World J. Surg. 24, 521–527, 2000
DOI: 10.1007/s002689910084

WORLD
Journal of
SURGERY

Intraperitoneal Gossypibomas: The Need to Count Sponges

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Abstract. Intraperitoneal forgotten foreign bodies are prone to create adhesions and to encapsulate, or to provoke an exudative response, with or without accompanying bacterial infection. Often a process of self-extrusion is initiated. This is also true for gossypibomas, retained surgical sponges. Presentation is possible as a pseudotumoral, occlusive, or septic syndrome; several cases, however, have remained asymptomatic for as long as several decades. Ultrasonography and radiology (especially computed tomography) contribute significantly to the detection of gossypibomas; magnetic resonance imaging is a less used technique. Detection by plain radiography is difficult. Ultrasonography demonstrates a hyperreflective mass with hypoechoic rim and a strong posterior shadow. Computed tomography shows a well defined mass with internal heterogenous densities. Therapy consists of operative removal of the foreign body in association with resolving its complications. Adding a series of five cases to the existing literature reports, the fate of intraperitoneal forgotten surgical sponges is reviewed.

Despite precautions taken before, during, and after surgical procedures, surgical objects are still occasionally left behind in the peritoneal cavity. The most commonly retained foreign body is the laparotomy sponge [1–4]. It is often forgotten during operations in the lesser pelvis, explaining the high incidence of gossypibomas following gynecologic procedures. Another common site where sponges are unintentionally left is the lumbar spine during laminectomy.

The word gossypiboma (*gossypium:* Latin, cotton; *boma:* Swahili, place of concealment) refers to a mass composed of cotton matrix retained within the human body [5]. Cotton is an inert material and hence does not undergo decomposition [6, 7]. Nowadays sponges are made up of synthetic fibers, but the expression gossypiboma and its synonyms textiloma and cottonoid are still commonly used. Sponges, and therefore also gossypibomas, are found in several dimensions. The first case was reported by Wilson in 1884 [8]. Since then many casuistic reports have been published. We have collected five more cases of abdominal gossypiboma from various surgical departments of the Antwerp agglomeration. We stress the importance of this operative iatrogenic complication.

This study was presented at the VIIth European Congress of Surgery (Eurosurgery 1997), June 3–7, 1997, Athens, Greece.
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Case Reports

Case 1

In December 1990, a 61-year-old woman underwent cholecystectomy for acute cholecystitis. Histologic examination, however, demonstrated an invasive, well differentiated adenocarcinoma of the gallbladder. The postoperative course was complicated by thyroid dysfunction. Eighteen months later she complained of anorexia, weight loss, and fatigue; and she mentioned a pressing epigastric sensation. On palpation, the epigastric area was tender. Abdominal radiography unexpectedly revealed the presence of a gossypiboma in the right hypochondrium. Some time later, regurgitation and bile vomiting occurred, and the gossypiboma had become palpable at the original cholecystectomy scar. Esophagogastroscopy revealed a narrow gastric outlet due to exogenous compression. Ultrasonography offered a more precise image of the gossypiboma: a circa 8 cm large, not well circumscribed mass. At reexploration, the gossypiboma could be found only with great difficulty at the inferolateral border of the liver. It was surrounded by a tight fibrous capsule and contained two small partially digested gauzes, which were removed. Because of enormous adhesions, the abdomen was not further explored. Progressive cachexia developed during the postoperative course, and 6 weeks after reintervention she suddenly became hypotensive, developed multiple organ failure, and expired.

Case 2

A 59-year-old man presented in May 1995 with fever, weight loss, and abdominal pain and tenderness localized in the right hypochondrium. In 1991 surgical correction of a cicatricial hernia had been performed (following laparotomy for traumatic liver rupture 3 years previously). Suspicion of cholecystitis was not investigated, so cholecystectomy not performed because of too dense adhesions. At the time of presentation 4 years a mass could be palpated. Both abdominal radiography (Fig. 1) and ultrasonography showed an atypical configuration in the right subcostal area. During endoscopy and endoscopic retrograde cholangiopancreatography (ERCP) a gossypiboma, perforating and ulcerating into the proximal duodenum, was visualized. Computed tomography (CT) (Fig. 2) demonstrated a firmly encapsulated mass containing air,

