



Spectrum of CECT Findings of Retained and Migrated Surgical Items in Abdomen — a Series of Seven Cases

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Abstract

Various retained surgical items often present a diagnostic dilemma to the interpreting radiologist. These items include retained surgical sponge (gossypiboma), misplaced, broken instruments, irrigation sets, and a variety of surgical paraphernalia. Such foreign bodies present with varying imaging findings and can often mimic other diseases radiologically. We present a series of seven interesting cases of retained surgical mops (cases 1, 2, and 3), broken and retained surgical instrument (case 4), migrated plastic biliary stent (case 5), migrated contraceptive device (case 6), and surgically placed hemostatic agent (case 7). Familiarity with the variable imaging findings and communication with the clinician can facilitate timely management for these patients.

Keywords Retained surgical items · Gossypiboma · Migrated biliary stent · Migrated intrauterine contraceptive device · CECT

Background

The term “retained surgical items (RSI)” is referred to encompass all the surgery or procedure-related needles, broken instruments, gossypiboma, irrigation sets, and rubber materials placed or misplaced in the patient’s body [1]. Gossypiboma is a term used to describe a mass of cotton matrix that is left behind in a body cavity during operation [2]. Retained surgical items (RSI) have become a dreaded problem in modern medicine because they provoke many non-anticipated, potentially fatal complications to the patient, besides mitigating serious medico-legal implications. Radiologists often encounter unfamiliar surgical structures when asked to evaluate postoperative scans where interpretation becomes very challenging. The diagnosis of RSI and distinction from mimickers is important but difficult to make

and mandates interaction between the surgical team and the radiologists about the utilized surgical techniques. We describe a series of seven abdominal retained surgical items diagnosed on CECT.

Case Presentations

Case 1

A 39-year-old female with the chief presenting complaint of on and off bleeding and serous discharge per vaginam for 1 year. The patient gave a history of total abdominal hysterectomy done for uterine fibroid at another medical facility 2 years back. USG examination revealed a complex heterogeneous mass in the pelvis. CECT abdomen revealed a defined heterogeneous mass located posterior to the UB in the cul-de-sac. The lesion showed heterogeneous enhancement with multiple tiny nonenhancing fluid density components. There was no mottled air within the lesion (Fig. 1a). The possibility of an inflammatory pseudo mass was suggested. Exploratory laparotomy done revealed a globular inflammatory mass bulging posterior to the bladder, 12 × 12 cm in size filled with a surgical mop of approximately 16 × 17 cm and purulent material (Fig. 1b, c).

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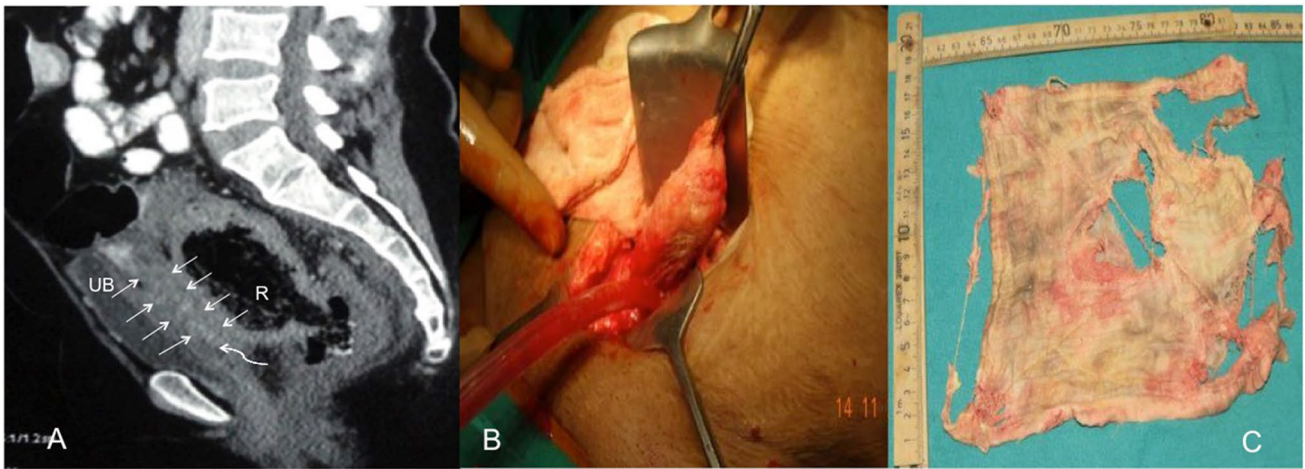


