gas trapped in the interfaces between adjacent packets.¹⁰ However, those radiological signs for liquid cocaine packets are not sensitive and also difficult to identify, even by experienced radiologists.

North Lantau Hospital, Hong Kong, is the nearest hospital to Hong Kong International Airport. Suspected body packers under the detention of customs officers and police in the airport are brought to the North Lantau Hospital AED for medical assessment. Plain abdominal radiography examinations are used as the screening tool for detecting the presence of intra-abdominal drug packets in the AED. For individuals with unclear radiological findings on abdominal radiographs or with clinical suspicion, computed tomography (CT) examination of the abdomen is arranged. The clinical experience for local emergency doctors in evaluating the radiological features of liquid cocaine body packers is limited and there is no local publication in this aspect. This article presents our experiences in evaluating plain abdominal radiographs in a case series of liquid cocaine body packers encountered in North Lantau Hospital AED.

METHODS

Patients

Patient data were extracted from the data set of a previous study.¹¹ Nine cases of confirmed liquid cocaine body packers from a total of 268 suspected body packers under the detention by the customs officers and police presenting to North Lantau Hospital AED for medical assessment from 1 January 2015 to 28 February 2017 were reviewed. The radiological features of liquid cocaine body packing on the plain abdominal radiographs were retrospectively evaluated and reported.

Image Acquisition

Plain abdominal radiography examinations were conducted with the suspected body packers in the supine position and using the standard anteroposterior view with a digital X-ray system (GE Medical Systems, Discovery™ XR636, United States) with a tube voltage of 80 kVp, tube current by automatic exposure control, and focus-film distance of 100 cm.

Radiological Interpretation

The plain abdominal radiographs and CT scan images were retrospectively interpreted by a qualified radiologist with professional experience of more than 10 years. The radiological features of liquid cocaine packets and other specific radiological signs of body packing were recorded. The radiological features of liquid cocaine body packing were compared with those of powder form cocaine body packing. New radiological signs of liquid cocaine body packing, and intra-intestinal drug packets were also identified.

The following shows various radiological signs for intra-intestinal drug packets on plain abdominal radiographs.

- 'Tic-tac' sign describes the presence of multiple oblong, uniformly shaped intra-intestinal drug packets.
- 'Double condom' sign is a radiolucent rim of air trapped between the multiple layers of packing surrounding each drug packet in a well-defined shape.
- 'Rosette' sign is formed by air trapped in the knot where the packing is tied.
- 'Halo' sign is a complete rim of blurred lucency around the drug packet.
- 'Black crescent' sign is crescent of air around the drug packet and bowel wall.
- 'Lucent triangle' sign is air in the interface between drug packets or with bowel wall.

In addition to specific radiological signs of intra-intestinal drug packets on plain abdominal radiographs, the density (opaque to soft tissue or faeces-like), the geometric shape and the border of the drug packets and the presence of dilated bowel were also recorded.

RESULTS

The liquid cocaine body packers included five men and four women of mean age 34 years (range, 22-47 years). More than half of them travelled from countries in South America, including Colombian, Venezuelan and Peruvian. None of the female liquid cocaine body packers was pregnant. All the liquid cocaine body packers were asymptomatic on arrival to the AED and all of them passed the drug packets uneventfully during their stay in the custodial ward in Queen Elizabeth Hospital. Five of them had unclear findings on plain abdominal radiographs interpreted by the attending emergency physicians and required CT scan to confirm drug body packing. The main reasons of inability to confirm drug body packing on the abdominal radiographs included the absence of the typical appearance of intra-intestinal drug

packets (the 'tic-tac' sign) and the faeces-like density of the drug packets in the bowel. The radiological features are summarised in the Table.

The classical 'tic-tac' sign was absent in all cases of liquid cocaine body packing. The liquid cocaine packets appeared to be irregular and had variable geometric shapes lacking clear borders on plain abdominal radiographs in eight cases (Figure 1). The 'double condom' sign (Figure 2) was identified in all the cases. However, the 'double condom' sign is very subtle particularly in the absence of a clear radiopaque

shadow of drug packet. The 'halo' sign (Figure 3) was detected in seven cases, 'black crescent' sign (Figure 4) in eight cases, and 'lucent triangle' sign (Figure 5) in five cases. None of the cases had visible 'rosette' sign on the plain abdominal radiographs. Dilated bowel was common and was detected in seven cases (Figure 6). One case had gaseous dilated bowel visible on plain abdominal radiographs (Figure 7) without clinical signs and symptoms of intestinal obstruction.

DISCUSSION

Cocaine, as well as opiates, is the one of the drugs

Table. Presence of radiological features in the studied population.

