Transduodenal migration of a retained surgical swab causing small bowel obstruction - imaging findings in the acute setting and prior to onset of symptoms

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ABSTRACT

Transmural migration of a retained surgical sponge causing small bowel obstruction is a rare occurrence. We report a case which demonstrates both the associated foreign body reaction seen on computed tomography months in advance of the onset of symptoms and confirms the subsequent fistulous decompression into the duodenum on both computed tomography and barium meal studies. To the best of the author's knowledge, a retained surgical swab causing small bowel obstruction has not been previously described with imaging both pre and post transluminal decompression.

CASE REPORT

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A 70 year old female was admitted via the Emergency Department with a two week history of vomiting. This had been progressive and at the time of admission she was unable to keep any fluids down. On arrival she was afebrile, dehydrated and tachycardic. Abdominal examination was unremarkable. Biochemical analysis revealed impaired renal function and raised inflammatory markers.

The patient's significant past medical history included radical cystectomy one year previously for a grade III transitional cell carcinoma of the bladder with nephroureterectomy of a non-functioning obstructed right kidney. She had an uncomplicated post operative recovery with discharge at day 9 and the patient remained asymptomatic at the three month outpatient review.

The admission abdominal radiograph (Figure 1) was interpreted by the surgical team as small bowel obstruction with gaseous distension of the stomach. The patient settled with conservative management before representing three days later at which point the imaging was reviewed by a radiologist. Radiographs demonstrated small bowel obstruction with a metallic foreign body in the pelvis (arrow, Figure 1) which had altered in position from the previous study. The foreign body morphology and alteration in position suggested an intraluminal location, within either the sigmoid colon or terminal ileum.

Previously, a three month follow up CT performed when the patient was asymptomatic showed a rounded collection within the right renal bed (arrow, Figure 2) with a thin capsule, a hypodense centre and multiple internal metallic coils. The collection was located immediately posterior to the junction of the second and third parts of the duodenum. Further discussion of the case was offered by the reporting radiologist. The significance of the finding was not realised and no further discussion occurred.

Follow up emergency CT scan performed during the second admission demonstrated decompression of the

collection in the right renal bed with a visible connection (arrow, Figure 3) to the third part of the duodenum. There was significant mechanical small bowel obstruction as far as an intraluminal mass in the terminal ileum which contained metallic coils (arrow, Figure 4). The blind ending fistulous tract (arrow, Figure 5) between the third part of the duodenum and the right renal bed was confirmed on a water soluble upper GI contrast study.

At laparotomy and small bowel enterotomy the object was removed and confirmed to be a medium surgical swab. The patient made an uneventful recovery.

The swab count for the initial operation was completed but not signed.

DISCUSSION

Retained surgical material with a foreign body reaction relating to cotton has been termed textilomas or gossypium (in Latin - cotton). Their incidence has been variably reported as being between 1 in 1000 to 1 in 1500 intra-abdominal operations [1] to 1 in 5,500 [2].

Typically two pathological types of foreign body reaction are described - fibroblastic and exudative. Fibroblastic is an aseptic fibrinous reaction leading to granuloma formation and encapsulation. This granulomatous reaction to retained cotton gauze has been confirmed histologically on rats [3]. The exudative subtype of reaction has been reported to present earlier and is associated with pain, fever and a palpable inflammatory mass or abscess which may fistulate into adjacent viscera [4].

A significantly increased risk of retained foreign body is associated with emergency surgery, unplanned change to operation and increased body mass index. Emergency surgery and unexpected change to operation were nine and four times more likely to result in retained foreign body respectively in a review [5]. In one study [6], the swab count was pronounced correct in most cases but most gossypibomas occurred when the sponge count was incorrect.

Gossypibomas were most commonly found in the abdomen 56%, pelvis 18% and thorax 11%. The average interval between surgery and discovery was 6.9 years with a median of 2.2 years [6].

The appearances on ultrasound and CT prior to transmural migration are variable [4,7] depending on the nature of the sponge and its radio-opaque marker, if present, as well as the age of the foreign body and the nature of the reaction. On ultrasound, a mixed echogenicity mass with prominent acoustic shadowing is characteristic with the mass sometimes appearing hypoechoic/cystic and containing irregular internal echoes. CT may demonstrate a mixed density and often calcified mass that may be striped or spotted and contain spongiform gas, the latter pattern of characteristic air trapping being present only in a minority of cases. Rim enhancement may occur following contrast administration which is presumably due to inflammation in the wall of the mass. A high density enhancing capsule with a low density centre is found in the majority of cases and can cause diagnostic difficulty between abscess and haematoma. Calcification is a rare finding and is more common in longstanding cases [3].

