ABSTRACT Background: Foreign bodies forgotten or missed in abdomen include cotton sponges, artery forceps or other instruments, pieces of broken instruments or irrigation sets and rarely tubes. The presence of retained surgical blade as the foreign body is uncommon and significant patient safety challenge. Most common etiologies for the presence of such foreign bodies are accidental, traumatic or iatrogenic. The most common surgically retained foreign body is the laparotomy sponge. We report the management of a case with a rare foreign body in the abdomen i.e. surgical blade and repair of the congenital diaphragmatic hernia. Case summary: A 38 year-old-female reported to us with X-ray lumbosacral spine showing the radio-opaque object in the abdomen. We further investigated the patient and CT scan abdomen revealed a metallic foreign body in the left hypochondrium just beneath the left lobe of the liver. It was seen near the transverse colon gut loops, and there was left Diaphragmatic Eventration a hernia with herniation of stomach, large bowel loop and omental fat into left hemithorax. Conclusion: Traditionally, diaphragmatic hernia was repaired by laparotomy, and foreign body was removed after exact localisation on C-arm.

KEYWORDS: Foreign body (FB), Diaphragmatic hernia, Laparotomy, Retained surgical sponge

Introduction

Error in medicine is common and may cause harm [1]. However, isolating the factors underlying specific types of errors has proved to be a formidable task. The types of errors that occur widely because of extreme complexity and heterogeneity of the tasks involved in medical care. Forgotten or missed foreign bodies, such as cotton sponges, gauze or instruments, after any surgical procedures are considered a misadventure and are associated with several legal problems. Foreign bodies can be opaque or non-opaque. These can be ingested, inserted into body cavities and can be the result of penetrating trauma or iatrogenic injury. Most common etiologies for the presence of such foreign bodies are accidental, traumatic-intentional or iatrogenic [2]. The retention of sponges and instruments considered by many to be avoidable and when it occurs, it can attract wide critical press coverage [3, 4, 5]. These errors occur. Although the incidence has not been determined, estimates suggest that such errors occur in 1 of every 1000-1500 intra-abdominal operations [6,7]. The incidence of retained surgical foreign bodies after abdominal op-
As per history of a patient she was taken up for laparoscopic AP and lateral view. To his surprise, on X-ray, a radio-opaque shadow was seen, and the patient was referred to us. The patient had an interesting history of Cholecystectomy 5 years back. According to her she developed dyspnoea on insertion of trocars and CO2 insufflation, followed by swollen chest wall, neck and face and crackling sounds were present underneath skin i.e. surgical emphysema. The patient was conscious during the surgery, obesity, unexpected intra-operative developments, the lengthiness or lateness of the procedure and urgency of the procedures, once at the beginning and once at the end of a surgical operation is low as it is and likely underreported [8]. These foreign bodies may be detected acutely (i.e., during the immediate post-operative period), produce severe early or intermediate-term postoperative complications, or remain dormant for months or even years postoperatively [6]. So far literature has reported the presence of various blunt and sharp objects like sewing needles, hypodermic needles, acupuncture needles, glass pieces and wooden pieces, retained sponges, and others. Sharp objects can cause injury to pleura, lungs, great vessels, and diaphragm and can migrate into abdominal cavity resulting in injury to visceral organs [2, 9]. Because of widespread use, the surgical sponge is the most commonly encountered foreign body after open abdomen surgery [10]. When not recognised or incorrectly diagnosed retained foreign bodies can lead to significant harm to the patients, including various complications and even mortality [11]. The term “gossypiboma” denotes a mass of cotton retained in the body after any intervention. This term is derived from the Latin gossypium for the “cotton” and Swahili word boma for “a place of concealment”. Data concerning the incidence of gossypiboma tend to fluctuate, and its incidence is difficult to estimate because of a low reporting rate due to medico-legal implications [12]. Since abdomen and pelvis are the most common sites for retained foreign bodies, this review focuses on gastrointestinal complications related to retained surgical sponges, instruments, and other objects [13].

“Risk factors included a change in nursing personnel during surgery, excessive loss of blood, lack of complete count of sponges and instruments, fatigue of the surgical team from the lengthiness or lateness of the procedure and urgency of the surgery, obesity, unexpected intra-operative developments, the involvement of multiple surgical teams, and the performance of more than 1 primary procedure at a time” (McLeod & Bohnen, 2004). The three most important factors identified were: “emergency surgery, unplanned change in the operation, and body mass index” [14]. Instrumentation should be counted for open cavity procedures, once at the beginning and once at the end of a surgical procedure. If a sponge or instrument is unaccounted for in the final count, a radiological examination and manual exploration should be performed [15].