Case	Amount (g)	Tic-tac sign*	Double condom sign	Rosette sign*	Halo sign	Black crescent sign	Lucent triangle sign	Density	Geometric shape	Border	Dilated bowel
1	969	-	+	-	-	-	+	Opaque to soft tissue	Irregular/variable	Lack of border	-
2	1144	-	+	-	+	+	-	Faeces-like	Irregular/variable	Lack of border	+
3	1008	-	+	-	+	+	-	Faeces-like	Irregular/variable	Lack of border	+
4	975	-	+	-	+	+	-	Faeces-like	Irregular/variable	Lack of border	+
5	3672	-	+	-	+	+	+	Opaque to soft tissue	Oval/round	Sharp	+
6	1161	-	+	-	+	+	+	Faeces-like	Irregular/variable	Lack of border	+
7	1800	-	+	-	+	+	+	Opaque to soft tissue	Irregular/variable	Lack of border	+
8	476	-	+	-	-	+	+	Faeces-like	Irregular/variable	Lack of border	+
9	560	-	+	-	+	+	-	Opaque to soft tissue	Irregular/variable	Lack of border	-

* No 'tic-tac' sign or 'rosette' sign was detected in any liquid cocaine body packers. + or - indicates presence or absence of radiological feature.

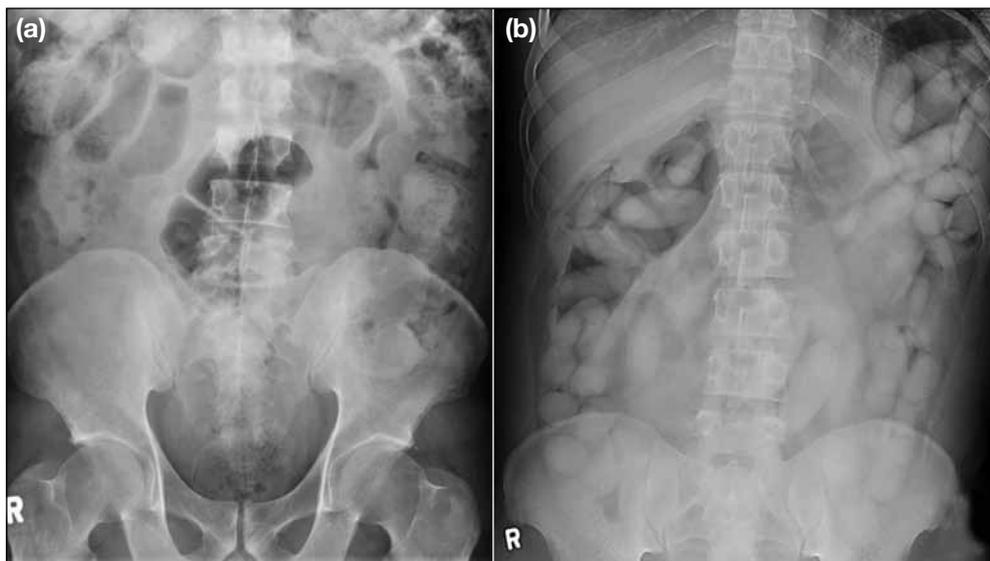


Figure 1. (a) Absence of classic 'tic-tac' sign in the a case of liquid cocaine body packing. (b) Classic 'tic-tac' sign in a case of powder form cocaine body packing.

