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Case Report

Unusual foreign bodies visualized by postmortem computed tomography in a deceased with borderline personality disorder☆,☆☆,★,★★

*Rilana Baumeister, MD**, *Michael Josef Thali, MD, Professor*

Department of Forensic Medicine and Imaging, Institute of Forensic Medicine, University of Zurich, Winterthurerstrasse 190/52, Zurich CH-8057, Switzerland

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ABSTRACT

The objective of this case report is the visualization and assessment of ingested or inserted foreign bodies by postmortem computed tomography and autopsy. The presence of foreign objects in the gastrointestinal tract involves, among many other medical subdisciplines, the fields of forensic medicine and psychiatry. We present a case of an 18-year-old female Caucasian with borderline personality disorder who was found unconscious in a closed psychiatric ward with suspected ingested foreign bodies. Cardiopulmonary resuscitation was unsuccessful. Postmortem computed tomography revealed several sharp foreign bodies in the intestine varying in radiodensity and shape but not perforating any anatomic structures. The autopsy showed well-preserved tablets in the intestine, a few inserted glass fragments and one metal fragment. Ultimately, fatal intoxication involving a mixture of opioids, benzodiazepines, neuroleptics and antidepressants resulted. This case illustrates the potential contribution of postmortem computed tomography in diagnosing, localizing and defining ingested and inserted foreign bodies in deceased as well as living individuals. Thus, diagnostic imaging might increase safety not only for the affected individuals but also for medical staff.

Abbreviations: CT, computed tomography; PMCT, postmortem computed tomography; HU, Hounsfield Units.

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* Corresponding author.
E-mail addresses: rilana.baumeister@irm.uzh.ch (R. Baumeister), michael.thali@irm.uzh.ch (M.J. Thali).

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Introduction

Foreign objects in the gastrointestinal tract have generated interest among medical professionals over the past 2 decades. Most of the time, medical subdisciplines such as emergency medicine, surgery, and gastroenterology are involved [1]. However, this phenomenon is multidimensional, also involving the fields of psychiatry, forensic medicine, and forensic radiology.

By definition, the ingestion of foreign bodies pertains to their introduction through the mouth; insertion refers to the introduction of objects through other body orifices [1].

The insertion or ingestion of foreign objects is common and is sometimes associated with certain personality disorders [1]. This is especially true for emotionally unstable personality traits and disorders of the borderline type. Such patients present with deliberate foreign body ingestion, which is often impulsively driven and repetitive and refractory to medical intervention [2]. Although it has been estimated that approximately 90% of foreign objects can pass spontaneously through the body via the rectum, the risk of injury is severe, and medical treatments such as endoscopy or even open surgical removal are frequently necessary [2]. In addition, a Japanese study describes that older, female patients who may display rectal foreign bodies are significantly more likely to have severe outcomes [3].

In the fields of forensic medicine and forensic and clinical radiology, deceased or living individuals can present with incorporated foreign bodies in different locations, such as the gastrointestinal tract, tracheobronchial system and urogenital system. Tseng et al. as well as Ingraham et al. showed that foreign objects in the body could be detected by imaging modalities such as radiography, ultrasound, and computed tomography (CT) [4,5].

CT is particularly useful for the precise localization and identification of foreign bodies as well as for assessing their relationship to surrounding anatomic structures and the depth of involvement [5]. However, the radiographic visibility of an object can depend on its size and radiopacity, as well as on its anatomic location and the patient's body habitus [4].

The objective of this case report is the visualization and assessment of ingested or inserted foreign objects by postmortem computed tomography (PMCT) and autopsy.

Case report

We describe the case of an 18-year-old female Caucasian who was found unconscious in her room on a closed psychiatric ward. Next to her was a broken box of tablets of unknown origin, and foam was found on her mouth. Cardiopulmonary resuscitation was unsuccessful. She had a borderline personality disorder and was hospitalized for suicidal thoughts.

The time of death was estimated as a few hours prior to the autopsy. A medico-legal examination of the circumstances was ordered by the local prosecutor.

Prior to autopsy and toxicology, native whole-body PMCT was performed using a dual-source CT scanner (Flash Definition, Siemens, Forchheim, Germany). The routine scan parameters were as follows: tube voltage 120 kVp; 400 ref mAs using automatic dose modulation software (CARE dose 4D, Siemens, Forchheim, Germany); slice thickness 2.0 mm; increment 1.0 mm; and image reconstruction with soft tissue and bone kernels.