The differential diagnosis for a retained swab in this case includes tumour recurrence, an abscess or a complex renal cyst. Indeed, the significance of the appearances seen on the follow up CT scan was not recognised by the reporting radiologist. The appearances of a tumour recurrence would be variable, most likely a complex, solid and irregular mass on ultrasound (with a resulting mixed echogenicity appearance) and CT with evidence of heterogeneous contrast enhancement on the latter. There will be no evidence of a metallic foreign body on either study. A post operative abscess may demonstrate foci of gas on AXR, though the examination would typically be normal. On ultrasound, a typical finding would be a complex fluid collection with internal echoes [8]. The presence of gas may cause acoustic shadowing which could be confused for the presence of a metallic foreign body, i.e. a retained sponge [4]. The imaging appearances of septae, solid nodules, calcification and enhancement within a complex renal cyst are variable depending on the complexity of the lesion. No metallic markers are present [9].

Our case demonstrates a coiled metallic marker on plain radiograph. Initial CT findings included a thin well defined capsule surrounding the sponge with coiled metallic markers (Figure 2). The pre-operative staging CT had no corresponding abnormality confirming the timing of the operative error.

The follow up CT scan following transluminal entry into the small bowel and subsequent small bowel obstruction has a more typical spongiform appearance. After surgical removal of a retained swab, as in our patient, no long term complications would be expected. The unique feature of our case is the demonstration of the variable appearance of retained surgical swabs both before and after fistulation as well as the confirmed tract on CT and fluoroscopy. It also highlights the importance of knowledge and recognition of the appearance of radio-opaque markers on plain film.

TEACHING POINT

Retained surgical swabs are an important entity to consider when reporting post-operative studies. Knowledge of their appearance on plain film, ultrasound and CT is important to increase reporting accuracy and reduce patient morbidity. Identification of radio-opaque markers on a plain film should lead to discussion with the surgical team, correlation with the operative swab count and CT assessment to identify the swab's precise location prior to operative removal.

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FIGURES

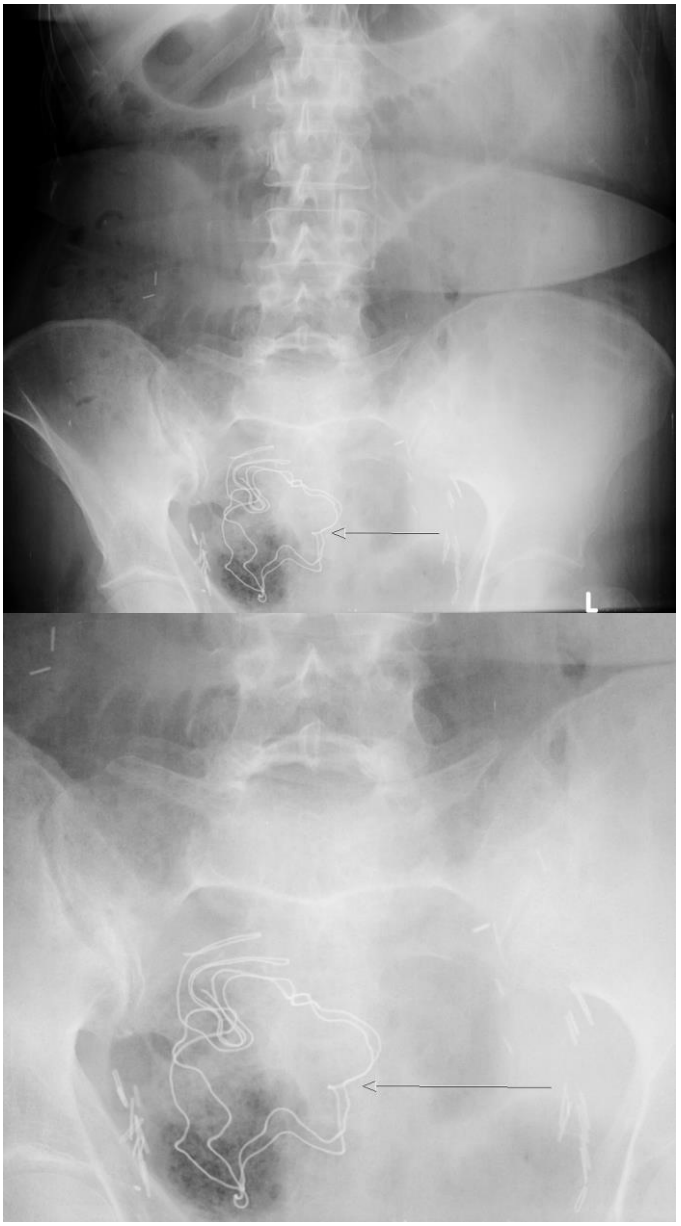

Figure 1: 70 year old female patient with a retained surgical swab. Supine abdominal radiograph, and magnified view, (45mAs, 65kV) which demonstrates dilated small bowel loops and a coiled metallic foreign body, likely representing a swab, within the pelvis (arrow).