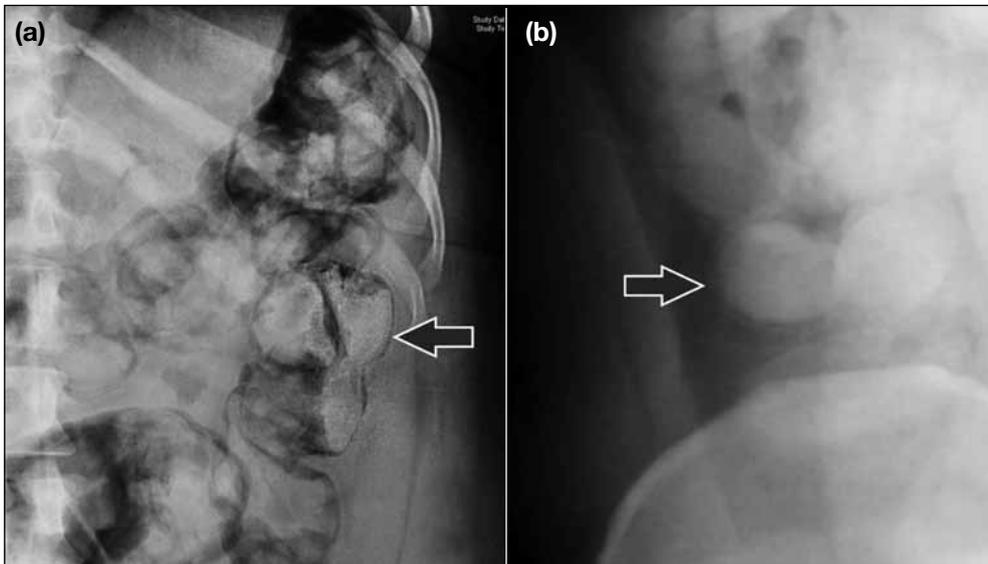


Figure 2. ‘Double condom’ sign (rim of air tripped between multiple layers of backing surround each packet) in (a) liquid cocaine and (b) powder form cocaine body packing. (Reproduced with permission from SAGE Publications Ltd)

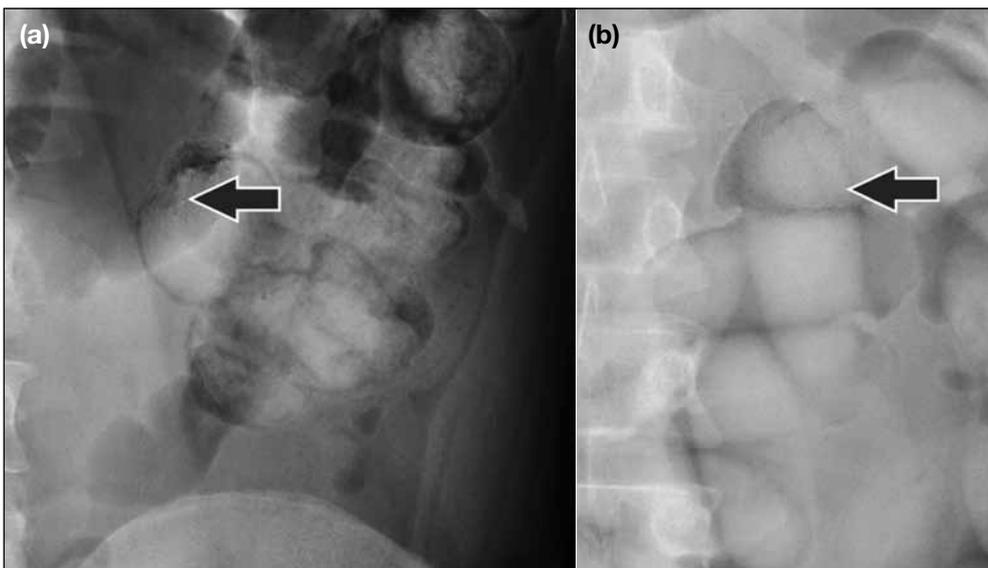


Figure 3. ‘Halo’ sign (complete rim of blurred lucency around drug packet) in (a) liquid cocaine and (b) powder form cocaine body packing.

most often smuggled by body packers.¹ Although plain abdominal radiography in general is highly sensitive to detect intra-abdominal body packets, a range of sensitivities is reported in the literature from 40% to 90%.^{8,12,13} Despite the limitations of abdominal radiography, it is still the adopted screening tool to detect body packing in local AEDs, owing to the consideration of resource availability and unnecessary radiation exposure.¹¹ Specific radiological signs for powder or solid form drug body packing in the literature include

‘tic-tac’ sign, ‘double condom’ sign, ‘halo sign’, and ‘rosette’ sign.^{1,8} Niewiarowski et al¹⁴ reported that the incidences of these radiological signs were 93% for the ‘tic-tac’ sign, 73% for the ‘double condom’ sign, and 36% for the ‘halo’ sign in a cohort of 295 suspected body packers. The ‘rosette’ sign was not detected in any of the confirmed cases.¹⁴

Liquid cocaine packets have different radiological properties from powder or solid form drug packets,