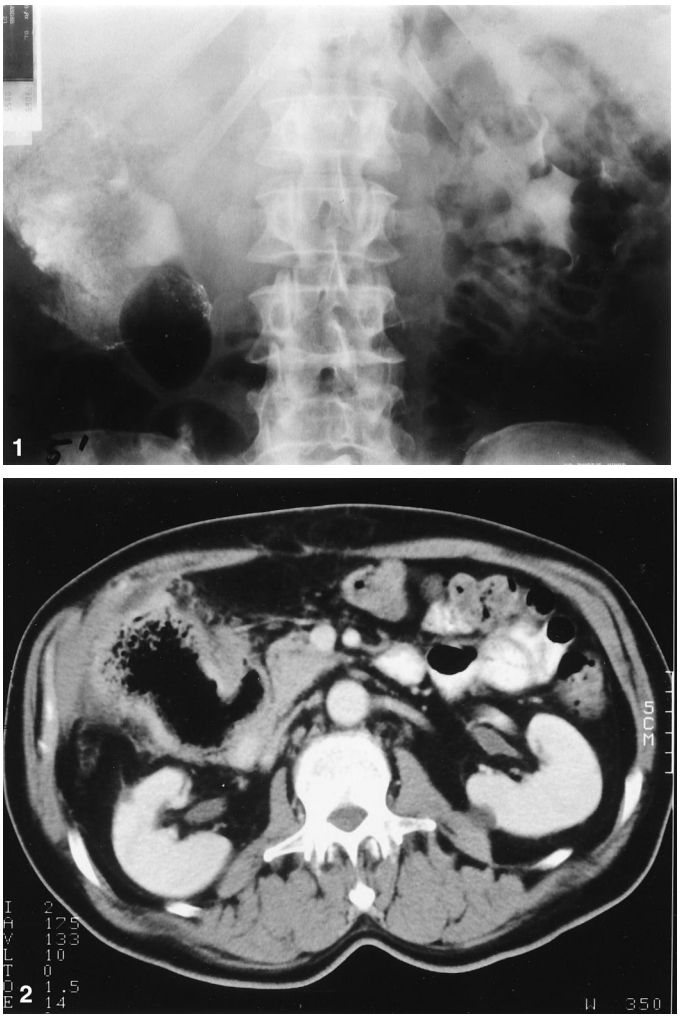

Fig. 1. Abdominal radiograph (case 2) reveals an atypical configuration localized in the right hypochondrium.

Fig. 2. Computed tomography of the abdomen (case 2) demonstrates an air-containing mass with a thick wall, localized in the right hypochondrium. A connection between the mass and the gut is suspected.

with connections into the gastrointestinal system. With colon radiography studies and colonoscopy, a second perforation of the gossypiboma into the colon was disclosed at the level of its liver flexure. An extended Billroth II procedure was performed, together with partial colectomy and cholecystectomy. An uncomplicated postoperative course allowed the patient to leave the hospital a few weeks later.

Case 3

A 54-year-old man underwent laparotomy for a high intestinal obstruction. Fourteen months earlier he had undergone a highly selective vagotomy for persistent bulbar ulcus. Air-fluid levels were present on plain abdominal radiography. At operation firm adhesions constricting the proximal jejunum were found in connection to a gossypiboma. A short segment of small bowel, together with the gauze, was resected. The postoperative course has remained uneventful.

Fig. 3. The forgotten sponge is easily recognized on a plain abdominal radiograph (case 4).

Case 4

Radical hysterectomy and adnexectomy followed by multiple courses of chemotherapy were needed in the therapy for recurrent ovarian cancer in a 31-year-old patient. Several months later, a second laparotomy was undertaken because of a bulky recurrence. This procedure was laborious and hemorrhagic, and it took nearly 10 hours. About 5 liters of blood were lost. At the end of the operation, two sponges were reported lacking, but immediate radioscopy failed to demonstrate them. Postoperative abdominal radiography (Fig. 3), however, revealed a sharply marked, folded foreign body in the left subcostal space. At reintervention 4 weeks later, one large encapsulated gauze was found in the left paracolic region. The peritoneal cavity was thoroughly inspected and cleaned. The patient recovered but eventually died 7 months later of progressive disease.