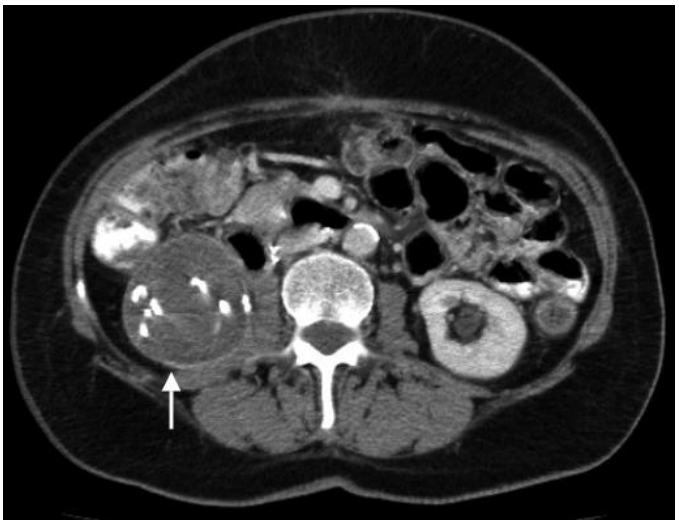

Figure 2: 70 year old female patient with a retained surgical swab. Axial section of a CT scan (oral and intravenous (100ml of Omnipaque 300) contrast in the portal venous phase, 1mm slice thickness with 5mm reconstructions, 402mA, 120kV) which demonstrates a rounded collection (arrow) within the right renal bed consisting of a thin capsule with a hypodense centre (HU=50) containing multiple metallic coils and located immediately posterior to the junction of the second and third parts of the duodenum.

Figure 3: 70 year old female patient with a retained surgical swab. Sagittal section of a follow up CT scan (oral and intravenous (100ml of Omnipaque 300) contrast in the portal venous phase, 1mm slice thickness with 5mm reconstructions, 402mA, 120kV) performed as an emergency during the second admission which demonstrates decompression of the collection in the right renal bed with a visible connection (arrow) to the third part of the duodenum (star).

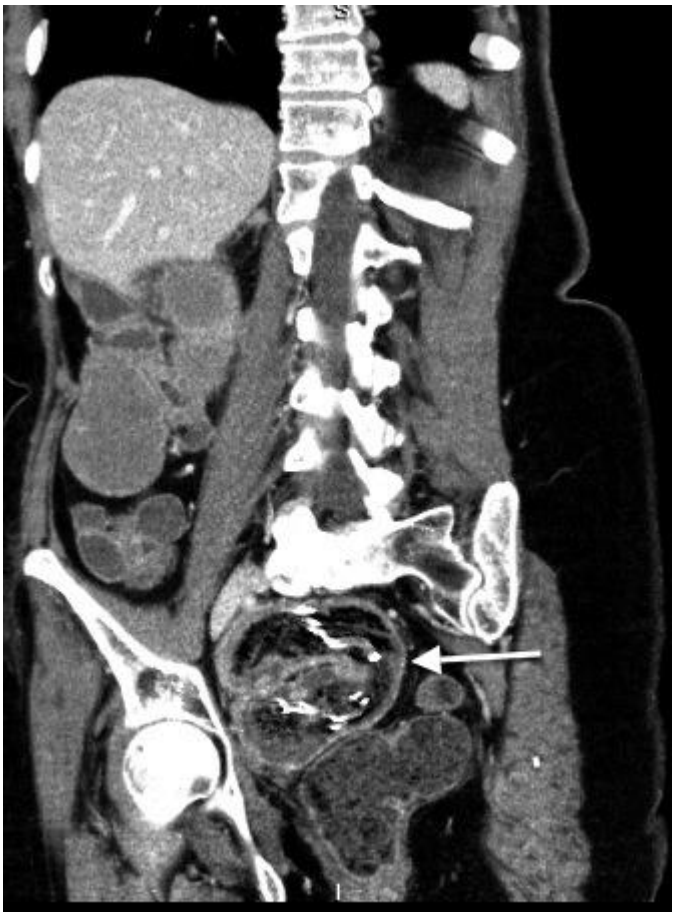

Figure 4 (left): 70 year old female patient with a retained surgical swab. Coronal section of a CT scan (oral and intravenous (100ml of Omnipaque 300) contrast in the portal venous phase, 1mm slice thickness with 5mm reconstructions, 402mA, 120kV) which demonstrates small bowel obstruction secondary to a mass in the terminal ileum which contains metallic coils (arrow).