We herein, report the management of a case with an unusual foreign body in abdomen i.e. surgical blade after five years and repair of congenital diaphragmatic hernia by laparotomy.

Case report

A 38-year-old female reported to an orthopaedic surgeon for a backache, and she was advised X-rays for lumbosacral spine: AP and lateral view. To his surprise, on X-ray, a radiopaque shadow was seen, and the patient was referred to us. The patient had an interesting history of Cholecystectomy 5 years back. As per history of a patient she was taken up for laparoscopic cholecystectomy under spinal anaesthesia at some hospital and according to her she developed dyspnoea on insertion of trocars and CO2 insufflation, followed by swollen chest wall, neck and face and crackling sounds were present underneath skin i.e. surgical emphysema. The patient was conscious during the process, and according to her, Trocars were taken out, and the laparoscopic procedure was abandoned. Surgeon anaesthetist gave multiple stab incisions over chest and abdomen. She was shifted to another hospital which was better equipped for the management of dyspnea and surgical emphysema. Where next day open cholecystectomy was done, and she was discharged after five days and stitches were removed after 8-9 days. Postoperative period was unremarkable, and for the last five years, she was symptom-free, as there was no history of dyspnea, dyspepsia or digestive symptoms including intermittent pain, vomiting or dysphagia suggestive of a diaphragmatic hernia. Exactly we also don’t know the sequence of events of retained foreign body i.e. surgical blade. Most likely during the process of multiple stabs either the surgical blade might have slipped from the handle, and it has gone into the abdomen or into the second hospital where open cholecystectomy was done. On retrieval, it was found that one side of the blade was broken. She had no history of trauma or any other pulmonary disease. The patient was further investigated to achieve the diagnosis through a simple chest X-ray and CT scan. In this case, chest X-ray showed a radio-opaque shadow and gas, and organs were seen over the diaphragm, and CT scan abdomen revealed – A metallic foreign body in the left hypochondrium just beneath the left lobe of the liver. It was seen near the transverse colon gut loops and left Diaphragmatic Eventration a hernia – herniation of stomach, large bowel loop and omental fat into left hemithorax. [Figure: 1 & 2] Preoperative evaluation was unremarkable. On admission into the operating room, the patient was monitored with ECG, noninvasive blood pressure and pulse oximetry. Anaesthesia was induced by 4.0mg of midazolam and 5mg of Scoline. Fifty milligrammes of atracurium paralysed muscles. Endotracheal intubation 7.0mm was placed into the trachea to a depth of 20 cm from front teeth. Pure oxygen was used to ventilate the lungs mechanically. Through midline incision starting from epigastrium abdomen was opened. Stomach, omentum, colon and left lobe of liver were gently and cautiously pulled into the abdomen. Left lobe of the liver has to be separated from the diaphragm and brought back to abdomen. The defect was 7 cm x 5 cm in the left diaphragm. Then we used c-arm for exact localisation of a foreign body. To our surprise, the surgical blade was completely entrapped in the omentum which was retrieved. [Figure 3 & 4]

A diaphragmatic hernia was repaired with 1.0 Prolene interrupted sutures. The repair defect was buttressed by a polypropylene mesh which was secured with 2.0 prolene thread. A chest drain was inserted into the left thoracic cavity at the end of the procedure. Minimal intraoperative bleeding occurred, and the total duration was about 70 minutes. The nasogastric tube was removed the day after surgery. The chest drain was removed and eating was resumed on 2nd postoperative. A chest radiograph showed that lung was expanded. The patient was discharged 4th day after surgery. [Figure 5, 6 &7]

Discussion

Retained foreign bodies locations can be anywhere in the tracheobronchial tree, gastrointestinal tract, pleural cavity, peritoneal cavity, and in various other locations have been subject to many reports and reviews. Sharp foreign body like the surgical blade has rarely been mentioned in literature, as it was located in the immediate proximity of major vessels, colon or stomach, and all sharp foreign bodies should be extracted, lest they penetrate and can cause bleeding or damage to organs.

