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Gossypiboma: A Surgeon's Nightmare: A Systematic Review and Case Report

Vinay H.G[1], Naveen N[2], Ramprashanth MP[3], Safeera MD[4]

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Abstract

Objective: To assess the trends in Gossypiboma over 1975-2023 and the impact on the career of a surgeon.

Background: Gossypibomas are the most feared and undesired complication of surgery. Despite numerous guidelines, they still exist in our modern society. Here, we examine worldwide data along with a case report.

Patient: A 46-year-old diabetic anaemic female with a 6-month earlier history of operative management for cancer of the cervix (stage IA2) presented with features suggesting acute intestinal obstruction. She was managed by emergency laparotomy and removal of the retained foreign body.

Methods: A literature search was performed on PubMed for gossypiboma and was limited to case reports from 1975-2023. Analysis using Excel and Python.

Results: In a study of 289 total gossypiboma cases, analysis revealed that Asia had the highest incidence (53.53%, n=269), and the most common symptom was pain (36.5%, n=287). Additionally, age and time of discovery exhibited an upward trend, with thoracic cases taking the longest to discover.

Conclusion: Surgeon accountability for unintentional mistakes, akin to random errors, sparks debate. Gossypibomas emphasize the need to follow rigorous safety standards and team work endorsed by WHO.

Keywords: Medico-Legal; Surgical Complication; Foreign Body; Female; Emergency Laparotomy; Gauzoma; Textiloma; Surgical Sponge; Middle Aged.

Author Affiliation: [1,2]General Surgery, [3,4]MBBS, Department of General of Surgery, Vamshodaya Hospital, Kolar 563101, Karnataka, India.

Corresponding Author: Vinay H.G, General Surgery, Department of General of Surgery, Vamshodaya Hospital, Kolar 563101, Karnataka, India.

Email: vinay_1771@yahoo.co.in

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INTRODUCTION

Gossypiboma is a rare surgical complication where the cotton gauze, a foreign body is left in situ, post-operatively. Though gossypiboma is an avoidable complication, the possibility is never zero due to human errors. Over the years, we have witnessed the emergence of innovative surgical

techniques and advancements in medical education and infrastructure. Their influence on its trends is being explored, along with a case report.

MATERIALS AND METHODS

Case Description and Management

A 46-year-old diabetic female presented with intermittent vomiting, abdominal pain, and loose stools for a week. She was previously diagnosed with cervical carcinoma of stage IA2 six months before, for which she underwent an elective radical hysterectomy. The surgery was performed by a team of surgical oncology specialists for three hours. After the surgery, she received two cycles of adjuvant radiotherapy in two months.

On examination, the patient was dehydrated and anaemic. The abdomen was distended, with increased bowel sounds. The clinical features were suggestive of acute intestinal obstruction. Contrast enhanced computed tomography (CECT) of the abdomen revealed a linear hyper attenuating string like structure in the distal bowel loop (suggesting a retained foreign body).

The patient was immediately evaluated preoperatively and taken up for emergency laparotomy under general anaesthesia. Through a midline laparotomy, the abdomen was opened and revealed dense inter-bowel adhesions with cocooning of the bowel, inflamed and thickened gall bladder wall with omental adhesions and inter-bowel fistula involving the proximal ileum. A C-arm X-ray of the suspected part of the bowel was done to localize the retained foreign body (RFB). A retained surgical cotton (Video 1) of size 20 cm by 20 cm was removed through the ileal lumen via enterotomy. The ileal fistula was dismantled, and the fistulous opening was closed. Adhesiolysis and peritoneal lavage were done before the closure of the abdomen. A part of the peritoneum was sent for histopathology and reported to be a chronic inflammatory reaction with the presence of lymphocytes, plasma cells, macrophages, and a few areas of proliferating blood vessels. The patient had an uneventful post-operative recovery having been placed on appropriate antibiotics, analgesics, and intravenous fluids. On day 8, the patient was discharged with oral antibiotics, analgesics, and protein supplements for a month.

Search Strategy

A literature search was performed on PubMed advanced search for the terms "gossypiboma", "retained surgical sponge", "retained surgical towel", "cottonoid", or "gauzoma". The articles were limited to case reports from January 1975 to August 2023. They were also screened for relevance and completeness of the data.

