Abdominal Gossipiboma: What the radiologist can not forget

Poster No.: C-1621
Congress: ECR 2017
Type: Educational Exhibit
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Keywords: Obstruction / Occlusion, Inflammation, Foreign bodies, Medico-legal issues, Computer Applications-General, Computer Applications-Detection, diagnosis, MR, CT, Conventional radiography, Emergency, Anatomy, Abdomen
DOI: 10.1594/ecr2017/C-1621

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Learning objectives

The purposes of our educational exhibit are to:

- Recall the imaging characteristics of gossypiboma, in order to familiarize radiologists with this condition and its main differential diagnoses;

- Highlight the evaluation of clinical correlation with imaging for the correct diagnosis in order to avoid potentially serious complications related to the presence of gossypiboma.

- Revise the theme in order to increase its detection and consequently reduce its morbimortality.
Background

Gossypibomas can occur in different organs and locations and after various surgical procedures. The most common locations are abdominal (56%) and pelvic (18%), with textile material (gauzes or surgical sponges) being the most commonly found [1].

The clinical presentation is wide ranging from asymptomatic cases to potentially fatal cases, which gives imaging an essential role in the diagnosis aid in order to avoid unfavorable evolution of the condition. Ultrasonography and conventional radiography can be used as an initial evaluation method, but Computed Tomography (CT) and Magnetic Resonance (MR) allow a better evaluation of the possible complications.
Findings and procedure details

All cases presented in the present study were selected from our institution's teaching files at an University Hospital (Instituto de Medicina Integral Prof. Fernando Figueira - IMIP) and show CT and MR images of gossypibomas and its differential diagnoses.

INTRODUCTION AND EPIDEMIOLOGY

The first report of gossypiboma occurred in 1884 and was described by Wilson who observed the presence of an intra-abdominal textile foreign body after a laparotomy [2,4,6,11].

The set formed by a textile tissue surrounded by an inflammatory/granulomatous tissue reaction is called "gossypiboma" (Gossypium [Latin]: cotton, Boma [Suaili]: place of concealment) and has as synonymy the term textiloma [1,3,4,5,8,9].

Its incidence is quite variable and is not known for sure, two hypotheses for this are underreporting or non-identification, which may occur due to the variable clinical presentation with the absence of symptoms in some patients, but also due to the legal implications of detection [2,3,8].

The recommended treatment after its detection is excision in order to avoid complications that can progress to death in 11 to 35% of cases [2].

PREDISPOSING FACTORS

Several factors may predispose to the occurrence of gossypiboma that may be related to both the medical staff and the patient's own conditions.

Emergency surgery, need for unplanned surgical procedure, change of medical and nursing staff during surgery, prolonged procedure time, obesity and intraoperative complications, such as hemorrhage, are the main factors related to the occurrence of abdominal gossypibomas [1,3,5,7,8,9]. Other causes, like staff fatigue and omission of instrument and/sponge count could result in the sponge retention too [21].

CLINICAL PRESENTATION
The clinical presentation of a gossypiboma is quite variable and depends on the location of the material and the type of organic reaction that the organism produces, which also ends up defining the evolution time [2,8,12].

Two types of organic responses are described: the first is an aseptic inflammatory reaction, with fibrin production that leads to adhesions and encapsulation of the material with subsequent formation of a granuloma.

Generally, the patient does not present significant symptoms in this type of reaction, being identified in some cases only a palpable mass. Approximately 30% of patients with gossypiboma are asymptomatic [1,3,5,8,10,11].

The second type is an exudative reaction and may have secondary bacterial contamination, including abscess formation. This type of response promotes more early and exuberant symptoms, which depend on the affected organ and can cause intestinal obstruction, fistulas, perforation of intestinal loops, malabsorption syndrome, adhesions and even peritonitis [1,3,5,8,10,11].

The patient may have complaints related to the location of gossypiboma such as abdominal pain, palpable mass, nausea, vomiting, rectal bleeding, abdominal distension, diarrhea, dysuria, pyuria, hematuria and urinary urgency but may also have systemic symptoms such as fever, anorexia, anemia and weight loss [1,2,4,6,8,10,12].

A very rare event is transmural migration that can cause the foreign body to penetrate the gastrointestinal tract or bladder and make the patient symptomatic after several years. The ileum and colon are the most common sites of the gastrointestinal tract [1,2,6,18,19].

**IMAGING FEATURES**

The diagnosis of a gossypiboma can be a challenge for the radiologist because of the lack of specificity of the symptoms or even absence of them. Various imaging methods can be performed, as listed below.