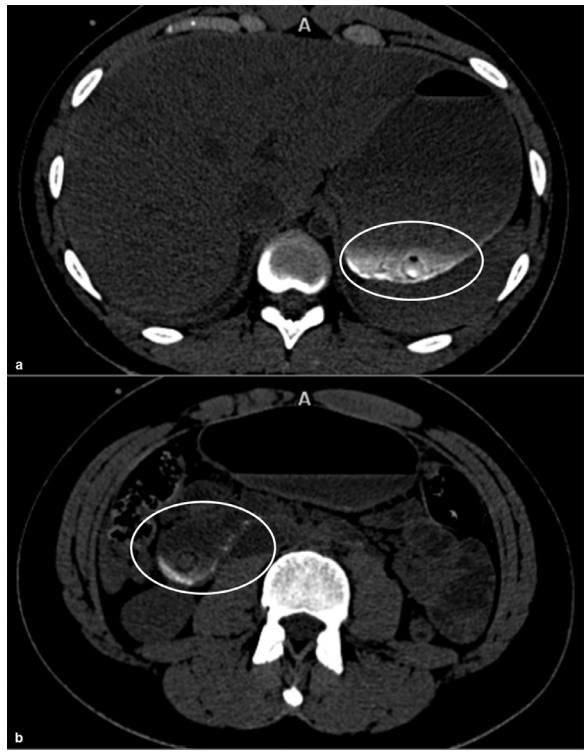

Fig. 1 – Visualization of ingested tablets by postmortem computed tomography (PMCT), both native routine PMCT, axial view, soft tissue window. (a) PMCT of the abdomen at the level of the stomach. This image shows slight to moderate hyperdensity in the stomach caused by dissolved tablets and one conserved round tablet (ellipse). (b) PMCT of the abdomen at the level of the duodenum. Slight hyperdensity in the duodenum due to tablet sedimentation and one almost dissolved tablet (ellipse).

A resident in forensic pathology and a board-certified radiologist performed the reporting, postprocessing and analysis of postmortem imaging using a multimodality reading solution (Syngo.via, version VA30A, Siemens, Medical Solutions, Erlangen, Germany). Both physicians were experienced (half a year to 8 years) with the interpretation of forensic postmortem imaging.

PMCT revealed slightly hyperdense sediment with partially well-preserved tablets in different locations in the stomach and duodenum (Fig. 1).

Cross-sectional images displayed further foreign bodies in the sigmoid colon and rectum with a high mean radiodensity (1328-1658 Hounsfield Units [HU]) and different sizes and shapes with edges and spikes (Fig. 2).

There was no free abdominal air as a possible indicator for perforation of the gastrointestinal tract, particularly of the rectum and sigmoid colon (Fig. 3).

Fig. 2 – Native routine PMCT showing ingested foreign bodies with high radiodensity. Axial view, bone window. (a) PMCT of the pelvis at the level of the rectosigmoid junction. Irregular foreign bodies with high radiodensity (up to 1658 HU) in the rectosigmoid junction (circle). (b) PMCT of the pelvis at the level of the rectum. Foreign objects in the rectum with different shapes, edges, and high radiodensity (circle).

Furthermore, PMCT indicated edema of the brain and lungs, foamy fluid in the paranasal sinuses and central and peripheral airways, aspiration, and signs of chronic cholecystitis with slight ascites.

External inspection of the body revealed multiple scars on the extremities: countless parallel and partially perpendicular scars with equal depth on the sides of the flexors of both upper extremities and on the sides of both extensors of the lower extremities, most likely self-inflicted.

We found many foreign bodies in the gastrointestinal tract, mainly tablets as well as shards of glass and metal. The well-preserved tablets were easily detectable and located mainly in the stomach as well as in the duodenum, with one in the rectum that could not be identified with PMCT.

Initially, foreign objects were not visible in the open colon (Fig. 4). Subsequently, cautious manual searching in the solid feces in cooperation with the PMCT images revealed 8 sharp glass fragments and one small spiky metal fragment in the colon. Fig. 5 shows an overview of all the captured tablets and other foreign bodies in the gastrointestinal tract.

The intestine displayed no perforation or other complications, such as free fluid or inflammation.