Exclusions

1. Retained surgical foreign bodies other than cotton gauzes like metallic stents, pessaries, and others were excluded from analysis.
2. Case reports with more incomplete than complete data.
3. In accessible case reports where the abstract was insufficient.
4. Case reports with no Digital Object Identifier (DOI) or with incomplete abstract.
5. Case reports with animal subjects.
6. Sponges expelled out naturally or left in situ on purpose.

Description of Obtained Data:

The total search results were 493, obtained from the PubMed Advanced Search in CSV format. They were converted to 3 JSON files, with each having a maximum of 200 case reports. The abstract of each of these case reports was analysed under the following headings:

1. Age of the Patient
2. Sex of the Patient
3. Clinical Features
4. Time taken to discover the foreign body
5. PMID (as a source of identification and prevention of duplicates)
6. Affiliation (to rule out animal-related case reports)
7. Place of Origin
8. Continent (for gross demographic data)

The case reports were excluded based on the criteria described earlier. The final published articles of non-open access case reports with insufficient abstracts (a total of 165) were manually analysed to obtain the data. Exclusion criteria were once again applied to this data and were compiled with the former data.

Results Compilation

The final data was then merged and exported to an Excel spreadsheet. A total of 289 case reports were included in the study. The rest of the 203 case reports were excluded. Among the selected 289, few were

selectively excluded due to the incompleteness of data required for specific analysis (PMIDs excluded are mentioned in the master data sheet).

RESULTS

Among the 289 cases, the average age of the reported cases of gossypiboma was 47.78 years (range of 1.92 – 92, SD=18.13). The most recorded age was 30 years.

Gossypibomas were commonly seen in females with a preponderance of 66.91% of 269 cases. The most common symptom was pain (n=287, 36.5%).

Results revealed Asia to be the largest reporter of gossypiboma cases (n=269, 53.53%), and more specifically from the year 2005 to 2015 (n=177, 46.32%). The next larger reports were from North America and Europe. (Fig. 1 & 2)

