J Surg Med. 2026;10(5):00-00.
https://doi.org/10.28982/josam.8298

JOSAM

Journal of Surgery and Medicine

e-ISSN: 2602-2079

Case report
https://jsurgmed.com/

A surgical bag retained for eight years: A case report

Lidia Berthon, Amir Rastegar, Nasibeh Khaleghnejad-Tabari, Farshad Shabani, Andre Risha

General Surgery, Noble's Hospital, Isle of Man

ORCID of the author(s)

LB: https://orcid.org/0009-0003-6566-676X
ARa: https://orcid.org/0009-0000-2472-8416
NKT: https://orcid.org/0000-0003-4570-7416
FS: https://orcid.org/0009-0002-1117-9651
ARi: https://orcid.org/0009-0009-9809-7325

Corresponding Author
Lidia Berthon
50 Greensand Avenue, Barrington, Cambridge, CB22 7AF
E-mail: lidiaberthon99@gmail.com
lidia.berthon@nobles.dhss.gov.im

Informed Consent
The authors stated that the written consent was obtained from the patient presented with images in the study.

Conflict of Interest
No conflict of interest was declared by the authors.

Financial Disclosure
The authors declared that this study has received no financial support.

Published
2026 May 14

Abstract

Retained surgical items, including sponges and other operative materials, can cause substantial harm beyond the perioperative period. We report the case of a 73-year-old woman in whom a surgical bag was retained for eight years after an open laparotomy performed in 2012. Abdominal pain and vomiting began two weeks after the original operation and continued intermittently throughout the eight-year period, leading to 36 imaging examinations. None of the reports raised concern for a retained surgical item. This case illustrates how retained surgical items may remain clinically occult despite recurrent symptoms and repeated imaging. It also highlights the importance of prevention, early suspicion, and inclusion of a retained surgical item in the differential diagnosis when postoperative abdominal symptoms persist, especially after technically complex surgery. The case is notable because the retained item was a large surgical bag and because of the prolonged interval before diagnosis.

Keywords: retained surgical item, case report, surgical safety, small bowel obstruction, foreign body

Introduction

A retained surgical item (RSI) refers to any surgical instrument or material used during an operation that is unintentionally left inside the patient afterward [1]. Although this preventable patient-safety event has been widely discussed, RSIs continue to occur despite established prevention strategies [2]. Most RSIs occur intra-abdominally and may cause pain, abscess, perforation, fistulation, bowel obstruction, or other complications [3].

Prevention remains the principal strategy for reducing RSI incidence. However, when an RSI has already occurred, timely clinical suspicion and detection are essential to limit further harm. This report describes the background, clinical presentation, investigation timeline, operative findings, and outcome of a patient with an RSI identified eight years after sigmoid colectomy for diverticular disease.

How to cite: Berthon L, Rastegar A, Tabari N, Shabani F, Risha A. A surgical bag retained for eight years: A case report. J Surg Med. 2026;10(5):00-00.

Case presentation

Written informed consent was obtained from the patient before submission of this case report. The patient was a 73-year-old woman who presented to the emergency department (ED) in September 2020 with worsening right-sided abdominal pain. She had experienced recurrent abdominal symptoms and multiple hospital presentations over the preceding eight years. Her relevant medical history included sigmoid colectomy for diverticular disease in 2012, breast cancer treated with left mastectomy, non-Hodgkin lymphoma, and hysterectomy with bilateral oophorectomy. Her medication history was unremarkable, and she was independent and mobile.

On admission, clinical examination demonstrated right-sided abdominal tenderness, mild distention, and hypoactive bowel sounds. There were no signs of peritonism, and a midline laparotomy scar was visible. Digital rectal examination showed an empty rectum with no palpable mass. Blood tests revealed mild leukocytosis (13.38×10^9/L) with neutrophilia (9.37×10^9/L), while C-reactive protein was within the normal range (4.3 mg/L).