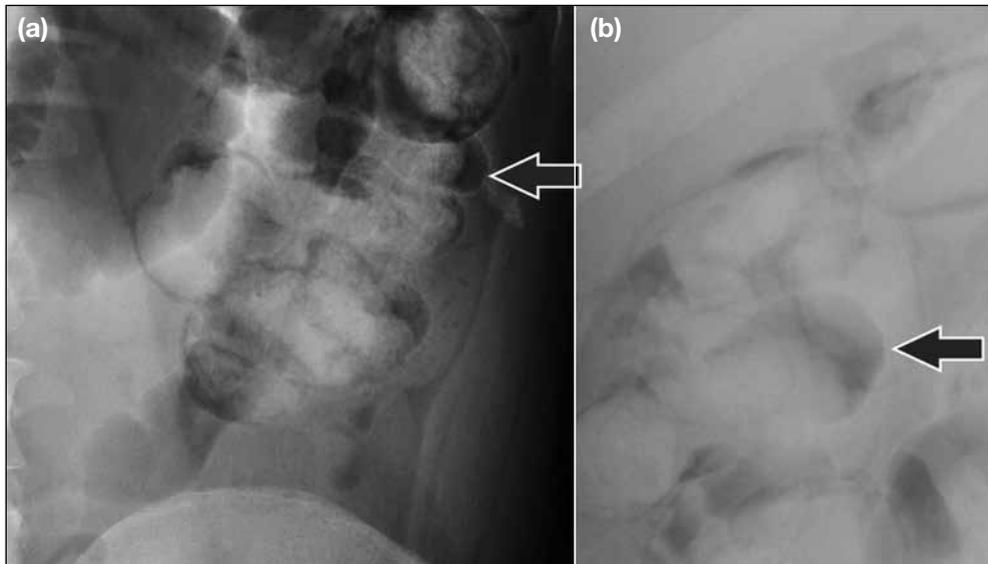


Figure 4. ‘Black crescent’ sign (crescent of air around drug packet) in (a) liquid cocaine and (b) powder form cocaine body packing.

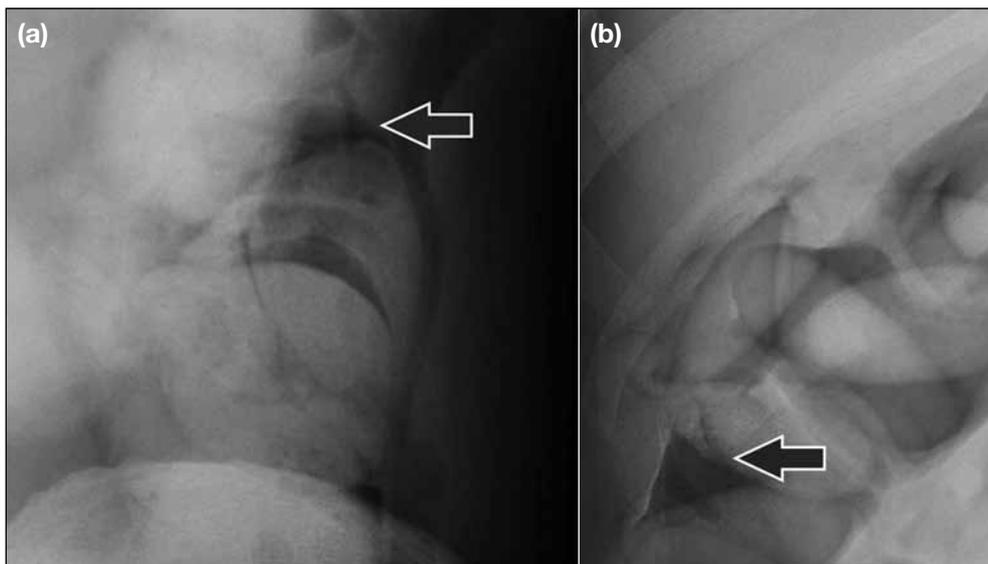


Figure 5. ‘Lucent triangle’ sign (air in the interface between drug packets or with bowel wall) in (a) liquid cocaine and (b) powder form cocaine body packing. (Reproduced with permission from SAGE Publications Ltd)

making them harder to detect on plain abdominal radiographs. They have similar opacity to bowel contents and have irregular shapes that conform to the intestinal contour.¹⁰ Owing to the variable geometric shapes and lower density of the liquid cocaine packets, the classic ‘tic-tac’ sign was absent in all the cases in our case series. In addition, we found that the “thin lucent lines” for the detection of liquid cocaine packets is difficult to identify on plain abdominal radiography. Therefore, we suggest two new radiological signs, the ‘black crescent’

sign and the ‘lucent triangle’ sign, to help identify liquid form drug packets on plain abdominal radiographs.

Abdominal CT scan is useful in the detection of drug packets, including both powder and liquid form cocaine.¹⁰ The use of low-dose CT scan for better delineation of drug packets has been reported. However, the dosage of radiation is still significantly higher than conventional radiography and it should be reserved for those cases with inconclusive plain abdominal radiography results.



Figure 6. Dilated colon particularly at ascending colon in a liquid cocaine body packer.



Figure 7. Gaseous dilated bowel in a liquid cocaine body packer without clinical sign of intestinal obstruction. (Reproduced with permission from SAGE Publications Ltd)

CONCLUSION

Liquid cocaine body packing is a novel method of drug smuggling. However, liquid form drug packets are more difficult to identify on plain abdominal radiographs compared with powder or solid form drug packets. Emergency physicians and other frontline doctors who encounter suspected body packers should be aware of those subtle radiological features of liquid cocaine body packing on plain abdominal radiographs.

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