1) **Conventional Radiology:**

Simple abdominal radiography can be used in the initial evaluation and is especially useful if the material contains radiopaque markers (sensitivity above 90% in these cases), however, it is important to differentiate them from calcifications, contrast material, screens or surgical clips [1,2,6].
The image aspect is variable and may appear as irregular and serpiginous radiodense lines; some serpiginous, and sometimes involved by increased density of adjacent soft tissues and volume. Another form of presentation is that of radiolucent amorphous images, possibly due to entrapment of gas or secondary infection by gas-producing bacteria [3,11].

It is also possible to search for indirect signs such as opacification, calcification, displacement of gastrointestinal structures and the presence of tumor mass [4].

2) Contrasted-enhanced tests:

Intestinal transit with barium contrast or fistulography with iodine contrast are examples of contrast-enhanced tests that can be performed to demonstrate fistulas and perforations that may also help locate the material when there is intraluminal migration [2].

3) Abdominal Ultrasonography (US):

The US has the advantages of identifying gossypibomas, including radiolucent ones, report of anatomical relations, non-use of ionizing radiation, and high sensitivity (between 95% and 98%) [3].

The imaging findings may vary depending on the material and the time evolution, but often appears as a well defined cystic image, with a hypoechoic border and hyperechogenic corrugated material inside, with zigzag echogenic bundle [20]. It usually has marked posterior acoustic shadow, which may be due to the attenuation of the sound beam by gossypiboma or resulting from the presence of gas or areas of calcification. It may also appear as a solid mass, complex hyper and / or hypoechoic. Doppler study does not observe internal vascular flow [1,2,3,6,10,11].

As disadvantages, it is an operator-dependent method, it has limitations for the evaluation of gossypibomas located posterior to hollow viscera that contains gas and there is the possibility of not identifying deeper foreign bodies. In the immediate postoperative period it has low sensitivity due to gas distension and caution should be taken with scars and calcifications of other etiologies that may result in false-positives [2,3].

4) Computed Tomography (CT):

CT is considered the gold standard method for the diagnosis of gossypiboma and its complications [2,3,6].
The appearance of the image is generally of a well-defined mass, with heterogeneous content, spongiform, of variable density (soft parts, high density, or even mixed), which may contain gas therein and has a high density post-contrast phase or wall calcifications, as well as radiopaque markers of the material as spiral or sinuous radiopaque lines [1,3,4,5,6,8,10]. **Figures 1 to 4.**

In the presence of artifacts generated by hardening of the bundle that make it difficult to identify the radiopaque marker of gossypiboma, the scout/topographic image is essential to aid in diagnosis, so it is always important to remember to evaluate it [3].

**Fig. 1:** CT of the abdomen without contrast, in (A) axial scans, (B) coronal and (C) sagittal reconstructions evidencing well-defined, heterogeneous lesion with serpiginous marker in the intervening, compatible with post-surgical foreign body.

**References:** - Recife/BR
Fig. 2: Typical findings of intraabdominal gossypiboma. A: The scout of the patient evidences a rounded, dense lesion in mesogastrium displacing the intestinal loops (yellow arrows) without, however, configuring the metallic marker. CT of the abdomen in axial scans (B and C) and sagittal reconstructions (D and E) shows a heterogeneous, well defined lesion that, although it contains the metallic marker (white arrow), shows a very characteristic aspect of the gossypibomas that is the presence of a serpentine hyperintense area inside the lesion (red arrows). This finding should suggest to the radiologist the diagnosis of gossypiboma, since not all surgical materials such as compresses and gauzes have the characteristic metallic marker.

References: - Recife/BR
Fig. 3: Enhanced abdominal CT in (A) axial scan, coronal reconstruction (B and C), and sagittal reconstruction (D) showing a heterogeneous lesion, well delimited, with hyperintense areas of serpiginiform aspect, suggesting gossypiboma (black asterisks), which displaces Intra-abdominal structures, such as the pancreas (yellow arrow) and the descending colon (red circle).

References: - Recife/BR
Fig. 4: Patient 26 years old, male, victim of multiple abdominal gunshot injuries subjected to a urgent exploratory laparotomy. It evolved postoperatively with hepatic abscess, and post-surgical CT was requested for a better evaluation. A and B: Contrast CT axial sections showing well-defined mass, with heterogeneous content, spongiform, with metallic marker present in surgical compress, characterizing gossypiboma (red circle), which rejects the stomach. C: Sagittal CT reconstruction showing intima relationship of the foreign body with the stomach (green arrow). D: showing hepatic abscess (yellow arrow), besides gossypiboma.

References: - Recife/BR

A small amount of gas together with gossypiboma, forming the spongiform pattern (Figure 5), can be identified for up to six months after surgery, but it is important to
remember to investigate, in these cases, intestinal perforation and associated infection as abscesses. This pattern is the most characteristic tomographic signal for gossypiboma [2,3,6,11].