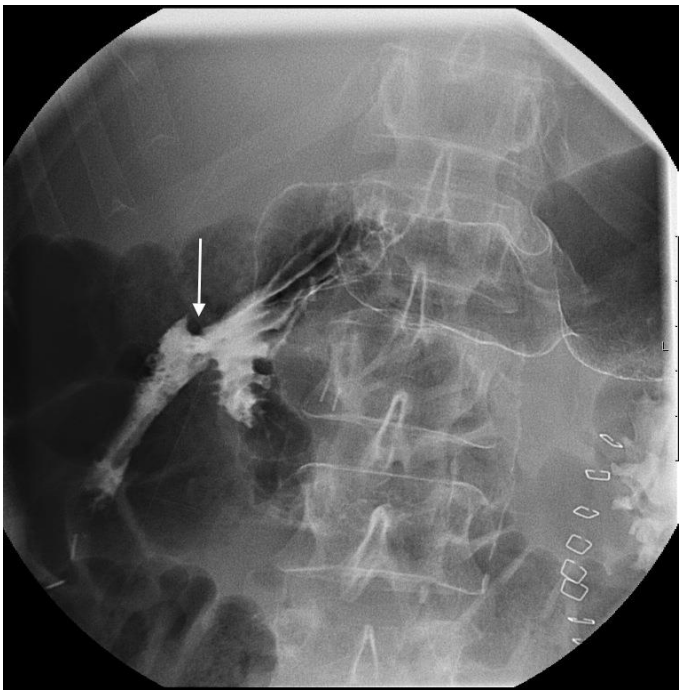

Figure 5: 70 year old female patient with a retained surgical swab. Water soluble (150 ml of Omnipaque 300) upper GI contrast study (30mAs, 120kV) demonstrating a blind ending fistulous tract (arrow) between the third part of the duodenum and the right renal bed.

Aetiology	Occurs due to surgical error.
Incidence	Between 1 in 1000 to 1 in 5500 intra-abdominal operations.
Gender ratio	N/A
Age predilection	N/A
Risk factors	Emergency surgery, unplanned change to operation and increased body mass index.
Treatment	Surgical removal of the swab +/- the affected bowel loop if fistulation has occurred.
Prognosis	After swab removal, good.
Findings on imaging	AXR: ring shaped foreign body or a coiled metallic marker. US: mixed echogenicity mass with prominent acoustic shadowing. Sometimes a hypoechoic/cystic mass with irregular internal echoes. CT: mixed density and often calcified mass that may be striped or spotted and contain spongiform gas. Rim enhancement may occur following contrast administration.

Table 1: Summary table for a retained surgical swab in the renal bed.

Entity	Abdominal XR	Ultrasound	Contrast CT
Retained swab	Ring shaped foreign body or coiled metallic marker.	Mixed echogenicity mass with prominent acoustic shadowing. The mass sometimes appears hypoechoic/cystic and contains irregular internal echoes.	Mixed density and often calcified mass that may be striped or spotted and contain spongiform gas. Rim enhancement may occur following contrast administration.
Recurrent tumour	Not applicable.	Complex, solid and irregular mass with a resulting mixed echogenicity appearance. No evidence of strong acoustic shadowing to suggest a metallic foreign body.	Complex, solid and irregular mass with evidence of heterogeneous contrast enhancement. No evidence of a metallic foreign body.
Abscess	Probably normal but may see small foci of gas.	Mass with a thick wall and central hypoechogenicity, in keeping with fluid. The wall may demonstrate increased flow on colour Doppler. The presence of gas may cause acoustic shadowing which could be confused for the presence of a metallic foreign body, i.e. a retained swab.	Mass with a thick wall. Rim enhancement.
Complex renal cyst	May see calcification but usually normal.	Septae, solid nodules and calcification are variable depending on the complexity of the cyst.	The appearance of septae, solid nodules, calcification and enhancement is variable depending on the complexity/Bosniak grade of the cyst. No metallic markers are present.

Table 2: Differential diagnosis table for a retained surgical swab in the renal bed.

ABBREVIATIONS

AXR = Abdominal radiograph
CT = Computed tomography
HU= Hounsfield unit
MRI = Magnetic resonance imaging

KEYWORDS

Small bowel obstruction; swab; fistula