Furthermore, the autopsy confirmed edema of the brain and lungs and aspiration of gastric content, indicating possible intoxication, as well as signs of chronic cholecystitis.

The cause of death was intoxication with opioids, benzodiazepines, neuroleptics and antidepressants, leading to brain

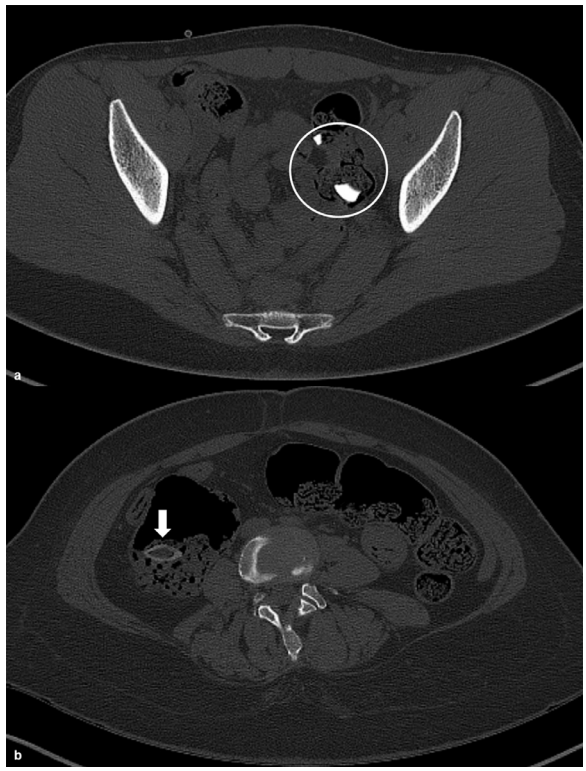

Fig. 3 – Differentiation of diverse foreign bodies in shape and radiodensity. Routine PMCT. (a) Axial view of the pelvis at the level of the rectosigmoid junction, bone window. Despite the glass shards (circle) in the colon, there are no signs of perforation. (b) Axial PMCT of the abdomen at the level of the ascending colon, bone window. A different case of an older woman with (accidental) stone fruit ingestion and a spiky stone in the ascending colon (arrow). Again, there are no signs of perforation or other complications.

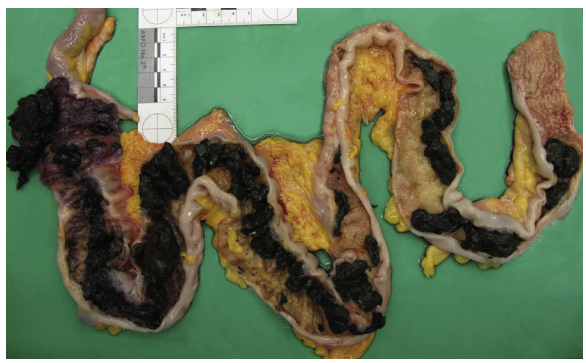

Fig. 4 – Foreign bodies elude visualization at autopsy. Photograph of the colon at autopsy. The initial open colon reveals solid feces and any visible foreign bodies.

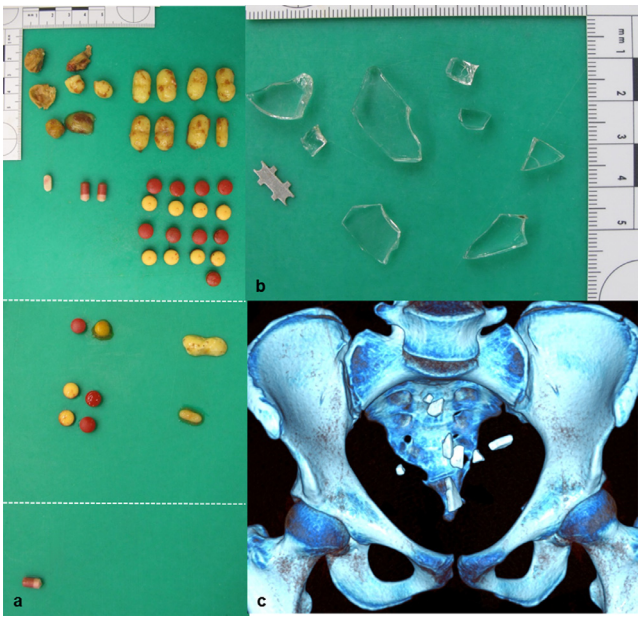

Fig. 5 – Overview of all captured tablets and other foreign bodies in the gastrointestinal tract. (a) Autopsy photograph. Forty-four captured tablets: 35 in the stomach, 8 in the duodenum, and 1 in the rectum. (b) Autopsy photograph. Nine captured foreign bodies in the colon, 1 metal fragment with spikes and 8 glass shards; the biggest is over 2 cm. (c) Volume rendering technique of the pelvis. Three-dimensional visualization of the glass shards in the colon.