Fig. 1 CECT image showing heterogeneously enhancing lesion (arrow) with multiple tiny nonenhancing fluid density components (curved arrow) posterior to urinary bladder (a). Exploratory laparot-

omy done revealed a globular inflammatory mass bulging posterior to bladder, filled with surgical mop, and altered fluid collection (b, c)

Case 2

A 72-year-old male who presented with heaviness and discomfort in the right upper abdomen for the last 4 years. The patient gave a history of open cholecystectomy done 10 years ago at another medical facility. Physical examination revealed a firm 6×6 cm non-tender lump in right hypochondrium per abdominal examination. USG examination suggested the possibility of intraperitoneal hydatid cyst in the right hypochondrium. CECT abdomen showed an intraperitoneal complex cystic lesion in the right hypochondrium with an internal lamellated membrane and a diagnosis of hydatid Cyst was suggested (Fig. 2a). However, IgG and IgM were negative for *Echinococcus*

granulosus. Intraoperatively, a capsulated gauze of 9×8 cm was present in the peritoneal cavity in right subhepatic region densely adherent to the inferior surface of the right lobe of the liver, omentum, and adjacent bowel with purulent material inside the capsule (Fig. 2b, c).

Case 3

A 26-year-old female presented with pain and purulent discharge from the incision site for 3 months following total abdominal hysterectomy performed in another hospital 4 months back. Physical examination showed a sinus tract was noted in the lower part of the incision with an underlying, irreducible, mobile lump of 10×8 cm. USG abdomen suggested a complex inflammatory mass in the supravescical

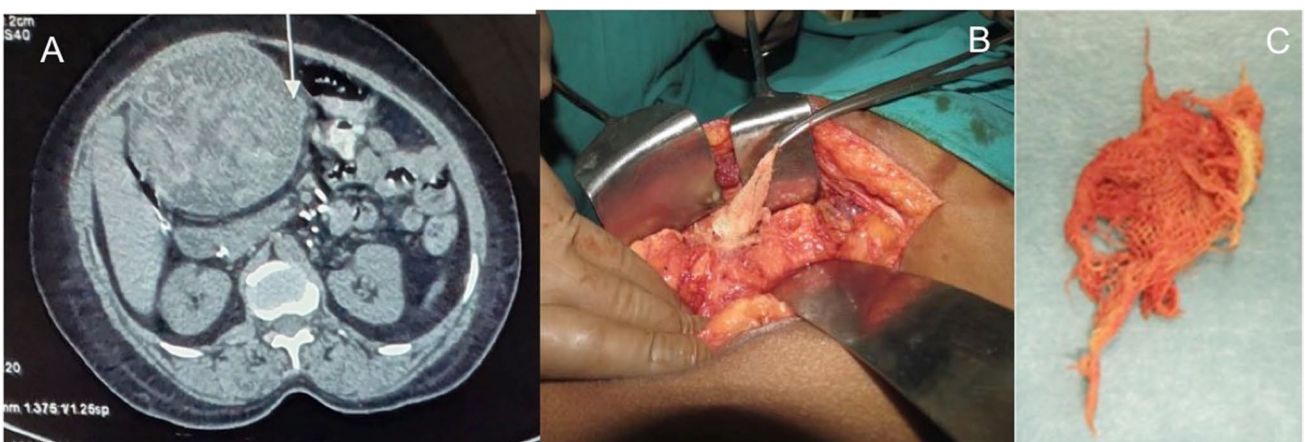


Fig. 2 CECT image showing an intraperitoneal complex cystic lesion (arrow) in right hypochondrium with internal lamellated membrane (a). Intraoperatively, a capsulated gauze was seen in right subhepatic region (b, c)

region. CECT showed a well-defined thick-walled heterogeneous intraperitoneal collection measuring $6 \times 9 \times 10$ cm in supravescical region in midline suggestive of an abscess. The lesion showed mottled air loculi in the center indicating a possibility of retained sponge (Fig. 3a). Exploratory laparotomy revealed a 10×8 cm surgical gauze present adherent to the posterior surface of the bladder and adjacent bowel with foul-smelling purulent material (Fig. 3b).