Case 5

A 45-year-old woman in January 1978 underwent radical hysterectomy for uterine myomatosis. During the evening following the intervention, she developed septic shock with fever, hypotension,

renal insufficiency, and peritonitis. Plain abdominal radiography revealed a large collection of air in the left subcostal area, for which she was reoperated on 2 weeks later. Immediately after incision a gossypiboma together with purulent fluid was disclosed and removed. Twenty-four days later the patient died of respiratory insufficiency.

Discussion

Epidemiology

Forgotten intraperitoneal foreign bodies have rarely been reported. Data concerning the incidence of gossypiboma tend to fluctuate because of a low reporting rate; its occurrence varies between 1/100 and 1/5000 laparotomies [1, 9–11]. Few authors have reported series that include five or more patients [1, 3, 6, 8, 10–16], although large historical series exist (Schachnem reported 155 cases; Forgues had 165 cases; and Crossen had 307 cases) [8].

In some cases, two or more sponges are lost [3, 13, 17–20]. Circumstances reported to explain operative loss of sponges are emergencies (when initial counts are often hurried or omitted), hemorrhagic procedures, time-consuming operations, sponge counting while closing, change in operating theater personnel, operations in anatomic regions difficult to reach [1, 9, 19].

Several reports of gossypiboma concern patients initially operated on in other departments [1]. Initial procedures (Table 1) mainly consist of operations in the lower pelvis [11] and form in combination with operations on the gastrointestinal tract 75% of all reported gossypibomas (digestive surgery 52%, gynaecology 22%) [8, 13]. Striking is the high incidence after appendectomies and cholecystectomies and after gynecologic operations, in contrast to other interventions in the lesser pelvis, such as procedures on the rectosigmoid. The portion of urologic and vascular interventions is less substantial (10% each) [3, 8].

Initial procedures in our series consisted of abdominal hysterectomy in two patients, cholecystectomy and supraselective vagotomy in two other patients, and laparotomy for liver rupture in the last patient. Fifty percent of gossypibomas are discovered 5 years or more after surgery, and forty percent are detected within the first year [19].

Table 1. Gossypibomas in relation to type of operation.

Type of operation	Number of cases
Intraabdominal gossypibomas	
General surgery	74
Esophagus	1
Stomach [1, 12, 14, 16, 17, 19, 21–26]	14
Hepatobiliary (cholecystectomy) [1, 10–12, 14–16, 18, 19, 22, 27–34]	31
Pancreas [16, 35]	2
Small bowel [36]	1
Appendix [1, 11, 13, 21, 37–39]	8
Large bowel [1, 16, 19, 32, 40]	6
Rectum [1, 15, 16, 23, 41]	5
Explorative laparotomy [13, 42, 43]	4
Hernia repair	8
Umbilical hernia [1]	
Eventration [11, 16, 31]	
Inguinal hernia [11, 14, 44, 45]	
Splenectomy [15, 29]	2
Miscellaneous [1, 12]	2
Gynecology	23
Hysterectomy (with or without ovariectomy) [1, 9, 10, 12–14, 22, 46–49]	12
Salpingectomy/ovariectomy [1, 11, 13, 14, 22, 29]	6
Cesarean section [11, 16, 35, 48, 50]	6
Miscellaneous [1]	1
Vascular surgery [1, 29]	2
Urology	15
Kidney [1, 15, 24, 35, 51–54]	9
Ureter [5, 15]	2
Urinary bladder [40, 55, 56]	3
Ectopic testicle [11]	1
Prostate [57]	1
Unknown [31]	1
Multiple operations [1, 10, 14, 35, 49, 58–60]	12
Extraabdominal gossypibomas	
Thoracic surgery	
Pulmonary (63–65) [24, 61–63]	4
Cardiac (39, 66–69) [35, 64–67]	5
Endocrine surgery [68]	1
Breast surgery [10, 69]	2
Orthopedics [31, 70–73]	5
Neurosurgery [16, 74–80]	11
Otorhinolaryngology/maxillofacial surgery [10, 31, 81, 82]	4

Pathophysiology

The fate and the symptomatology of intraperitoneal retained sponges fully depend on the type of foreign body reaction [1, 11]. A first possible reaction is an exudative response, usually early during the postoperative course. The human body attempts to extrude the foreign material either externally or into a hollow viscus, creating various fistulizations. Bacterial infection with anaerobes may be induced.