The respiratory rate was 20 breaths/min, oxygen saturation was 93% on room air, blood pressure was 146/87 mmHg, heart rate was 87 beats/min, and temperature was 37.2 °C. Chest X-ray showed no pneumoperitoneum, and abdominal X-ray showed colonic fecal loading with a dilated bowel loop in the right lower quadrant. The overall clinical impression was subacute small-bowel obstruction.

A detailed timeline of the patient's ED attendances is presented in Table 1. In October 2012, she underwent elective sigmoid colectomy for diverticular disease and stricture. According to the postoperative letter, there were "extensive adhesions between the sigmoid colon and pelvic organs," as well as small-bowel adhesions and diverticular stricture. The operation was described as uneventful, postoperative recovery was described as remarkable, and no postoperative complications were reported. The patient was discharged five days later.

Table 1. Overview of emergency department admissions between the original surgery in 2012 and the admission described in this report

Date	Presenting complaint
October 26, 2012	Right-sided abdominal pain with vomiting. 15 episodes of loose stools. AXR showed "bowel sutures noted in the pelvis. No specific features."
May 24, 2013	Loose stools and cramping tender/non-guarding right-sided abdominal pain
August 2, 2013	Abdominal pain and 20 episodes of loose stools. Diagnosis of IBS/diverticulitis.
April 26, 2015	GP referral for abdominal pain
August 28, 2015	Upper abdominal pain (prompted endoscopy on March 15, 2016: stomach – gastritis, esophagus – hiatus hernia, duodenum normal)
March 29, 2016	Abdominal pain and vomiting; bowel movements 4–5 times per day
March 26, 2017	Colicky right-sided abdominal pain
December 27, 2017	Abdominal pain
July 22, 2018	Central abdominal pain
February 5, 2019	Central abdominal pain + vomiting
August 4, 2019	Epigastric pain
March 2–13, 2020	Right upper abdominal pain

AXR: abdominal X-ray, ED: emergency department, IBS: irritable bowel syndrome.

Over the next eight years, the patient had 12 hospital attendances for abdominal pain, vomiting, and, at times, loose stools. Imaging was performed on 36 occasions (Table 2), including 18 abdominal X-rays, six abdominal ultrasound scans, 10 computed tomography scans of the thorax, abdomen, and pelvis (CT-TAP), one computed tomography scan of the neck, thorax, abdomen, and pelvis (CT-NTAP), and one magnetic resonance imaging scan of the small bowel. Several reports described possible partial bowel obstruction or adhesions, but these findings were attributed to recurrent lymphoma or vascular small-bowel malformations that had remained unchanged over a prolonged period.

On two occasions, an abdominal mass was investigated but was not visualized on ultrasound. Imaging reports alternated between no abnormality detected and small-bowel loop distention. No report mentioned a foreign body, and an RSI was not included in the clinical differential diagnosis. During the same period, the patient also underwent two upper endoscopies, two colonoscopies, and flexible sigmoidoscopy, which demonstrated diverticulosis, gastritis, and a hiatus hernia (Table 3).

Table 3. Endoscopies performed between the original surgery in 2012 and removal of the retained surgical bag in 2020

Date	Investigation	Finding
January 4, 2013	Flexible sigmoidoscopy	Nil acute
September 3, 2013	Colonoscopy	Diverticulosis, ileitis
April 24, 2015	Upper endoscopy	Gastric ulcers
March 15, 2016	Upper endoscopy	Gastritis, hiatus hernia
March 10, 2017	Upper endoscopy and colonoscopy	No report available
December 17, 2020	Colonoscopy	Diverticulosis

The present report focuses on the final ED admission in this sequence of presentations. Eight days before bag retrieval, the patient presented for the thirteenth time with similar symptoms, including worsening right-sided abdominal pain, 18 episodes of vomiting during the previous 24 hours, and reduced bowel movements. Based on the clinical findings, the leading differential diagnosis was subacute bowel obstruction. She was admitted under the general surgical team, a Ryle's tube was inserted for decompression, and intravenous co-amoxiclav was started.