**Fig. 5:** Patient 63 years old in recent postoperative period of transabdominal hysterectomy due to endometrial cancer evolving with pain and abdominal distension. Performed abdomen CT for investigation. A: Scout of the patient showing metallic marker of serpiginous aspect. Abdominal CT in axial scan (B), coronal (C) and sagittal (D) reconstructions showing a heterogeneous mass, spongiform, well defined contours, compatible with post-surgical foreign body.

**References:** - Recife/BR
Magnetic Resonance (MR):

MR is reserved for selected cases where other, more widely available imaging methods have not been able to identify signs suggestive of gossypibomas or were inconclusive [2,3].

The characteristics of the image are variable, but gossypiboma usually presents as a heterogeneous mass with well-defined contours and with a well-delimited capsule with variable signal intensity according to the mass component, the examination phase, and the presence of complications. Within the mass the hyposignal prevails in T1 and the hypersignal in T2, presenting serpiginous and irregular images of intermediate signal in T1 and T2. The capsule generally exhibits low signal in all pre-contrast sequences, and may or may not show enhancement in sequences following administration of the paramagnetic contrast medium. Radiopaque markers are not well visible through this method [1,2,3,4,6,11]. **Figures 6 to 8.**

There are few publications evaluating this method for the diagnosis of gossypibomas, but sensitivity is reported close to 100% [3].
Fig. 6: Patient 61 years old with suspected right adnexal lesion and a previous history of surgery. T2-weighted MR in the coronal reconstruction (A) and axial scan (B) showing the adnexal lesion with serpiginiform content inside it - gossypiboma (red arrows). MR in phase (C) and out phase (D), showing the magnetic susceptibility artifacts that the metal marker produces in these sequences.

References: - Recife/BR
Fig. 7: Patient submitted to transabdominal hysterectomy. MIR of the abdomen in the T2 phase. Axial scan (A), sagittal (B) and coronal (C) reconstructions show heterogeneous lesion, well defined, with hypersignal (yellow asterisks). D: Axial scan in T1 phase showing that the same lesion presents in this phase with hyposignal (orange asterisk). The referred lesion presents restriction to the diffusion, presenting hypersignal in the diffusion (white arrow) with hyposinal in the ADC map (red arrow).

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Fig. 8: Typical appearance of intraabdominal gossypibomas, through CT scans and MR. A: Scout of the patient showing metallic marker in the mesogastrium region, suggesting foreign body (red arrows). B, C and D show CT axial scan, coronal reconstruction and sagittal reconstruction, respectively. The lesion is identified, being possible its better delimitation and confirms the presence of the intralesional metallic marker, confirming the diagnosis of gossypiboma. It is important to note that both CT and MRI studies present similar typical features, as seen in C (coronal reconstruction of CT) and in E (MR in T2 phase in a coronal reconstruction), show a heterogeneous, well delimited, serpiginous lesion inside (yellow arrows). These findings are very indicative of gossypiboma, even in the absence of the metal marker.

References: - Recife/BR

DIFFERENTIAL DIAGNOSIS

The main differential diagnoses include:

1) Bruising:

They are identified early in the postoperative period and usually evolve with progressive resorption in subsequent evaluations. One should look for the spongiform aspect with air inside and / or the radiopaque marker to help distinguish it from gossypiboma [3,4,10].
2) Abscesses:

Attention should be paid to the possibility of the coexistence of abscess with gossypiboma, since this may complicate the formation of abscesses. The differential diagnosis between these two conditions can be difficult if there is no radiopaque labeling of gossypiboma, but the abscesses usually present themselves as masses of liquid density and have capsule well defined and reinforced. It is sometimes possible to identify gas with formation of hydro-level within the lesion [3,4,6,10].

3) Neoplastic lesions:

Gossypiboma may present as a palpable mass in a patient with non-specific or absent abdominal complaints, associated with previous history of abdominal surgery, but in cases where the surgery was oncologic, the differential diagnosis between residual lesion, tumor recurrence and gossypiboma is a challenge [3,10]. In addition, gossypiboma may be a cause of chronic abdominal mass and may mimic primary abdominal neoplasias [14]. Figures 9 to 12.
Fig. 9: Elderly patient complaining of abdominal pain associated with vomiting. Conventional radiograph of the abdomen demonstrates a heterogeneous mass with lobules, hypotransparent, located in the right hypochondrium, extending to the ipsilateral flank, rejecting the intestinal loops to the contralateral side. **References:** - Recife/BR
Fig. 10: Axial imaging methods. No-enhanced abdominal CT on axial scan (A), coronal (B) and sagittal (C) reconstruction showing a large heterogeneous expansive lesion, with calcification in the interior, predominantly located in right hypochondrium and characterized by diffuse hyposignal on T2 coronal fat-saturated reconstruction (D, E) wrapped by ascending colon Patient admitted with history of abdominal pain and vomiting associated with palpable abdominal mass, being a neoplastic process considered as the main hypothesis of diagnostic.