Case 4

A 35-year-old female presented to emergency department with diffuse abdominal pain for 4 years. The patient had undergone open appendectomy 10 years back and revealed no other history of other surgical intervention or abdominal trauma. On examination, the abdomen was distended with diffuse tenderness tachycardia and blood pressure of 100/50 mm Hg. CECT revealed a large hyperdense tubular structure extending from ileal loop to sigmoid colon lumen, with adjacent clumped and adhered small bowel loops

(Fig. 4). A possibility of iatrogenic foreign body or a cut end of nasogastric/drainage tube with fistulous communication between the sigmoid colon and small bowel (ileocolic fistula) was kept. The patient developed sepsis and was shifted to the ICU for hemodynamic and ventilator support. The patient expired before surgery could be performed. The family denied autopsy.

Case 5

A 62-year-old man underwent laparoscopic cholecystectomy and 1 week after discharge developed intense pain in the right upper abdomen. Ultrasound showed moderate free fluid in GB fossa and perihepatic regions. The patient underwent ERCP which revealed biliary leak through the cystic duct. A double pigtail plastic stent was placed. The patient was lost to follow-up for the next 2 months. Two and half months later, the patient presented with colicky abdominal pain, vomiting, and distension of bowel. CECT of the abdomen was performed with oral and intravenous

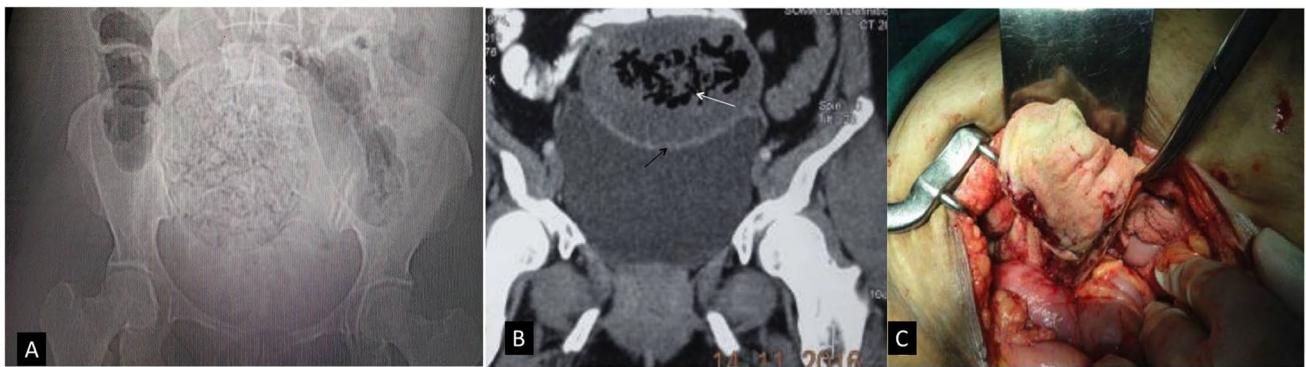
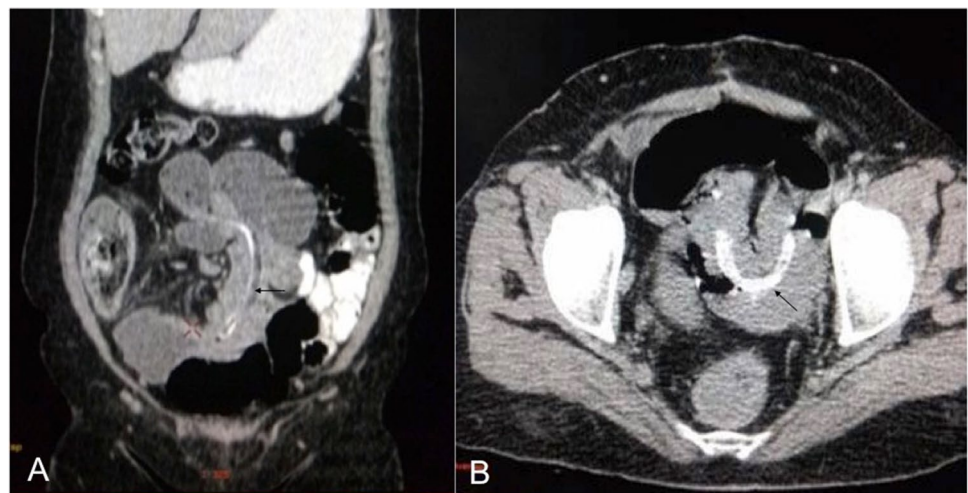