The next day, contrast-enhanced CT of the abdomen and pelvis was performed (Figures 1 and 2). The report described calcifications on the walls of small-bowel loops with prominent vessels, likely related to previous lymphoma treatment; dilated small-bowel loops; the impression of an internal twist or hernia; adhesions between small-bowel loops in the abnormal areas; and no perforation.

Four days later, symptoms persisted, and repeat CT of the abdomen and pelvis with oral contrast suggested subacute obstruction. Over the next two days, the patient remained clinically stable. Her abdominal pain improved, and the Ryle's tube was removed. She tolerated a soft diet for 24 hours after tube removal but subsequently began vomiting again. Eight days after admission, vomiting persisted without a clear cause. Repeat blood tests showed resolution of leukocytosis and neutrophilia, and C-reactive protein remained unremarkable. Because of persistent symptoms, the patient consented to post-laparotomy small-bowel adhesiolysis.

Table 2. Abdominal and thoracic imaging reports between the original surgery in 2012 and removal of the retained surgical item in 2020

Date of scan	Indication	Type of scan	Relevant findings
November 2, 2012	Abdominal pain, perforation?	AXR/CXR	Abdomen: Normal gas pattern. Chest: No free sub-phrenic gas.
December 18, 2012	Abdominal pain	AXR/CXR	Abdomen: No specific features. Bowel sutures noted in the pelvis. Chest: no abnormalities.
February 28, 2013	Abdominal pain	Abdomen US	No obvious gross abnormalities demonstrated in the liver, pancreas, aorta, gallbladder, CBD, spleen and kidneys.
May 27, 2013	Abdominal pain	AXR	Abdomen unremarkable.
August 2, 2013	Abdominal pain	AXR/CXR	Abdomen: Surgical sutures noted in the pelvis. Otherwise normal bowel gas pattern. Chest: No evidence of free subdiaphragmatic gas.
August 7, 2013	Abdominal pain	CT-TAP	No lung lesion or pleural fluid. Small simple liver cyst. The gallbladder, pancreas, spleen, adrenal glands and both kidneys are normal. The bowel loops are of normal size. Anastomosis is noted at the level of sigmoid colon. No significant abdominal lymphadenopathy or ascitic fluid is evident. Conclusion: no disease recurrence
November 23, 2013	Rule out pulmonary embolism on background of breast cancer	CT-TAP	No evidence of pulmonary embolism. No evidence of recurrent disease or metastases.
March 2, 2015	Abdominal mass (peri-umbilical)	US of anterior abdominal wall	Not well visualized with ultrasound. For CT to characterize mass.
March 11, 2015	Abdominal mass	CT-TAP	Previous hysterectomy and anterior resection noted, with sigmoid anastomosis. No mass lesion identified. "There is a slightly unusual enhancement pattern within a small bowel loop close the midline in the upper abdomen, with prominent mural vessels and mucosal enhancement. Similar changes were observed in the previous study dated August 7, 2013, so it is unlikely to be of any major significance." Small cyst noted posteriorly within the right lobe of the liver, with no evidence of metastatic disease.
April 26, 2015	Constipation	CXR/AXR	Chest: No abnormalities. Abdomen: Constipation. No evidence of acute obstruction, no free gas, no evidence of perforation. Previously reported mild vascular malformation in small intestine showing as coiled vessels in left upper quadrant.
August 28, 2015	Abdominal pain	AXR	Chest: No abnormalities, no free air. Abdomen: No evidence of intestinal obstruction or perforation.
August 28, 2015	Recurrence of lymphoma?	CT-TAP	Unusual enhancement in the wall of the small intestine most likely due to some vascular malformation within the wall of the small intestine, unchanged since the previous examination. Diverticulum in the second part of the duodenum is noted. Tiny cyst within the liver is insignificant. No evidence of recurrence of lymphoma.
March 29, 2016	Abdominal pain and vomiting	AXR	No free gas under the diaphragm, no evidence of perforation, obstruction or ileus.
March 31, 2016	Abdominal mass and loose stools	US of abdomen	Central mass felt clinically but no abnormality visualized.
January 26, 2017	Abdominal pain	AXR	Chest: no abnormality. Abdomen: colonic fecal loading. No free gas. Few slightly distended small bowel loops so acute abdomen cannot be excluded.
