



# Feasibility of abdominal plain film images in evaluation suspected drug smuggler

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## ABSTRACT

**Objective:** Drug smuggling in the gastrointestinal tract has soared within the last 20 years. Though illegal substances in the gastrointestinal tract can be visualized with ultrasound, MRI and CT, the abdominal radiograph has by far remained the most frequently used way of detecting smuggled drugs. The purpose of the study was to evaluate the inter-radiologist interpretation error and the reliability of the abdominal radiograph in detecting smuggled drugs.

**Materials and methods:** A total of 279 abdominal radiographs of suspected smugglers were classified by three radiologists as clearly positive or negative for drug smuggling. All available information about the cases was collected from the customs officers and police.

**Results:** Out of these cases 203 (73%) were interpreted as negative and 35 (13%) as positive by all three radiologists. In 86% of the cases there was, therefore, an inter-radiological agreement in interpreting the images. In 41 (14%) cases, however, there was an inter-radiologist disagreement. Kappa-value for inter-observer variability was 0.70.

**Conclusions:** In up to a seventh of the abdominal radiographs the interpretation can be challenging even for an experienced radiologist. False positive interpretation can lead to innocent passengers being detained in vain. As negatively interpreted images usually result in releasing of the suspect, there is no way of knowing how many false negative occur. This makes the abdominal radiograph a suboptimal examination, and low dose CT should be considered as the screening modality for gastrointestinal drug smugglers.

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## 1. Introduction

Drug smuggling in the gastrointestinal tract was first documented forty years ago [1,2]. Since then the number of persons imaged for suspected smuggling of illegal substances in the gastrointestinal tract has soared. In addition to the gastrointestinal tract, illegal substances have also been smuggled in the vagina [3]. The abdominal plain film image has been considered to have a good detection rate of illegal substances [4,5]. Only a few case reports have been published about visualizing concealed substances by MRI, CT and ultrasound [4,6]. In addition, there is only one study available using an animal model concerning detection of illegal drugs in the gastrointestinal track by low dose CT [7]. Furthermore, there are no larger studies about using other modalities than abdominal plain film images in screening for concealed substances available. The abdominal plain film image has therefore, remained the first line of imaging in suspected smuggling cases.

Illegal drugs in the gastrointestinal track can cause bowel obstruction or intoxication due to ruptured drug packets in the bowl [1,8,9]. Cocaine, heroin, LSD and illegal substances in pill form can be concealed in the gastrointestinal track in several ways. They can either be swallowed or passed into the colon per rectum. Heroin and cocaine are mostly wrapped in plastic or condoms, to form 2–4 cm packages, which are then swallowed (Figs. 1–3). These suspects can often have up to 100 packages both in their colon and small intestine [4]. This is the most common way used by smugglers passing through larger airports and best documented in previous studies. Another way to smuggle illegal substances is to put them in larger 4–6 cm hard plastic containers, which are then placed into the rectum (Figs. 4 and 5) [5]. These containers can hold solid drugs, powder or pills.

The purpose of the present study was to evaluate the inter-radiologist interpretation error and the reliability of the abdominal radiograph in detecting smuggled drugs.

## 2. Materials and methods

Our institution is located in a middle sized European capital, with a fairly busy international airport. All the suspected drug smugglers in the metropolitan area are imaged in the one on call

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**Fig. 1.** Packages that had been swallowed by a 35-year-old drug smuggler whose radiograph is shown in Fig. 2.

hospital of the area. In most cases the customs officials escort the suspect to the imaging center. In some cases also police bring suspects trying to smuggle illegal substances into prisons. Many of the suspects are imaged outside office hours.

We searched retrospectively for abdominal plain film images taken to detect suspected drugs in the gastrointestinal tract from our PACS picture archive. Standard anteroposterior views of the abdomen had been taken of all the suspects. In addition to the images, the original reports of the images made by the radiologist on duty were retrieved. The images were then interpreted by two other radiologists one of which has 30 years of experience of gastrointestinal radiology (AK) and the other one with 6 years of experience in general radiology (MS). Therefore altogether three separate radiological reports of every image were available for the study.

The reports and images were interpreted by the radiologists as clearly positive or negative for drug smuggling. The customs department were contacted to get all possible information on how



**Fig. 2.** Radiograph of a 35-year-old suspect. Only four packages on the left of the belly button causing small bowel obstruction can easily be seen. Another two packages can vaguely be seen superimposing on the right iliac bone. The patient was operated on and a total of 35 drug packages were found, which are shown in Fig. 1. A majority of them could, therefore, not be seen on the radiograph. Also the visualization of the packages was made considerably easier by the bowel obstruction they caused.



**Fig. 3.** (A) Numerous easily identifiable drug packages found in a 30-year-old suspect. (B) Image of the same suspect after he has passed 92 packages. No packages can reliably be seen on the image, but the suspect later passed 23 more packages after this image was taken.



**Fig. 4.** Plastic containers used by drug smugglers. The smugglers place the containers into the rectum.

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