

A case report of fatal splenic rupture caused by multiple organ infection following foreign body ingestion in a detainee

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Abstract

Among forensic and clinical cases, infections caused by the ingestion of foreign bodies are common. In general, timely removal of the foreign body and appropriate treatment prevent serious consequences. We herein report a rare case of death due to massive bleeding caused by splenic rupture following foreign body ingestion. To our knowledge, no similar cases have been reported in the Chinese or international literature, making this case particularly noteworthy. In this instance, the decedent was in a detention centre for a criminal offence and swallowed a wire unnoticed. The wire remained in his stomach for >50 days, leading to a severe suppurative infection in the gastric tissue. This resulted in suppurative inflammation affecting multiple organs, including the liver, pancreas, and spleen. The condition ultimately led to the rupture of splenic vessels and the formation of a rare, massive haematoma beneath the splenic capsule. Based on medical records and histopathological findings, we infer that the wire had remained in the stomach for ~50 days, triggering severe suppurative infections in multiple organs. The spleen eventually ruptured, and the victim died of massive haemorrhage.

Keywords: forensic pathology; ingestion of foreign body; rupture of spleen; infection

Introduction

Among routine forensic cases, we often encounter instances of inadvertent or deliberate ingestion of foreign objects. Retention of foreign bodies in the gastrointestinal tract without timely treatment can lead to septic infection, and severe infections may progress to sepsis. Sepsis is a complex condition characterized by a dysregulated host response to infection, often resulting in multiple organ dysfunction and a high risk of death [1]. Many cases of suppurative infections affecting the liver and other organs secondary to foreign body ingestion have been reported, with most patients recovering after appropriate treatment [2–4]. In this case, although the deceased had developed suppurative infections in multiple organs as a result of foreign body ingestion, the immediate cause of death was haemorrhage due to suppurative infection damaging the hilar splenic vessel. Such findings are extremely rare in forensic practice and have not been previously reported in the literature. This case highlights the need for public security officers to closely monitor individuals with a history of suicidal behaviour or self-harm. Additionally, it underscores the critical role of forensic pathology in determining the timeline and progression of injuries.

Case presentation

A 46-year-old man was being held in a detention centre for a criminal offence and swallowed a plastic object unnoticed. He

was promptly taken to hospital, where the foreign body was successfully removed. However, from 11 to 15 March 2022, the man complained of fever and coughs and was treated with oral aneurin and spiramycin. On 16 March, at ~9:00 a.m., he reported pain in the left upper abdomen, and his temperature rose to 38.5 °C. He was again administered oral aneurin and spiramycin. At ~1:00 p.m. on the same day, he experienced vomiting and lost consciousness while going to the bathroom (temperature: 38.5 °C). Detention centre staff transported him to hospital 10 min later. Physical examination revealed unconsciousness, non-responsiveness, absence of respiration and heartbeat, carotid pulse disappearance, bilateral pupil dilation (~5 mm in diameter), and loss of bilateral light reflexes. An electrocardiogram showed no pulse activity. The diagnosis was respiratory and cardiac arrest. Cardiopulmonary resuscitation and endotracheal intubation were performed, but after 157 min of resuscitation efforts, he was pronounced dead.

The forensic examination was performed by our institution with forensic qualifications and in accordance with local legal procedures. The body measured 162 cm in length. Livor mortis was observed in the uncompressed dorsal region. Puncture marks were present in the left elbow fossa and on the back of the hand, while no abnormalities were found in the rest of the autopsy.

Regarding the systemic anatomy, there was no obvious brain injury or bleeding, no haemorrhage in the neck muscle

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group, and no fractures in the bilateral ribs or sternum. Bilateral pneumothorax tests were negative, and no significant effusion was observed in either pleural cavity. A small amount of yellowish fluid was present in the pericardium. There were no fractures or haemorrhages in the cervical vertebrae and no fractures of the hyoid bone, thyroid cartilage, or cricoid cartilage. No foreign bodies were found in the larynx or trachea. A total of 1240 mL of blood and 570 g of clots were present in the abdominal and pelvic cavities (Figure 1A). The diaphragmatic surface of the spleen was ruptured, and a clot weighing 417 g was found beneath the capsule (Figure 1B). Excessive purulent secretions were observed around the splenic hilum and the tail of the pancreas (Figure 1C). A thin black wire with four curves was discovered in the gastric pylorus. The gastric mucosa near the wire appeared black, although the wire had not penetrated the gastric wall (Figure 1D). No significant injuries were observed in other organs.