January 27, 2017	Right flank pain	US of urinary tract	Both kidneys grossly normal with no hydronephrosis. No other gross abnormalities.
October 6, 2017	Recurrence of lymphoma?	CT-TAP	No lymphoma. No change in the appearance of the previously reported vascular malformation in small bowel. No other new changes.
December 27, 2017	Left iliac fossa pain with nausea and vomiting	AXR	Few distended bowel loops, previous abdominal surgery noted. Acute abdomen cannot be confidently excluded.
December 27, 2017	Left iliac fossa pain with nausea and vomiting	CT-TAP with contrast	Evidence of previous resection anastomosis of the colon. No perforation but small amount of free fluid in abdomen and pelvis. Multiple prominent loops of small bowel. Distal ileum thick walled and mildly distended. Terminal ileum normal. Previously described small bowel abnormality with possible calcification. Mid-abdomen: multiple prominent loops around it with an impression of an adhesions or mass formation. Appears to be due to multiple loops of small bowel getting stuck to the abnormality in the bowel. Exact nature is unclear but could be due to previous treated lymphoma. Recurrence of lymphoma? Adhesions?
April 12, 2018	Abdominal pain with distension and vomiting	AXR	Abdomen: Fecal loading of the large bowel. Surgical sutures left hemi-pelvis. No evidence of obstruction. Chest: No free air under diaphragm, no acute changes.
April 12, 2018	Right upper quadrant pain	US of abdomen	No significant abnormality and no free fluid or evidence of perforation.
July 22, 2018	Central abdominal pain and vomiting	AXR	Abdomen: Fecal loading of the large bowel. Surgical sutures. Nil acute. Chest: Nil acute.
January 20, 2019	Abdominal pain and melena	AXR	Evidence of previous colectomy. No evidence of obstruction or perforation.
February 5, 2019	Abdominal pain and vomiting	AXR	Abdomen: No specific diagnostic features. Existing surgical clips noted. Chest: Possible aspergilloma right upper zone. No free sub-diaphragmatic gas.
February 7, 2019	Abdominal pain and vomiting	CT-TAP with contrast	Dilated small bowel loop with abnormal tortuous dilated vessels. Free fluid in abdomen, pelvis and around pancreas. Possible acute pancreatitis. Para-duodenal diverticulum in 2nd part of duodenum, slightly impressing lower part of common bile duct.
February 8, 2019	Abdominal pain, pancreatitis?	US of abdomen	Normal pancreas size. Pancreatic duct prominent but normal width. Gallbladder wall slightly thickened. Common bile duct dilated but no obvious intra-ductal calculi. Traces of free fluid around liver and spleen.
February 12, 2019	Abdominal pain and vomiting	AXR	A few small bowel loops are prominent. Colon is loaded with feces. No pneumoperitoneum. Postoperative changes noted in the pelvis.
March 2, 2020	Abdominal pain	AXR	Chest: Nil acute. No free air under diaphragm. Abdomen: No significant abnormality.
March 2, 2020	Abdominal pain and nausea	US of abdomen/pelvis	Liver demonstrates prominent intra-hepatic biliary ducts. Common bile duct dilated. Dilated fluid-filled bowel loops on right side of abdomen. No peristalsis seen.
March 3, 2020	Abdominal pain	CT-TAP	Nasogastric tube compressing stomach. Unusual mucosal venous enhancement in collapsed mid small bowel loops which appears to be due to a localized twist in the mesentery with a closed off obstruction with dilated bowel loops in the right flank. Similar changes with marked small bowel mucosal thickening observed on the previous study dated February 7, 2019. There is some associated distortion of the duodenum, which is the likely cause of the associated prominence of the pancreatic duct and distal common bile duct shown on previous CT and on recent ultrasound. No definite underlying calculi or pancreatic mass lesions. Small amount of fluid within the peritoneal cavity, most marked in the left upper quadrant around the spleen. Previous sigmoid resection noted. No abnormal lymphadenopathy. Old scarring noted in the right upper lung zone posteriorly, with moderate background centrilobular bullous change. There are small simple cysts in the right kidney.
March 6, 2020	Previously observed bowel obstruction. AXR to determine resolution.	AXR	Lower end of the nasogastric tube is inside the stomach. There are a few slightly distended bowel loops.