edema and central nervous arrest. Indications of third-party interference were not found. However, the manner of death was unnatural and compatible with suicide.

Discussion

The present case report displays how postmortem imaging, such as PMCT, reveals information about the existence, location, and shape of foreign bodies in the gastrointestinal tract and possible associated injuries. Furthermore, PMCT might disclose possible risks to forensic pathologists from sharp objectives during autopsy.

In this case, the ingestion and insertion of tablets, glass, and metal were performed likely as a consequence of an emotionally unstable personality disorder of the borderline type. However, these objects were not causative of death; the cause was fatal intoxication involving a mixture of opioids, benzodiazepines, neuroleptics, and antidepressants.

Although the recto-sigmoidal glass shards and the metal fragment did not cause colon perforation or significant bleeding in the present case, perforation of the intestine is one of the main complications of gastrointestinal foreign objects present in the living [6]. Another risk of rectally inserted objects is rectal bleeding, but this is usually self-limited [6]. Further complications, such as the development of fistulas, infections, abscesses, intoxication, and death, are described in the literature [3,7–10].

Berger et al., Rashid et al., and Flach et al. described another type of foreign body, drug containers used for smuggling, that could be detected by conventional radiography, CT, low-dose linear slit digital radiography, or PMCT [8–10]. Most of these so-called body packers remain asymptomatic while smuggling, but the internal packages may leak or rupture and can cause perforation, bowel obstruction, intoxication, and death [9].

Odagiri et al. reported potential accidental foreign body ingestion (eg, fish bones) due to mental disorders, particularly in older females [3], whereas Poynter et al. wrote about deliberate ingestion due to psychiatric diagnoses such as borderline personality disorder [2]. These articles present clinical cases in which CT (for example) can be a helpful tool in the detection and visualization of ingested foreign bodies; additionally, CT can guide surgeons in determining the location of a foreign body [6,9]. In living individuals, imaging procedures such as CT represent a decisive diagnostic method leading to fast and appropriate, and likely life-saving, therapy for affected patients. This is especially true for patients who incorporate batteries, drugs, or magnets [4,6].

Our case report shows the value of PMCT as a modality that might direct forensic pathologists toward determining the location of any intestinal object. The colorectal metal fragment and the glass shards were surrounded by solid feces and thus were not visible to the forensic pathologist and probably would not be detectable by routine autopsy.

Furthermore, CT and PMCT can help determine the material and shape of foreign objects for better visualization by radiodensity measurements and 3-dimensional reconstruction, respectively [4,5,11,12].

For medical staff, in addition to diagnostic information, cross-sectional imaging may help prevent stab or cut injuries during the removal of sharp incorporated objects.

Concerning the material, glass as a foreign body can be challenging to detect. The radiopacity of glass is not determined by lead content but rather results from its significantly higher density than soft tissue [13]. In our case, the radiodensity of the colorectal glass was higher than that of the surrounding soft tissue; therefore, it appeared intensively hyperdense in contrast to the colon.

In 2009, Bolliger et al. examined the radiodensity of common foreign bodies in corpses and found that glass from a window pane displayed a mean radiodensity of 493 HU, whereas bottle glass and glass from the front and side of a car had a much higher mean radiodensity of 2088-2260 HU [11]. In this case, the mean radiodensity was in between these values; identification of the type of glass is not possible without further examination, but in some cases, approximate identification of the material is possible by imaging alone.

Conclusion

Overall, CT and PMCT are valuable tools for visualizing and localizing ingested or inserted foreign bodies in living or deceased as shown in the present case. They reveal important diagnostic findings, and they also provide safety for medical

staff such as forensic pathologists who have to remove foreign bodies. This is especially true for sharp objects. Thus, we strongly recommend forensic imaging prior to autopsy.

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