Abdominal and pelvic cavities are the most frequent locations of retained surgical foreign bodies which account for nearly one-half of all retained foreign bodies [16]. The presence of foreign body in thoracic cavity is very uncommon. Most etiologies for the presence of such foreign bodies are accidental, traumatic-intentional or iatrogenic. However leaving blunt foreign bodies in the chest (either in the pleural cavity or extrapleural) predi-
Fig. 1,2. A metallic foreign body in the left hypochondrium.

Fig. 3,4. C-arm for exact localisation of a foreign body.
A diaphragmatic hernia was repaired with 1.0 Prolene interrupted sutures.

Leaving a sponge, needle, or instrument in a patient during surgery is an error avoidable by a systematic approach [17]. Estimates of retained foreign bodies in surgical procedures range from 1 case per 8000 to 18000 operations [18]. Cases of retained foreign bodies after surgery have been reported in the literature since the mid-19th century. The earliest case mentioned took place in 1859 when a “sea sponge” was lost in operation. At least 500 cases of retained sponges and instruments were described; they were reviewed by Crossen brothers in their 1940 classic book Foreign Bodies Left in the Abdomen (19). The Authors reported that the mortality rate from objects left in the abdomen ranged as high as 25% and almost 20% of the cases were discovered during the autopsy. Sponges were found up to 30 years after surgery.

No experimental evidence addresses the problem of retained foreign bodies directly after surgery, but these events occur because of faulty processes of care in the OT and poor communication between assistant nurses and doctors. Examples of faulty processes of care include inadequate or incomplete wound explorations, poorly performed sponge and instrument count, and incomplete, inadequate, or misread intraoperative radiographs. Of the eight risk factors the Authors identified (emergency operation, unexpected change of operation, more than one surgical team involved, change in nursing staff during the procedure, body mass index, the volume of blood loss, female sex, and surgical counts). Three significant risk factors were emergency surgery, unplanned change in the operation and increased body mass index [20]. In addition to above factors, fatigue in the surgical team due to lengthiness or lateness of the procedure and urgency of surgery are the risk factors [7, 21, 22].

Malpractices, claims and reports are an imperfect representation of the true incidence and nature of any complication [23, 24, 25].

Clinical manifestations of Retained foreign bodies are due to a multifactorial interaction between the following elements: nature of FB; the presence of infection; various patient factors; and the precise location of the FB [6, 13]. Most frequently encountered symptoms are nonspecific abdominal pain and intestinal obstruction [11]. Removal of FB results in less severe manifestations while internal erosion may lead to more significant complications, including abscess, fistula formation, and intestinal obstruction [6]. Inadvertent retention of a foreign body in the abdomen often requires another surgery to recover the material. This increases morbidity and mortality [26]. Moreover, it has been reported that the interval between the probable causative operation and the diagnosis of retained gauge may range from 11 days to 28 years [27]. Laparoscopic removal of a subphrenic encapsulated granuloma surrounding a retained surgical sponge has been successfully performed more than 20 years after the abdominal procedures [28].

Foreign bodies retained in the peritoneal cavity after surgeries are rarely documented owing to medical, legal and other reasons. Each such incidence acquires significant importance because of excessive media hype now a day which can jeopardise the reputation of a surgeon amongst his professional colleagues and public as a whole. It is the more embarrassing situation for a surgeon when all the clinical and radiological
features point toward the suspicion of retained intra-abdominal foreign body but on reoperation, no foreign body is found. In such situations when there is a high index of suspicion for a retained intra-abdominal FB, the reoperation may be carried out by explaining the indication of reoperation different rather than retained foreign body, as a collection of pus or an incisional hernia and others to avoid unnecessary embarrassment [10]. In spite of the diagnostic and therapeutic difficulties, the presence of an FB inside the patient can be easily proved and the patient may litigate the responsible surgeon because this is an avoidable problem [29] and surgeon will face charges of negligence [30].