AXR: abdominal X-ray, CBD: common bile duct, CT: computed tomography, CT-(N)TAP: computed tomography of the (neck), thorax, abdomen, and pelvis, CXR: chest X-ray, MRI: magnetic resonance imaging, NG: nasogastric, US: ultrasound.

Table 2. Abdominal and thoracic imaging reports between the original surgery in 2012 and removal of the retained surgical item in 2020

Date of scan	Indication	Type of scan	Relevant findings
March 9, 2020	Previously described bowel obstruction March 3, 2020	CT-TAP with oral and IV contrast	Appearance of the small intestine described before same as on the previous examination (March 3, 2020). Several small bowel loops are seen in the middle of the abdomen with distended vessels within the in the wall. Some of the bowel loops are dilated and some are contracted. Edematous wall of the intestine particularly on the right side and in the complex area in the middle of the abdomen. The appearance of the bowel loops in the middle of the abdomen is longstanding. Contrast is noted in the large intestine; therefore, there is no evidence of complete small bowel obstruction. Slightly enlarged liver, tiny cyst in the liver, insignificant.
May 7, 2020	Abdominal pain	MRI small bowel study	Scan abandoned due to patient vomiting and losing control of bowels.
July 2, 2020	Abdominal pain	AXR	No significantly dilated bowel loops. No evidence of obstruction or perforation.
September 20, 2020	Abdominal pain	AXR	Abdomen: Colonic fecal loading. Dilated bowel loop in the right lower quadrant. Acute abdomen cannot be confidently assessed.
September 21, 2020	Abdominal pain, vomiting	CT abdomen, pelvis with contrast	Trace fluid in the abdomen and pelvis. Calcifications on the walls of the small bowel loops with prominent vessels likely due to previous lymphoma treatment. In comparison to the previous CT on March 3, 2020, there are some dilated loops of small bowel with impression of internal twist or hernia. Impression of adhesions between small bowel loops in these abnormal areas. Presence of subacute obstruction could not be excluded. No perforation.
September 25, 2020	Abdominal pain	CT of abdomen, pelvis with oral and IV contrast	Dilated small bowel loops in the abdomen on both sides. Abnormal loops in upper abdomen with thickening and calcifications as was described in previous CT. Impression of a kink in bowel loop in distal ileum as described previously. No perforation. Congestive changes in mesentery and trace free fluid. Slow transit of oral contrast.
September 30, 2020	Post-laparotomy	AXR	Chest: Nil acute. No free gas under diaphragm. Abdomen: Recent laparotomy. No significantly dilated bowel loops.
October 7, 2020	Post-laparotomy with ongoing high NG output.	CT	Previous sigmoid resection noted. Small amount of free fluid in abdomen with edematous peritoneal/mesenteric fat. Edematous wall of distal small intestine. No evidence of obstruction. Tiny liver and right kidney cysts insignificant. Pneumonia in the left lung base with small pleural effusion. Active infection in the right base with small pleural effusion. Hiatus hernia.