Fig. 3 a CT topogram image shows mottled air foci in the superior aspect of pelvis. CECT image showing a well-defined thick-walled heterogeneous intraperitoneal collection (black arrow) in supravescical

cal region with mottled air loculi in center (white arrow) indicating a possibility of retained sponge (b). Exploratory laparotomy revealed a surgical gauze present adherent to the posterior surface of bladder (c)

Fig. 4 CECT coronal (a) and axial (b) images showing a large tubular hyperdense structure (arrow) extending from ileal loop to sigmoid colon lumen, with adjacent clumped and adhered small bowel loops suggestive of ileocolic fistula



contrast administration. A few dilated ileal loops were seen in the umbilical region with abrupt narrowing of the lumen suggestive of intestinal obstruction (Fig. 5a). On adjusting window settings, a coiled tubular structure was observed at the site of abrupt narrowing (Fig. 5b). The plastic biliary stent was not seen in CBD. A diagnosis of the migrated biliary stent causing intestinal obstruction was made and the patient was taken up for laparotomy. A possibility could be that the migrated stent got impacted at the site of stricture and thickening which was causing obstruction. The patient was taken up for laparotomy and enterotomy and surgical removal of the stent. The abdomen was opened with a mid-line incision and small bowel was explored from the IC junction to the DJ flexure. Stricture was noted approximately 3 ft proximal to IC junction, with proximal dilated bowel loops. The strictured segment of bowel along with the plastic stent

was resected and removed. Ileoileal anastomosis was done with proximal loop ileostomy.

Case 6

A 30-year-old P2 L2 female presented with a history of lower abdominal pain for 1 week. She had undergone intracerebral placement of intrauterine contraceptive device (Cu-T) that was placed 6 months ago. Three months after the placement, she passed the IUD thread through the vagina. She presented to our hospital with cyclical pain abdomen and amenorrhea to our hospital for the last 3 months. Ultrasound and CECT abdomen revealed showed the presence of collection within the endometrial cavity suggestive of hematometra. Also, a hyperdense linear structure consistent with IUCD was seen in the right parametrium (Fig. 6).

Fig. 5 A few dilated ileal loops were seen in the umbilical region with abrupt narrowing of the lumen (white arrow) suggestive of intestinal obstruction (a). On adjusting window settings, a coiled tubular structure (black arrow) is observed at the site of abrupt narrowing (b) suggestive of migrated biliary stent