On the other hand, an aseptic fibrinous response may take place, creating adhesions and encapsulation. In these cases, the gossypiboma can present as a space-occupying lesion (with resultant signs and symptoms of either an occlusion or a pseudotumoral process). It can also slowly become extruded through a hollow viscus. Indeed, the gossypiboma can penetrate through the wall of the gastrointestinal or urogenital tract by local pressure necrosis [1, 11, 13, 14, 27, 45]. Spontaneous evacuation of the foreign body per anus or per urethra has thus been described [13, 27, 45].

Clinical Diagnosis

Presenting symptoms usually consist of an abdominal palpable mass, pain, nausea and vomiting, rectal bleeding, or diarrhea; and general symptoms such as fever and weight loss may prevail. Coughing and dyspnea, as well as dysuria, may be the result of exogenous compression on the respiratory or urinary tract.

In several cases the gossypiboma has remained "silent," leading to an independent life in its host's body [1, 6]. It may be discovered by accident during a radiography examination or a new surgical procedure, most frequently performed by a different surgeon than the one who did the first operation. Moreover, when the latter surgeon does not recognize the textile foreign body, he or she is at high risk of being called the responsible one.

Clinical symptomatology leading to the diagnosis of gossypiboma is quite different in each of our five presented cases. In one patient the possibility of a gossypiboma was already considered at the end of the operation because of a lack of "two" sponges. Although immediate radioscopy failed to demonstrate them, post-

operative abdominal radiography was conclusive. Another patient immediately suffered postoperative septic shock. Abdominal radiography had already shown atypical findings, and a gossypiboma was diagnosed a few days later at laparotomy. The three other patients had a longer interval between the initial operation and detection of the gossypiboma: 14 months in the patient with high gastrointestinal obstruction, 18 months in the patient with vague epigastric discomfort, and 7 years in the patient with a pseudotumoral syndrome.

Technical Investigations

Medical imaging plays a major role in making a correct diagnosis. On ultrasonography the gossypiboma can be recognized as (1) an echogenic area with a strong posterior shadow as a consequence of the multiple fluid–cotton interfaces [21, 28]; (2) a well defined, cystic mass containing echogenic foci and wavy, striped infolded structures, representing the foreign body; or (3) a nonspecific hyperechoic mass [5]. Ultrasonography defines the solid or liquid nature of the mass and its volume (in case of a pseudotumoral syndrome) [11]; in addition, it offers the opportunity to observe the foreign body in three dimensions. Ultrasonography becomes less reliable in the presence of abundant abdominal fat or gas.

Conventional plain abdominal radiographs theoretically should be able to detect gossypibomas because of their radiopaque markers. However, the use of textiles provided with these markers is not generalized [6]; and even when such markers are applied, one can easily overlook them, as they may become distorted by becoming folded or twisted; they can even disintegrate over a period of time. In addition, it is possible that they project over a bony structure. On the other hand, surgical clips can mimic the pattern of radiopaque markers [6]. Classical radiographs are often certified to be normal or only indirect signs of a gossypiboma are mentioned, such as "a mass," "an opacification," displacement of the gastrointestinal tract, or calcifications [11]. A mass is recognized only if the gossypiboma is large enough. A "sponge-like appearance" sometimes is noted because of entrapped gas or barium between the textile fibers. When a sinus tract is present, fistulography with water-soluble contrast medium can fill the fiber meshwork of the gauze [10]. Contrast studies may be helpful for occlusive forms.

Computed tomography (CT) of the abdomen demonstrates the same well defined mass, usually with a thick, enhanced wall and internal heterogeneous densities [22, 23, 28, 29] representing the various contents of a gossypiboma: the textile foreign body, granuloma formation, and pus. Mottled calcifications and gas bubbles can be present in longer-existing gossypibomas. The occurrence of gas bubbles does not correlate with complications such as intestinal perforation or abscess formation [6]. When CT scans are performed on sponges placed in a waterbath (in vitro studies), gas bubbles appear within 1 hour; and their presence remains constant after several months [6]. The CT image is less characteristic and provides a poorly constant image compared with ultrasonography. The low density signal depends on the material used and the possible association with an abscess.