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Fig. 11: 3-Dimensional reconstruction (A) confirms the expansive lesion seen in right hypochondrium. Patient was submitted to surgical resection, having as an intraoperative finding an important intestinal dilatation (B) due to the presence of intraluminal compress (C). The only intra-abdominal surgery reported by the patient was more than 30 years ago.

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**Fig. 12:** Child with primary bladder neoplasm undergoing surgical treatment. During evolutionary control, it was evidenced an expansive lesion in the bladder floor, as seen in this MR of the abdomen with sagittal reconstruction in T2. The main diagnostic hypothesis was tumor recurrence. Patient submitted to a chemotherapy cycle, with reevaluation after its completion, showing an unchanged lesion in relation to previous examination. Opposed by a new surgical approach, having as intraoperative finding the presence of intravesical foreign body (gauze).

**References:** - Recife/BR

4) **Fecalomas:**

They are located inside intestinal loops and do not have a well-defined capsule [3,10]. **Figure 13.**
Fig. 13: A 36-year-old patient underwent hysterectomy and oophorectomy. (A) CT of abdomen without contrast showing heterogeneous lesion, spongiform aspect, located in the right iliac fossa (white asterisks). Enhanced abdominal CT in axial scan (B), coronal (C) and sagittal reconstruction (D) showing that the heterogeneous lesion presents parietal enhancement and is close to the ascending colon (yellow arrow), presenting a fistulous path with it (red arrow). The hypothesis of fecaloma was suggested. However, due to the surgical past, the gossypiboma hypothesis was not ruled out and was later confirmed during the surgical procedure. B = Bladder; U = Uterus.

References: - Recife/BR

5) Other conditions:

Postoperative adhesions should be considered, although adherence may be due to gossypiboma, intestinal invagination, mesenteric panniculitis, among others [2,3].

TREATMENT AND PROGNOSIS

Although it is known that the best treatment for gossypiboma is surgical removal of the foreign body, prevention is the best to do and should always be emphasized [15].

The main complications are visceral perforation, intestinal obstruction, peritonitis, fistulization (Figure 14), septicemia and migration from gossypiboma to the gastrointestinal or urinary lumen [1,2].
**Fig. 14:** Patient 75 years old, had previous surgery for colorectal cancer with free margins and evolved with delayed postoperative abdominal pain; tumor recurrence/reicidive was suspected and the patient was submitted to oncologic tracking. A: CT Scout of the patient shows a metallic marker of gossypiboma inside the upper abdomen (red arrow). B: Non-enhanced CT, axial scan in the thoracoabdominal transition showing the spongiform aspect and the tip of the metallic marker (white asterisks). C and D: MR T2-weighted axial scans showing intimate contact of gossypiboma (white asterisks) with the stomach, colon (primary resection site) and ileum, as shown in E and F, through MR T2-weighted coronal reconstructions it is possible to identify fistulas for stomach (blue arrow), and intimate contact with ileum (yellow arrow) and the primary resection site (pink arrow).

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In the case of diagnosis of gossypiboma, surgical excision is performed through laparoscopy or laparotomy, in order to avoid complications [2,4,5,12] which may require repair or resection of intestine [13, 17].

Some authors report the possibility of conservative treatment with periodic radiological evaluation in the presence of free intraluminal migration without intestinal perforation [2]. Other studies recommend alternative methods of treatment, which have recently appeared in the literature, such as percutaneous extraction [16].

The prognosis of gossypiboma is variable and generally depends on the length of time gossypiboma stays within the patient. Attention should be paid to the high risk of
complications from surgery to remove a long-lived gossypiboma from the patient, due to adhesions and the possibility of complications requiring extension of surgery. Therefore, the best treatment is the early treatment for the best prognosis [2,4,5,12].
Images for this section:

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Conclusion

Gossypiboma involves serious medical-legal implications in addition to presenting potential risk to the patient's life. Care should be taken to investigate patients with persistent postoperative complaints, and it is important to identify their presence early to minimize possible complications, facilitate treatment and improve prognosis.

Always having in mind this diagnostic possibility assists in the research and identification of this condition, therefore, the radiologist should be aware of the possible presentations of gossypibomas so that, in this way, the radiologist is able to help the medical assisting team to better conduct the patient's diagnostic investigation.
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