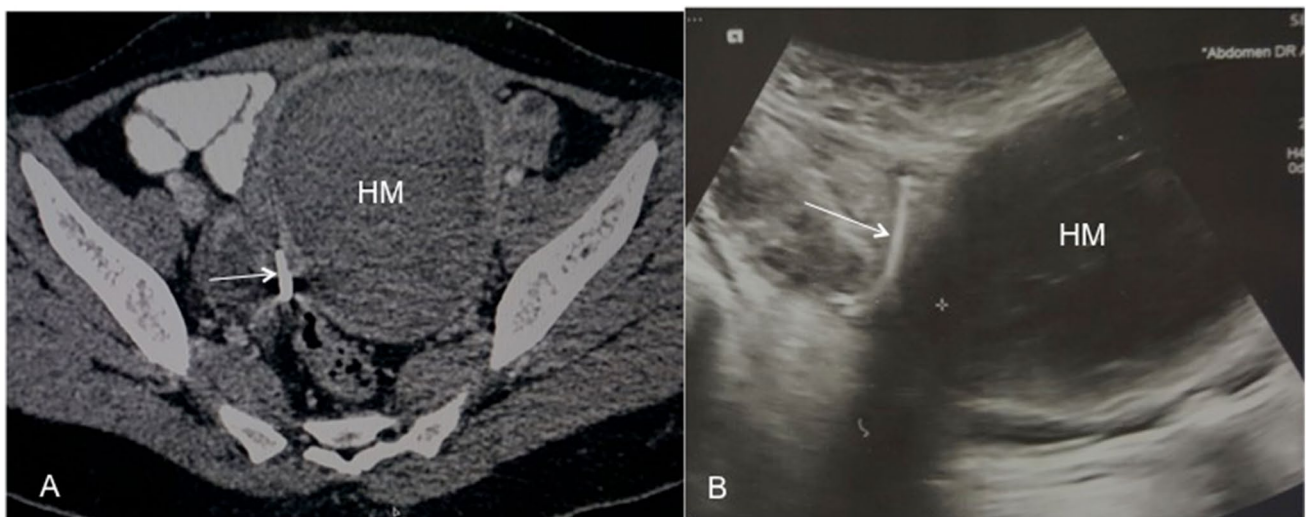
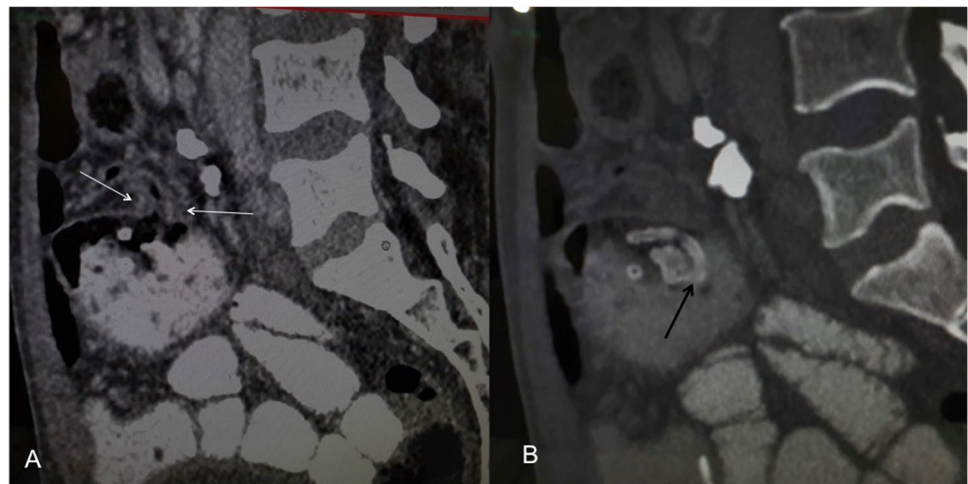


Fig. 6 CECT (a) and ultrasound (b) images showing a hyperdense linear structure in right parametrium (arrow) consistent with migrated IUCD as well as hematometra (HM)

A diagnosis of post-surgical hematometra with misplaced IUCD was made and evacuation of hematometra and laparotomy was planned to remove the migrated IUCD. However, eventually, hysterectomy was performed with the retrieval of Cu-T.

Case 7

A fifty-eight-year-old lady was referred for CECT abdomen for evaluation of postoperative sepsis. She underwent vaginal hysterectomy a day ago for uterine prolapse at an outside institute. Within hours after surgery, the patient became hypotensive and tachycardic.

Hemoglobin was 7 g/dl (from preoperative 11 g/dl). Laparotomy was performed to arrest the bleeding. Subsequently, a day later, the patient was referred to our institute with sepsis. The patient was febrile and TLC was markedly raised (21,000/mm³). CT showed a large heterogeneous hematoma measuring approximately 14 × 7 × 4 cm in the pelvis and lower abdomen, posterior to the urinary bladder. A well hypodense structure was seen superior and anterior to the hematoma with multiple closely packed gas pockets within (Fig. 7a, b). A diagnostic suspicion of gossypiboma was made and the presumptive diagnosis was offered to the referring gynecology team.

However, after interacting with the operating surgeon, the re-evaluation of the scan was requested as the surgical sponge count was confirmed during and after surgery. The operating surgeon informed us that gelatine sponge (gel foam, Pharmacia) was used against the bleeding surface to produce hemostasis. To evaluate the imaging pattern of gelfoam, a scan of gelfoam soaked with blood, stuffed in surgical glove, was obtained (Fig. 7c). Comparison with the scan and scrutiny of the pattern and morphology of the

structure convinced us of the initial fallacy. The decision was made to conservatively manage the patient with i.v. antibiotic therapy. The patient gradually improved and was discharged after 7 days.