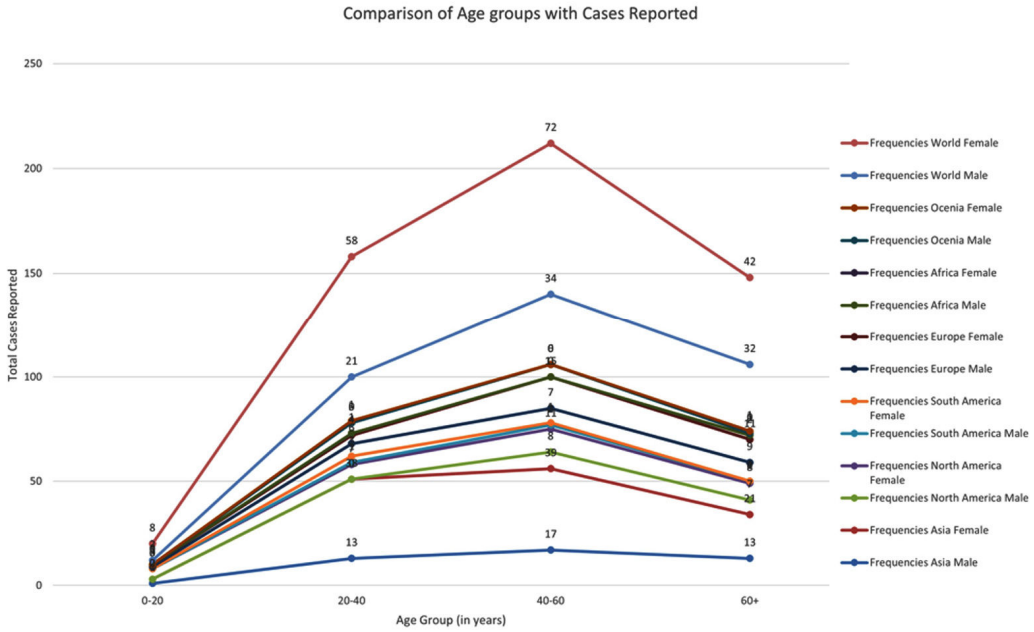


Fig. 1: Comparison of age groupvs. cases reported

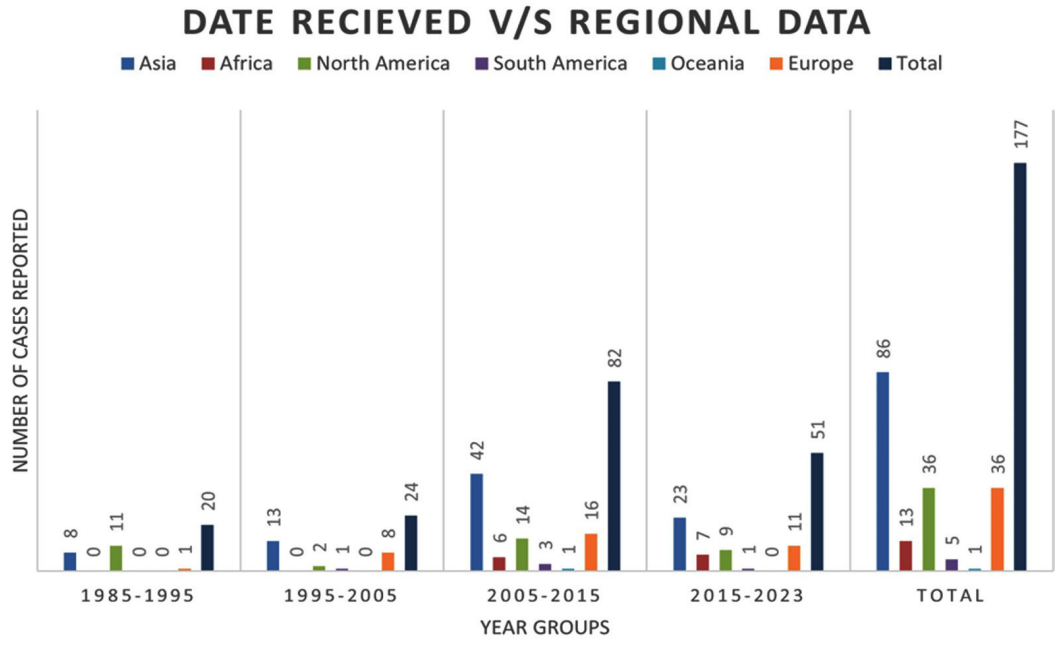


Fig. 2: Date received vs. regional data

The largest number of cases were among the age group of 40 to 60 years with 34 males and 72 females. A fall in cases was seen past the age group of 60 years.

With an increase in age, the time required to discover the foreign body was longer. (Fig 3) The average time was 7.45 years (ranging from a few days post-op to 52 years, SD=10.72). Most cases were discovered within 2 years (both mode and median). Thorax had the longest time required to discover the foreign body.(Fig. 4)