AXR: abdominal X-ray, CBD: common bile duct, CT: computed tomography, CT-(N)TAP: computed tomography of the (neck), thorax, abdomen, and pelvis, CXR: chest X-ray, MRI: magnetic resonance imaging, NG: nasogastric, US: ultrasound.

Figure 1. Transverse-plane CT scan performed on September 21, 2020, before the adhesiolysis procedure. Adhesions and dilated bowel loops can be seen, but there is no clear view of a foreign body.

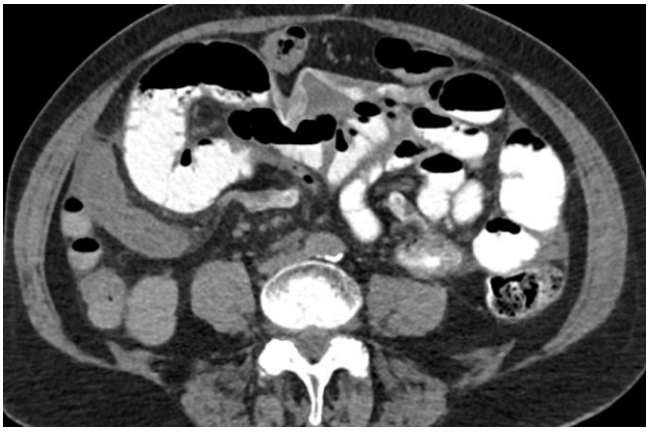
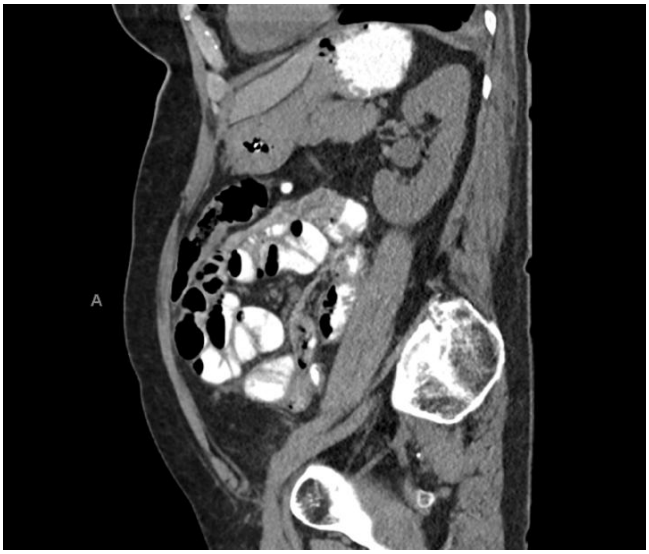


Figure 2. Sagittal-plane CT scan performed on September 21, 2020, before the adhesiolysis procedure. As in Figure 1, there is no clear evidence of a foreign body in the abdomen.



A midline incision was performed. Operative findings included extensive adhesions and a calcified mass surrounding the small bowel. After several hours of adhesiolysis, the calcified mass was mobilized anteriorly and to the left over the small bowel. The surgeon unexpectedly identified two laces, which were recognized as part of a Bogotá bag left from the laparotomy in 2012. The bag was removed after six hours of adhesiolysis (Figures 3 and 4). Postoperatively, the patient recovered well, with no further complications. Her repeated hospital presentations were attributed to the RSI, and she has had no further notable abdominal symptoms since the operation.

Figure 3. Surgically removed Bogotá bag on September 28, 2020. The bag had been retained from the original procedure in 2012 and shows the foreign material associated with the patient's symptoms over eight years.

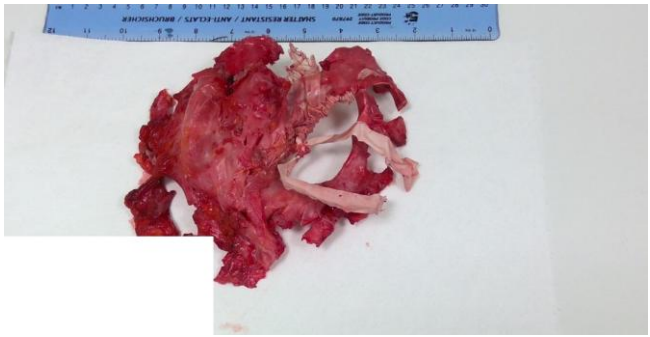


Figure 4. Image of an intact bag identical to the one surgically removed from the patient, illustrating the size of the surgical item retained in the abdominal cavity.