Discussion

Retained surgical items (RSI) can be seen in cases of emergency surgery, the unexpected change in the surgical procedure, disorganization (e.g., poor communication), change in the surgical team or scrub nurses, hurried sponge counts, long operations, unstable patient, inexperienced staff, inadequate staff numbers, and obesity. Imaging features of RSI are variable and depend on the time since surgery, secondary infection, communication with bowel, and other organs [3]. CT is the imaging modality of choice for diagnosis and identification of possible complications. The typical imaging appearance of retained sponges (gossypiboma) on CECT is divided into three types: (i) spongiform mottled air densities with or without surrounding fluid collection, (ii) a well-defined cystic mass containing distinct internal hyperechoic wavy, striped structures similar to hydatid cyst, and (iii) non-specific pattern with a complex mass [3–5]. Mottled air loculi adjoining the gossypiboma can be seen up to 6 months after surgery [6].

The presence of mottled gas densities in the surgical field often alerts the radiologist and the surgeons to the possibility of gossypibomas, especially when accompanied by clinically evident sepsis. However, bioabsorbable hemostatic agents used at the time of surgery contain coalescent gas trapped within their interstices and hence mimic gossypibomas [7]. In chronic cases, the calcified reticulate rind has been reported as a useful sign to

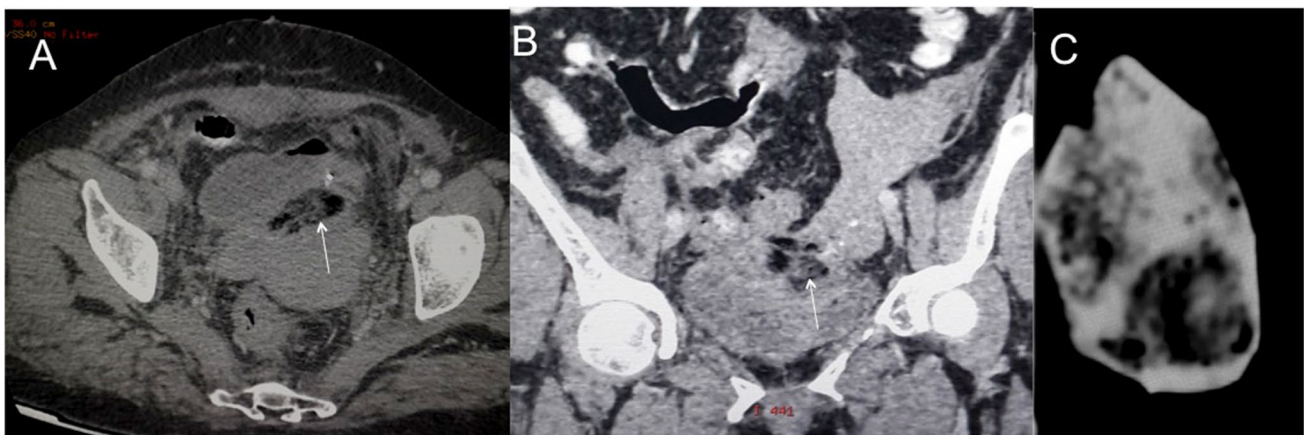


Fig. 7 CECT image shows a large pelvic hematoma and a hypodense structure seen superior and anterior to the hematoma with multiple closely packed gas pockets (arrow) within (a, b). To evaluate the

imaging pattern of gelfoam, a scan of gelfoam soaked with blood, stuffed in surgical glove, was obtained (C) which showed similar appearance

diagnose gossypiboma where the gas bubbles within are gradually absorbed [8]. In complicated cases, the gauze can be seen extending into the bowel, vagina, or urinary bladder or can cause intestinal obstruction [4].

One of our cases (the fourth case) most likely represented a retained surgical instrument that showed transmural migration to bowel lumen and subsequent ileocolic fistula. Besides surgical sponge, various other instruments such as clamps, retractors, drains, and electrodes can be left behind after abdominal surgeries [9]. Similar to sponges, they can also manifest as an abscess or inflammatory mass. Also, they can show catastrophic complications such as massive gastrointestinal bleed, perforation of the bowel, bowel fistula, or intestinal obstruction [9].