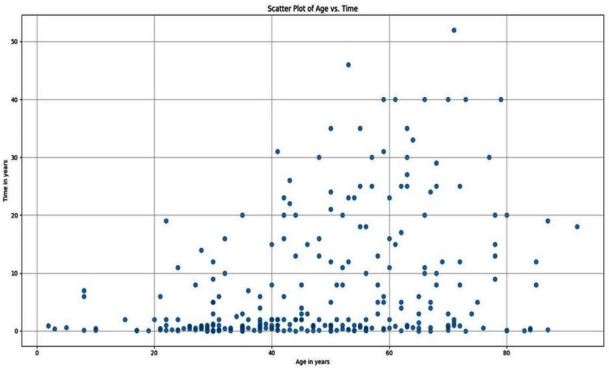


Fig. 3: Scatter Plot of Age vs. Time

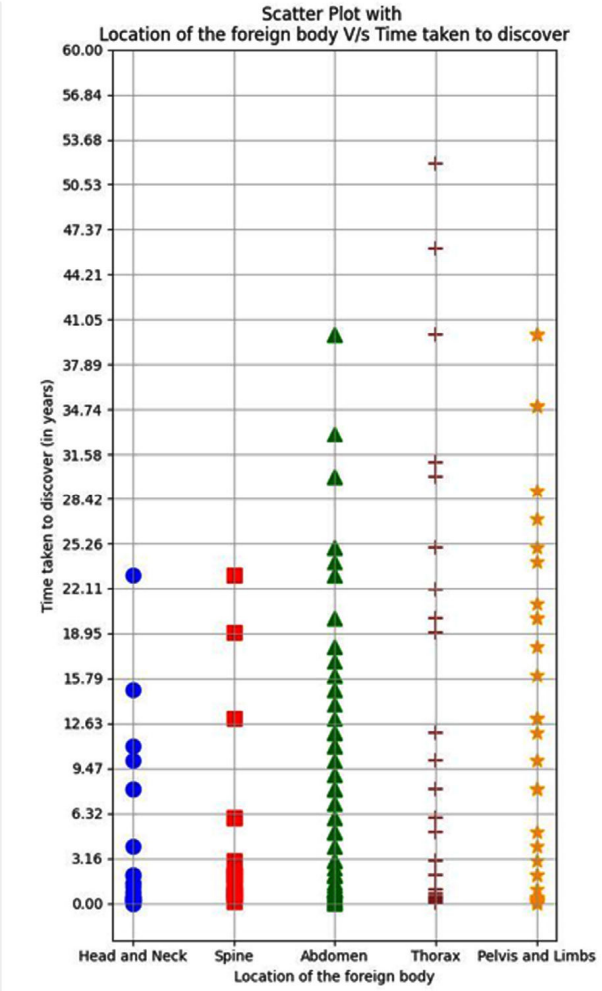


Fig. 4: Location vs. time taken to discover

The abdomen was the most common location for the retention of the foreign body (n=258, 52.32%) and the spine was the least (n=258, 6.18%). All the locations were more common in females except in the thorax where male predominance was seen, slightly.(Fig. 5)

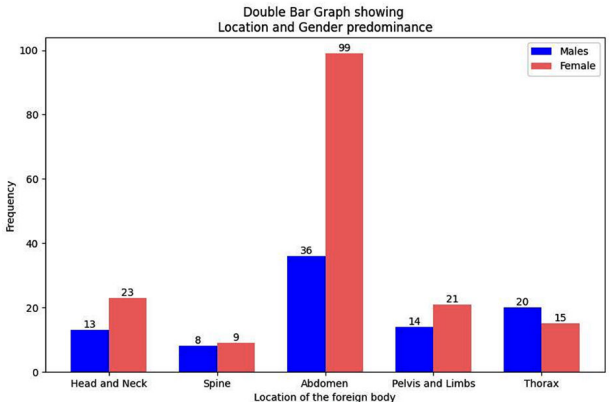


Fig. 5: Double Bar Graph

DISCUSSION

Gossypiboma was first reported in 1884 by Wilson and is derived from the Latin words "Gossypium" meaning "Cotton" and "Boma" meaning "Concealment".[1] The incidence of RFB is 0.001%–0.01%, out of which 80% is by Gossypiboma (a surgical sponge). They are more often seen in gynaecological surgeries (41.2%) than in abdominal surgeries (35.7%).[2]

The Risk Factors Include[3,4]

1. Emergency procedures with heavy blood loss.
2. Change of scrub nurse.
3. Complex surgical procedures.
4. Surgeries with entry into multiple body cavities.
5. Unexpected change in the course of surgery.
6. Long duration of surgeries, and
7. Obese patients.

The Pathogenesis is Due to:[5]

1. An exudative inflammatory response.
2. A milder fibrinous response by the RFB.

The exudate response is seen in patients with higher antigenic responses towards the RFB, where an abscess is formed around the RFB initially. As the pressure increases, the abscess ruptures towards the intestinal wall. This further leads to a

Table 1: Age Group (in years) with sex predominance

Age Group (in years)	Frequencies													
	Asia		North America		South America		Europe		Africa		Oceania		World	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
0-20	1	2	0	5	0	0	1	1	0	0	0	0	2	8
20-40	13	38	0	7	1	3	6	4	1	5	0	1	21	58
40-60	17	39	8	11	2	1	7	15	0	6	0	0	34	72
60+	13	21	7	8	1	0	9	11	2	1	0	1	32	42
Total	44	100	15	31	4	4	23	31	3	12	0	2	89	180
Grand Total	144		46		8		54		15		2		269	

Table 2: Demographic Data V/s Year of Reporting

Year Group	Asia	Africa	North America	South America	Oceania	Europe	Total
1975-1985	0	0	0	0	0	0	0
1985-1995	8	0	11	0	0	1	20
1995-2005	13	0	2	1	0	8	24
2005-2015	42	6	14	3	1	16	82
2015-2023	23	7	9	1	0	11	51
Total	86	13	36	5	1	36	177

Table 3: Clinical Features seen in males and females

Clinical Features	Number of cases		Total	Percentage
	Males	Females		
Pain	33	72	105	36.58537
Palpable mass	20	27	47	16.37631
Asymptomatic	9	14	23	8.013937
Fever	4	14	18	6.271777
Vomiting	5	11	16	5.574913
Respiratory-related	1	14	15	5.226481
Features of obstruction	1	6	7	2.439024
Lump	0	6	6	2.090592
Abdominal distention	0	4	4	1.393728

fistula and eventually pushes the sponge partially into the intestine. In addition, peristaltic waves can also cause the sponge to be drawn completely into the lumen of the intestine. Once inside the lumen, it may pass out unnoticed or may lead to obstruction, if lodged in the narrowest part. In the latter fibrinous response, RFB gets encapsulated forming a calcified mass. Migration of the RFB in fibrinous response is rarely seen here.