The histopathological examination showed that numerous eosinophils, neutrophils, and monocytes had infiltrated from the gastric mucosa into the muscular layer. Patchy necrosis was present in the muscular layer, accompanied by numerous neutrophils and pyocytes, cellulose deposition, and granulomatous tissue hyperplasia forming a fibrous capsule. The gastric tissue was highly oedematous (Figure 1E). Abundant pus was present in the splenic hilum, and microscopic examination revealed that pyocytes and neutrophils, along with a few fibrocytes, had formed abscesses (Figure 1F). The peripancreatic tissue showed abscess formation with patchy necrosis, accompanied by numerous neutrophils and pyocytes.

Additionally, fibroblasts proliferated around the necrotic tissue, contributing to abscess formation (Figure 1G). The lungs exhibited focal oedema with inflammatory cell infiltration, collapsed pulmonary alveoli in some areas, and a pronounced vascular leucocyte reaction (Figure 1H). In the liver, multifocal hepatocyte necrosis was observed with numerous infiltrating inflammatory cells, primarily neutrophils (Figure 1I). Grade II atherosclerosis was present in the left anterior descending and right coronary arteries, while mild atherosclerosis was detected in the left circumflex coronary artery. Furthermore, small vessels in the myocardium were poorly filled, with leucocyte reactions observed in some vessels and eosinophilic changes in a few myocardial cells. Leucocyte reactions were also detected in some small vessels within the brain tissue, while no significant changes were observed in other tissues.

In the toxicological evaluation, antipyrine was detected in the heart blood sample (concentration: 0.05 µg/mL), with no other common drugs or poisons identified. Antipyrine was also detected in the liver tissue, while no other drugs or toxins were found.

Discussion and conclusion

The iron wire in the gastric wall was the primary cause of the suppurative infection in the patient's stomach wall. Microscopic examination showed necrosis of the gastric wall, accompanied by infiltration of eosinophils, neutrophils, pyocytes, and monocytes, along with cellulose deposition around the necrotic tissue. Additionally, granulation tissue