Discussion

Retained foreign bodies after surgery remain a major concern in clinical practice and are considered "never events". NHS England data cited by the Health Services Safety Investigations Body indicate that retained-swab incidents varied between 11 and 23 cases per year from 2015 to 2023 [4]. However, the actual burden is difficult to quantify because available data include only events that are both recognized and reported.

Cases similar to the present one have been described, including surgical sponges removed many years after the index operation [5]. Retained surgical items may also present with bowel obstruction, as occurred in the present case [6]. This report therefore provides an opportunity to discuss patient impact,

healthcare-system burden, prevention, and the need for timely suspicion and detection.

RSIs may cause serious complications, prolonged admissions, additional operations, and avoidable radiation exposure from repeated imaging [7]. These consequences also increase healthcare costs [8]. In the present case, repeated imaging was clinically understandable but cumulatively burdensome. Abdominal imaging may expose patients to more radiation than chest radiography; for example, an abdominal X-ray has been compared with several months of natural background radiation, and CT of the abdomen and pelvis may approximate several years of background radiation exposure depending on protocol and patient factors [9-11].

The patient's repeated ED attendances and admissions also suggest a substantial physical and psychological burden, which may be overlooked when RSI harm is described only in technical or medicolegal terms. Prevention remains the central strategy. Surgical counts and standardized perioperative safety processes must be maintained, because incomplete or incorrect counts have been associated with retained foreign bodies [12]. National Safety Standards for Invasive Procedures also emphasize systematic approaches to prevent retained foreign objects [13]. Nevertheless, ongoing events demonstrate that prevention must be reinforced by detection strategies when postoperative symptoms persist.

Detection after an RSI has occurred is challenging. In this case, the retained bag was not identified despite extensive imaging and multidisciplinary clinical discussion. Imaging has been described as central to the diagnosis of gossypiboma and other retained surgical materials [14]. However, this case demonstrates that imaging does not always yield a clear diagnosis, particularly when findings are attributed to alternative explanations such as adhesions, prior malignancy, or vascular changes.

Improving detection may require both technical and cognitive interventions. Imaging-based advances, including deep-learning models designed to detect retained surgical sponges, may support radiologic recognition in selected contexts [15]. However, technology alone is unlikely to solve the problem. Clinicians should maintain suspicion for RSI when a patient has persistent or unexplained postoperative abdominal symptoms, especially after complex or prolonged operations.

Risk factors reported for RSI include high body mass index, emergency surgery, unplanned changes during the operation, longer procedure duration, and incorrect or incomplete counts [16]. In the present case, the index operation was elective and no explicit count discrepancy was documented. However, the operation involved extensive adhesions and intra-abdominal complexity, which may have increased the practical risk of item retention. Persistent abdominal symptoms after intra-abdominal surgery should therefore prompt careful review of the operative history, count documentation, and prior imaging, with RSI included in the differential diagnosis when symptoms remain unexplained.

Overall, this case supports a dual approach: robust prevention during surgery and improved detection after surgery. Earlier consideration of RSI in patients with recurrent postoperative abdominal symptoms may reduce diagnostic delay, repeated imaging, and unnecessary morbidity.