Our patient had undergone radical abdominal hysterectomy, a surgical procedure renowned for a long duration of operation (106.7 ± 36.2 min) and high blood loss (219.6 ± 149.3 mL).[6] Though the two risk factors were present, this operative procedure was planned and performed by a team of qualified surgeons. Hence, the case described is unfortunately due to a human error.

Radiological imaging is crucial in the diagnosis of Gossypiboma. Due to variable characteristics, they are more often misinterpreted to be hematomas, granulomatous lesions, or neoplastic proliferation. The usage of surgical sponges with radiopaque markers (in the initial stages) plays a crucial role in aiding the detection of gossypiboma in X-rays and Computed Tomography (CT). They can also be used intraoperatively to detect RFB when there is a discrepancy in the count of materials in the operating room. The most characteristic feature in CT scans includes mottled, bubbly gas shadows and spongiform patterns. Gossypiboma

in ultrasonogram (USG) is seen as a whorl like characteristic pattern with hyper reflective echo and a hypoechoic rim with posterior acoustic shadowing.[7]

Gossypibomas are managed by an urgent removal of the RFB through an open approach. However, minimally invasive techniques can also be tried based on the location and size of the RFB. The endoscopic management of RFB is not recommended in suspected transmural migration of RFB.[8]

Gossypibomas not only affect the patient's post-operative healing but also significantly impact the career of the surgeon who caused the retention of the foreign body in the patient. Depending on the country, gossypibomas are considered a case of negligence or criminal offence, with the case being dealt with similarly to assault or personal injury. In India, the surgeon will be prosecuted under Section 304A of the IPC which is punishable by up to 2 years of imprisonment.[9]

Gossypibomas can be Prevented by Incorporating a Multidisciplinary Approach, which Includes:[10]

1. Standardizing counting procedure as recommended by the American Society of Registered Nurses: ensuring a correct sponge count and other materials are made at the start of the operation, at the time of addition of new items, before the closure of the cavity, and finally at the end of the closure of the incision on the skin.
2. Following and meticulously implementing the checklist by the World Health Organisation (WHO) for simple and effective surgical safety.
3. Improving communication among surgeons, nurses, and technicians in the operating room, there by increasing awareness of the location and number of surgical sponges used.
4. The incorporation of technologies like radio frequency identification (RFID) tagging and barcode scanning of surgical sponges can reduce the risk of RFB.

Limitations

1. Not all gossypibomas found are documented as case reports. Hence the data obtained may be lower than real-life data.
2. Only PubMed was used to search and obtain data. PubMed has the highest records and the others did not offer downloading of search results (or an API) for further elimination of duplicates and processing of abstracts.
3. The entire search data was not included. Some case reports with credible data would be missed as they did not have the complete data or DOI or were digitally inaccessible.
4. Some of the older case reports did not have a received date and were thus modified to include the publication date instead.

CONCLUSION

None of the surgeons would intentionally leave a foreign body in situ while operating. Ultimately, it is due to a human error, but the question still lies about the "human" part. Whether a surgeon should take full responsibility and face consequences that would negatively impact their career is a subject of discussion.

Similar to how statisticians compensate for random errors, should similar lenience be granted to a surgeon for bad luck? Being a human (and not a machine) makes us prone to commit mistakes. Whether a surgeon should be punished for unintentional mistakes must be debated at a higher level.

No matter the cause, gossypibomas undoubtedly cause significant mortality and morbidity in the world. The most effective defence against this unavoidable surgical complication is safe work culture, transparent communication, collaborative teamwork, and adhering rigorously to safety standards set forth by the World Health Organization (WHO).

Declaration of Statements:

Financial Support: Nil

Conflicts of Interest: There are no conflicts of interest among authors.

Ethical Committee Clearance: Not applicable

No animal subjects were a part of this study.

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