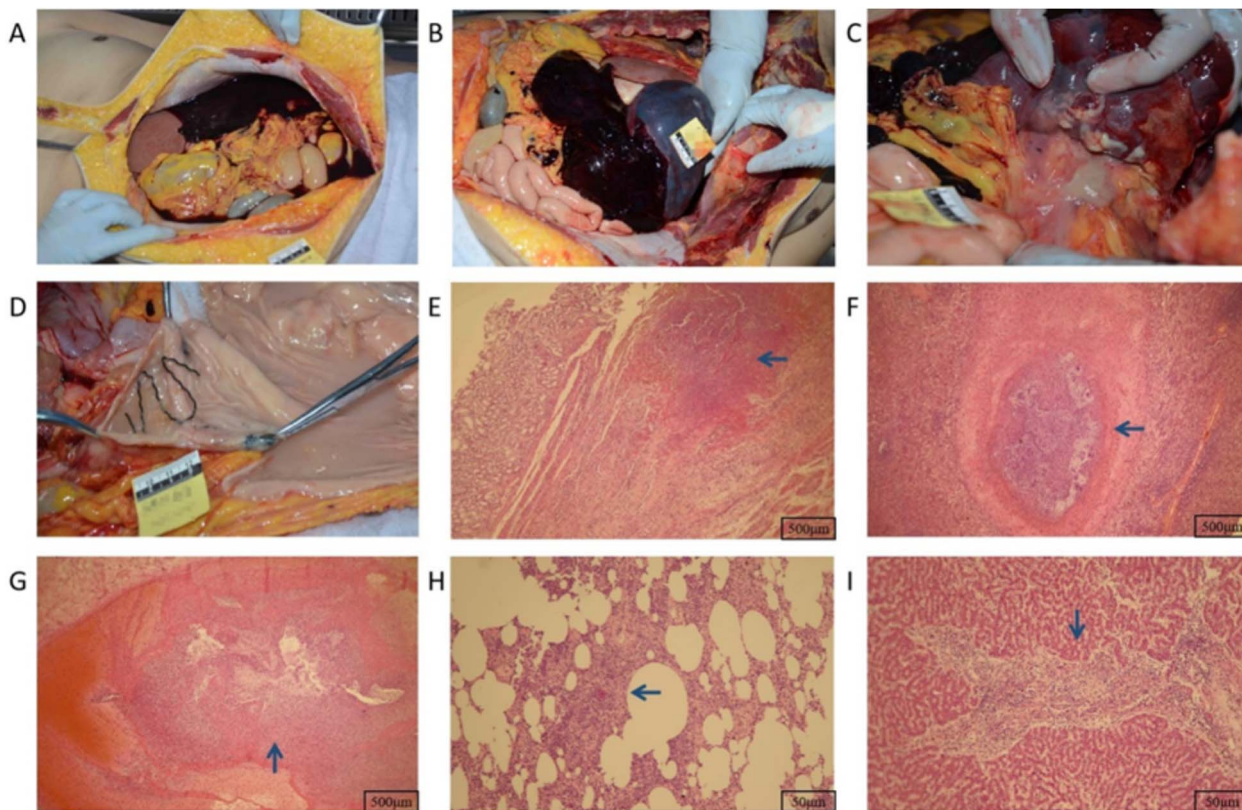


Figure 1 Documentation of the forensic examination. (A) Massive blood and clots in the abdominal and pelvic cavities. (B) Large haematoma beneath the splenic capsule. (C) Excessive purulent secretions around the hilum of the spleen and tail of the pancreas. (D) Black wire inside the gastric pylorus. (E) Infiltration of inflammatory cells and necrosis in gastric tissue. (F) Splenic abscess. (G) Necrosis and abscess formation in the peripancreatic tissue. (H) Infiltration of inflammatory cells in the lung. (I) Multifocal hepatocyte necrosis with inflammatory cell infiltration in the liver.

had proliferated and formed an abscess, indicating that the wire had caused a severe suppurative infection in the stomach. Furthermore, the infection was not confined to the stomach; the pancreas and splenic hilum were also visibly infected, with abscess formation following necrosis as the main pathological feature. The formation of a splenic abscess is primarily attributable to the haematogenous spread of infection from other organs [1] and is often accompanied by sepsis, which can lead to death from septic shock. In this case, the medical records indicated that the deceased had experienced a persistent fever for 5 days prior to death, with significantly elevated total white blood cell and neutrophil counts, suggesting the presence of sepsis. Sepsis is a dysregulated immune response to infection and is often accompanied by changes in the coagulation system. At the onset of sepsis, tissue factors are released, activating the coagulation system [5]. Sepsis can also activate protein C, while endogenous clotting pathways mediated by anti-thrombin and other substances are disrupted and plasminogen activator inhibitor 1 release is increased, leading to fibrinolysis system impairment. These mechanisms contribute to intravascular thrombosis and tissue hypoperfusion [6].

In addition to changes in the coagulation system, various anti-inflammatory and pro-inflammatory factors can trigger endothelial responses [7]. Endothelial cells exposed to pathogens, microbial toxins, and endogenous danger signals release pro-inflammatory factors, chemokines, and procoagulant factors, which damage cells and polysaccharide-protein complexes, increase vascular permeability, and lead to organ failure [8]. As a result, sepsis is associated with a high mortality rate and is commonly encountered in forensic cases. However, in this case, sepsis caused by suppurative infection was not the direct cause of death. A rare massive haematoma was found beneath the splenic capsule, and multiple blood clots were detected in the abdominal cavity. Therefore, we confirmed that the cause of death was a massive haemorrhage due to splenic rupture. After ruling out any trauma that could have caused the rupture, we determined that the deceased had developed a severe suppurative infection caused by the prolonged presence of a foreign body in his stomach. This infection had spread to the pancreas and spleen, where abscess formation damaged blood vessels, leading to haemorrhage. The accumulation of blood beneath the splenic capsule resulted in haematoma formation, ultimately causing splenic rupture and death due to massive haemorrhage.

Based on the medical records and histopathological findings, including the presence of abscesses in the gastric wall and fibrous tissue around the pancreas and spleen, we can infer that the wire had remained in the stomach for ~50 days, leading to severe suppurative infections in multiple organs. The spleen ultimately ruptured, resulting in massive haemorrhage and death. However, ingestion of the wire would not have been fatal if it had been treated in a timely manner. This case highlights the importance of vigilance among public security officers in monitoring individuals with a history of suicidal behaviour or self-harm. Preventative measures should

be implemented to restrict access to items that could be used for self-inflicted injury within supervised areas. Additionally, continuous medical observation of high-risk individuals is essential to prevent the recurrence of such fatal outcomes.

Authors' contributions

Yingmin Li, Guozhong Zhang, Min Zuo, and Haitao Bi conducted the examination of the pathological sections. Ke Chen, Yingmin Li, Guozhong Zhang, Min Zuo, Haitao Bi, Weibo Shi, and Bin Cong contributed to the case analysis. Ke Chen drafted the manuscript. Yingmin Li revised the manuscript. All authors have reviewed and approved the final version of the manuscript.

Compliance with ethical standards

This study has been approved by the relevant judicial authorities. The requirement for ethical review was waived by the Ethics Committee of Hebei Medical University. Written informed consent was obtained from the victim's family for both the study and the publication of this case report.

Disclosure statement

The authors declare that they have no conflict of interest.

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