During the last few years some reports were published concerning magnetic resonance imaging (MRI) of gossypibomas. They can be described as well defined masses, eventually showing thick walls, which signal a low intensity on T1-weighted images and high signal intensity on T2-weighted images. In the latter case, low signal intensity structures with "wavy, striped and/or mottled appearances" within these mass lesions may be discovered [24]. A possible evaluation of the abdominal cavity in three dimensions forms another advantage over the use of CT scans.

One gossypiboma was indirectly recognized with skeletal scintigraphy [20]. Gossypibomas may also be detected by endoscopy (esophagogastroscopy, ERCP, and colonoscopy) when signs of obstruction are present or when they penetrate the bowel lumen.

Abdominal radiography clearly demonstrated the gossypiboma in one of our patients and showed atypical configurations in three others. Ultrasonography was performed in only two instances and offered a more precise image of the forgotten surgical sponges, consisting of a hyperreflective mass with a hypoechoic rim. In these late-presenting cases, esophagogastroscopy uncovered exogenous compression on the stomach (case 1) or penetration of the duodenum (case 2). CT of the abdomen, colonoscopy, and colonic radiography studies disclosed the large bowel fistulization in case 2.

Differential Diagnosis

A correct preoperative diagnosis is made in about one-third of cases [8]. Depending on the form of presentation (septic, occlusive, space-occupying form) a differential diagnosis is proposed. Tumor or tumor recurrence, postoperative adhesions, invagination, and intraabdominal abscesses are the most cited tentative diagnoses.

On abdominal ultrasonography differentiation should be made with abdominal abscesses (which have no internal heterogenous densities but, instead, air-fluid levels), calcified lesions, and intestinal gas. On CT scans the differential diagnosis should also include an abdominal abscess, fecaloma, volvulus, necrotized tumor, and hematoma. One must keep in mind that gossypibomas and abscesses can occur at the same time.

Treatment

Altogether, even based on history, physical examination, laboratory, and radiographic findings, gossypibomas often are not suspected and remain an accidental peroperative or postoperative finding [10]. Often the presumptive diagnosis is that of a tumor. Failure to make a correct preoperative diagnosis frequently leads to an unnecessary aggressive surgical approach [10].

Treatment consists of thorough surgical exploration of the abdomen, removal of the gossypiboma, drainage of purulent fluid, and treatment of the accompanying lesions such as fistulizations [1, 11, 83]. Recently, the use of radiology (ultrasonography and CT scans) and minimally invasive surgery (laparoscopy) has been reported for removal of superficially located gassypibomas [5, 46].

In our patients therapy uniformly consisted of reintervention. It proved extremely difficult in three patients owing to dense adhesions and encapsulation. In the other two patients the textile foreign body was not yet encapsulated and could easily be removed.

Morbidity and Mortality

A seldomly reported but possible complication of a gossypiboma is development of an angiosarcoma [30, 84]. Late abscess formation, chronic fistulas, and erosion into blood vessels are also

possible. Gossypiboma-associated mortality is as high as 11% to 35% [1], stressing the need to prevent this often lethal complication. When the foreign body is diagnosed and removed during the immediate postoperative period, morbidity and mortality are low; however, in the presence of an important time delay, major surgical interventions are needed with consequent high complication and mortality rates [8].

Three patients did not survive in our series, one because of progressive disease (case 4) but two probably as a result of the presence of the gossypiboma (cases 1 and 5).

Prevention

The use of radiopaque markers implies the question whether routinely postoperative plain films should be obtained [11]. They are not advocated [83]; instead, a correct surgical attitude and handling of textiles (and other surgical requisites) is highly advisable [11]. This is the responsibility not only of the surgeon but of the assistant(s) and operating theater nurses as well.

Counting sponges at the beginning of the operation, at closure of the peritoneum, and after wound dressing forms part of this attitude (in about 90% of cases the sponge count was exact) [8]. Small sponges should not be used during laparotomy. Compresses should be used only intraperitoneally, one by one, mounted on a forceps. Before closing the peritoneum, the surgeon should explore the complete abdominal cavity; sponges should not be used to facilitate closure. In trauma situations, a plain abdominal radiograph should be obtained before closure [18, 83].

"A Sponge Is Missing . . . " Versus "A Sponge Is Found . . . "

As gossypibomas carry an important medicolegal aspect, every surgeon should know how to cope with the following ethical questions: Should he or she inform the patient? His colleagues? Should an asymptomatic gossypiboma be treated?