References

1. Gibbs V, Romano P. Retained surgical items: Definition and epidemiology. Patient Safety Network. 2024 Jan 4. Accessed February 3, 2025. Available from: https://psnet.ahrq.gov/primer/retained-surgical-items-definition-and-epidemiology
2. Hariharan D, Lobo DN. Retained surgical sponges, needles and instruments. Ann R Coll Surg Engl. 2013;95(2):87-92. doi: 10.1308/003588413X13511609957218.
3. Wan W, Le T, Riskin L, Macario A. Improving safety in the operating room: a systematic literature review of retained surgical sponges. Curr Opin Anaesthesiol. 2009;22(2):207-14. doi: 10.1097/ACO.0b013e328324f82d.
4. Health Services Safety Investigations Body. Retained swabs following invasive procedures: Investigation report. 2024 Apr 16. Accessed December 9, 2024. Available from: https://www.hssib.org.uk/patient-safety-investigations/retained-surgical-swabs/investigation-report/
5. Susmallian S, Raskin B, Barnea R. Surgical sponge forgotten for nine years in the abdomen: A case report. Int J Surg Case Rep. 2016;28:296-9. doi: 10.1016/j.ijscr.2016.10.026.
6. Alsuhaimi MA, Alghamdi HS, Alshaiji SA, Fayi MA, Aldhafeeri SM. Retained surgical item (Gossypiboma): A case report and literature review. Ann Med Surg (Lond). 2023;85(7):3717-21. doi: 10.1097/MS9.0000000000000992.
7. Al-Qurayshi ZH, Hauch AT, Slakey DP, Kandil E. Retained foreign bodies: Risk and outcomes at the national level. J Am Coll Surg. 2015;220(4):749-59. doi: 10.1016/j.jamcollsurg.2014.12.015.
8. Williams TL, Tung DK, Steelman VM, Chang PK, Szekendi MK. Retained surgical sponges: Findings from incident reports and a cost-benefit analysis of radiofrequency technology. J Am Coll Surg. 2014;219(3):354-64. doi: 10.1016/j.jamcollsurg.2014.03.052.
9. Mettler FA Jr, Huda W, Yoshizumi TT, Mahesh M. Effective doses in radiology and diagnostic nuclear medicine: A catalog. Radiology. 2008;248(1):254-63. doi: 10.1148/radiol.2481071451.
10. Lin EC. Radiation risk from medical imaging. Mayo Clin Proc. 2010;85(12):1142-6. doi: 10.4065/mcp.2010.0260.
11. Radiological Society of North America, American College of Radiology. Radiation dose from X-ray and CT exams. RadiologyInfo.org. Accessed December 9, 2024. Available from: https://www.radiologyinfo.org/en/info/safety-xray
12. Gawande AA, Studdert DM, Orav EJ, Brennan TA, Zinner MJ. Risk factors for retained instruments and sponges after surgery. N Engl J Med. 2003;348(3):229-35. doi: 10.1056/NEJMsa021721.
13. Centre for Perioperative Care. National Safety Standards for Invasive Procedures (NatSSIPs 2): Guidance on the prevention of retained foreign objects. 2023. Accessed December 9, 2024. Available from: https://cpoc.org.uk/guidelines-and-resources/guidelines/national-safety-standards-invasive-procedures-natssips
14. Manzella A, Borba-Filho P, Albuquerque E, Farias F, Kaercher J. Imaging of gossypibomas: Pictorial review. AJR Am J Roentgenol. 2009;193(6 Suppl):S94-101. doi: 10.2214/AJR.07.7132.
15. Kawakubo M, Waki H, Shirasaka T, Kojima T, Mikayama R, Hamasaki H, et al. A deep learning model based on fusion images of chest radiography and X-ray sponge images supports human visual characteristics of retained surgical items detection. Int J Comput Assist Radiol Surg. 2023;18(8):1459-67. doi: 10.1007/s11548-022-02816-8.
16. Stawicki SPA, Moffatt-Bruce SD, Ahmed HM, Anderson HL 3rd, Balija TM, Bernescu I, et al. Retained surgical items: A problem yet to be solved. J Am Coll Surg. 2013;216(1):15-22. doi: 10.1016/j.jamcollsurg.2012.08.026.