Distal migration of plastic biliary stent occurs in 8–10% cases and mostly is evacuated spontaneously. Uncommonly, they migrate and embed in the duodenal diverticula. Rare case reports of bowel perforation have been described in the literature with perforation of duodenal diverticula, duodenum, cecum, or ascending colon [10]. A case of duodenocolic fistula due to migrated stent has been reported [11]. Verma et al. reported a case of a mentally sound teenage male having eaten plastic wires leading to plastic bezoar causing an intestinal obstruction [12]. However, obstruction caused by migrated plastic stent has not been reported.

The migration of intrauterine contraceptive devices from fundus is a common complication. The migration can vary from intrauterine displacement, expulsion through the vaginal canal, and embedment into myometrium to complete uterine perforation into the parametrium or peritoneum [13]. Perforation of IUCD into parametrium and hematometra, both likely result of improper surgical technique of closure of uterine incision of cesarean section, has been reported previously as an isolated case report [14]. CT scan can effectively demonstrate the location of migrated IUCD and guide the surgical retrieval.

The differential diagnoses of retained sponges (gossypiboma) on imaging include intra-abdominal expansile masses/lesions such as hematomas, abscesses/collections, peritoneal hydatid cysts, neoplastic lesions, and fecalomas [2, 15]. Hematomas are seen in the early postoperative period and in general show resorption at follow-up scans. Abscesses are usually seen as peripherally enhancing collections and may develop secondary to gossypiboma. In cases of oncologic surgery, the differentiation between residual lesion, tumor recurrence, and gossypiboma may represent a diagnostic challenge to radiologists [6]. Fecalomas may present irregular contours and poorly defined limits at CT, but are located inside colon loops and do not present a well-defined and thick capsule. Other conditions, such as postoperative adhesions, intestinal invagination, mesenteric panniculitis, and retained absorbable hemostatic materials,

should be remembered and considered among diagnostic possibilities [16].

The imaging appearance of topical hemostatic agents which are essential tools to assist with the control of bleeding during surgery and wound closure can overlap that of abscess, gossypiboma, or tumor. Hemostatic agents fall into several broad categories including absorbable agents (gelatin foams, oxidized cellulose) and biologic agents (topical thrombin and fibrin sealants such as Floseal® and Surgiflo®) [17]. These hemostatic agents have a mixed air and soft tissue appearance on CT with echogenic dirty shadowing appearance on ultrasound. Case 7 included does not represent a migrated/retained object, rather highlights a radiological mimic and importance of communication between the interpreting radiologists and the surgeons.

The present series highlights the importance of CT scan and its variable presentation in diagnose suspected surgical items. Only a few reports on the MR appearance of retained surgical sponges in the abdomen have been published and CT remains the modality of choice. Moreover, MRI is contraindicated in patients who are suspected to have mobile metallic bodies in the abdomen. A plain radiograph should be obtained in patients referred for MRI if a patient has a history of a previous operation to rule out the presence of metallic foci. Radiographs can be also used in cases suspected to have a metallic plastic objects and in suspected cases of gossypiboma where it can reveal a fine opacity and/or some mottled small air densities superimposed on this area [18].

Conclusions

Our series describes the spectrum of CT findings of retained and migrated surgical items. CT is the most useful modality for diagnosis, localization, evaluation of adjacent anatomy, and recognition of complications of abdominal retained surgical items. Due to its variable and confusing clinical presentations, the radiologist is often the first to recognize the diagnostic possibility of RSI. Timely communication with the referring clinician is most urgent for those patients. Familiarity with imaging findings and communication with the clinician can facilitate timely management for these patients.

Abbreviations CECT: contrast enhanced CT; USG: ultrasonography; IUCD: intrauterine contraceptive device; TLC: total leukocyte count

Author Contribution Collection of data: SS; manuscript drafting: IK, SS; final approval and finalization of manuscript: AS, AV. All authors have read and approved the manuscript.

Data Availability (Data Transparency) Available.

Code Availability (Software Application or Custom Code) NA.

Declarations

Ethics Approval (Include Appropriate Approvals or Waivers) Institutional ethical committee of Institute of Medical Sciences, Banaras Hindu University, Varanasi, India, does not require ethical approval to publish case reports.

Consent to Participate Written informed consent was obtained from each patients/legal guardians to participate in this study.

Consent for Publication Written informed consent was obtained from each patients/legal guardians to publish this report.

Conflict of Interest The authors declare no competing interests.

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