When at the end of a surgical intervention the sponge count is incorrect, every effort must be made to find a missing sponge before the patient leaves the operating theater. This includes the use of immediate postoperative radiography and immediate reoperation. Hemodynamically unstable patients (case 4) should be allowed to recover, but without doubt a reintervention must be planned.

In several cases, the gossypiboma remains silent and is an accidental finding in asymptomatic or symptomatic patients [1, 6]. Especially in asymptomatic cases, patients should be informed completely to motivate them to a reoperation: a wait-and-see policy might be life-threatening. Symptomatic patients with a preoperative or peroperative diagnosis of gossypiboma should obtain all information necessary to understand their current surgical problem.

When a gossypiboma is an accidental peroperative finding, the surgeon should, in our view, maintain the right to inform the patient or remain silent, as did the missed sponge. However, in each of the above-mentioned cases, an effort must be made to contact the surgeon who performed the former intervention.

Conclusions

Although the real incidence of retained surgical sponges is unknown, they are not rare. The initial operation during which the gauze is left behind is usually abdominal and often gynecologic in origin. A gossypiboma is potentially life-threatening. Therefore extreme care in the handling of gauzes during surgical procedures is highly advisable. The best treatment of this complication is indeed its prevention. Two basic principles must be applied: repeated sponge counts before and after each part of the operative procedure and systematic use of large sponges, one by one. Although the presence of radiopaque markers in all gauzes might give a false feeling of safety, their use is helpful in case of an incomplete sponge count at the end of an operative procedure. For this reason, they are highly recommended.

Résumé

Les corps étrangers oubliés dans l'abdomen sont responsables de la création d'adhérences et ont tendance à s'enkyster ou de provoquer une réponse exsudative, avec ou sans infection bactérienne associée. Souvent, ces corps étrangers s'isolent d'eux-mêmes. Ceci est vrai aussi pour les compresses « oubliées » appelées « textillomes ». Le plus souvent le patient se présente soit avec un tableau de pseudotumeur, en occlusion ou en sepsis; parfois au contraire, le patient reste asymptomatique pendant plusieurs dizaines d'années. L'échographie et la radiologie (surtout la tomodensitométrie) contribuent beaucoup à la détection de ces « textillomes », alors que la résonance magnétique est moins utilisée. La détection par un cliché d'abdomen sans préparation est difficile. L'échographie peut montrer une masse hyper-échogène, avec des bords hypoéchogènes et une ombre postérieure importante. La tomodensitométrie peut montrer une masse bien définie avec des densités hétérogènes internes. Le traitement consiste en l'ablation chirurgicale des corps étrangers, et de traiter aussi les complications en rapport avec le corps étranger. En comparant cette série personnelle de cinq cas à la littérature existante, on revoit l'évolution des corps étrangers oubliés dans l'abdomen.

Resumen

Los cuerpos extraños olvidados en la cavidad peritoneal evolucionan hacia la creación de adherencias con su subsiguiente encapsulación o bien, producen una respuesta exudativa con o sin infección bacteriana concomitante. Con relativa frecuencia, se produce un proceso de autoexpulsión, esto ocurre especialmente en casos de torundas olvidadas en cavidad abdominal (gossypibomas = "torundomas"). La clínica de los "torundomas" puede semejar a la de un pseudotumor que evolución con un sindrome oclusivo o séptico. Sin embargo, algunos casos permanecen asintomático durante décadas. La ecografía y la radiografía, especialmente la TAC, facilitan el diagnóstico de estos pseudotumores. El valor diagnóstico de la resonancia magnética se desconoce por su escasa utilización. La radiografía simple no tiene valor diagnóstico. En la ecografía se observa una masa hiperreflectora con bordes hipoecográficos, que muestran una densa sombra posterior. En la TAC se observa una masa de contornos bien definidos, en cuyo interior aparecen densidades heterogéneas. El tratamiento consiste en extraer el cuerpo extraño y en realizar la terapia oportuna de las complicaciones que hubiese. Con motivo de la presentación de cincos nuevos casos, se revisan los existentes en la literatura, así como el devenir de los cuerpos extraños olvidados en cavidad peritoneal.

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