Forgotten or missed foreign bodies, such as cotton sponges, gauze or instruments, after any surgical procedures are considered a misadventure and term “gossypiboma” denotes a mass of cotton retained in the body after any intervention [31]. As sponge is most common retained foreign body, to prevent gossypiboma-related troubles, the operating room team must pay thorough attention to detail, surgical sponges should always be counted at least twice, one by one (once preoperatively and once postoperatively), radiopaque filament should be used, the surgeon should completely explore the abdominal cavity before closing the peritoneum, and if there is doubt about the count of sponges, intraoperative X-ray must be performed [12]. Inspection of the abdominal cavity before closure should be routine in all patients, with particular attention to patients who are high risk for FB. Retained instruments or sponges often become concealed within the fatty tissues of the abdomen or pelvis and can be very difficult to find, even upon very detailed wound exploration [13,32]. To prevent such concealment of FB, there should be clear verbal communication between the operating surgeon(s) and the operating room staff regarding precise number and location of each intra-abdominally placed sponge, instrument, or other surgical objects. Visible writing board should be there in the operating room for a count of all surgical objects before abdominal closure. Metallic instruments left postoperatively, while being clear verbal communication between the operating surgeon(s) and the operating room staff regarding precise number and location of each intra-abdominally placed sponge, instrument, or other surgical objects. Visible writing board should be there in the operating room for a count of all surgical objects before abdominal closure. Metallic instruments left postoperatively, while retained surgical sponges frequently cause a chronic progression of symptoms over months to years [33].

In addition to performing surgical counts, thoroughly exploring the surgical wound, and using radio-frequency tagged instruments/sponges, intraoperative detection of potential retained surgical FB may be carried out by using abdominal radiography or ultrasonography [13,34,35]. Although more efficient than many of its alternatives, intraoperative imaging may be less reliable in the detection of surgical foreign bodies than previously believed [34]. The possibility of retained surgical items should be included in the differential diagnosis of any post-operative patient who presents with pain, infection, or a palpable mass. Patient with retained FB may present with the findings of intraabdominal abscess formation, with associated Plain radiography, ultrasound, and even magnetic resonance imaging (MRI) have been used for diagnosis, but the computed tomography (CT) scan has emerged as the most reliable method of diagnosing retained items [36, 37, 38, 39]. The most definite sign for computed tomographic (CT) detection of a retained surgical sponge is the presence of gas bubbles within retained foreign body [18]. Also, FB has been detected by angiography, endoscopy, laparoscopy, or upon surgical re-exploration [13, 40, 41]. An experienced radiologist is needed to differentiate retained FB from pathologic processes or iatrogenically placed objects that may resemble the appearance of various retained surgical objects [35]. Such processes and objects include abscesses, hematomas, cystic lesions, surgical staple lines, as well as other surgically placed objects [35,42].

Transmural migration of retained FB may erode the intestinal lumen despite the absence of any concomitant bowel trauma. Migration of surgical sponge into bowel lumen is a rare cause of bowel obstruction. However, it should be considered in the differential diagnosis in a patient with a history of the previous laparotomy who presents with non-specific abdominal complaints [43, 44].

Foreign bodies can be opaque, can be ingested, inserted into body cavities and can be a result of penetrating trauma or iatrogenic injury. Retained surgical foreign body can lead to significant medical and legal problems between the patient and the doctor. It may be incorrectly diagnosed preoperatively, which can result in unnecessary invasive diagnostic procedures and operations. Possible excuses given for sponge retention are emergency surgery, unexpected change in the surgical procedure, disorganisation, hurried sponge counts, continued operations, unstable patient condition, young staff, inadequate staff numbers, and patient with high body mass index; but these cannot be allowed to prevail. In spite of the diagnostic and therapeutic difficulties, the presence of a foreign body inside the patient can be easily proved and the patient may litigate the responsible surgeon because this is an avoidable problem and the surgeon will face charges of negligence.

In preoperative care, nurses should practice well-defined counting methods for sponges and needles and other surgical devices. They should perform these actions as a team, using good communication techniques. Both surgeons and nurses should evaluate new technologies (e.g., wands used by surgeons, counting systems used by nurses) that may improve the accuracy of their work. Radiologists and radiology technicians should efficiently provide their expertise. They should work all together to provide tightly linked communication channels and well-organised processes of care. It is a good practice to record all operations. Retained surgical foreign bodies continue to be underreported and poorly studied postoperative complications.

Despite the near-universal implementation of protocols for surgical sponges, instruments, and needles, incidents of foreign bodies still occur. Gastrointestinal complications secondary to abdominal FB can be catastrophic and complex. In addition to instilling a higher index of suspicion, implementation of reliable institutional regulations and strict adherence to these regulations should be emphasised. Surgical team awareness is critical in reducing the incidence of human error, but additional prevention methods should also be considered, particularly in cases identified to be at higher risk for FB. Manual surgical instrument and sponge counting alone is not a reliable mechanism for eliminating foreign bodies. The implementation of passive radio-frequency identification tags which allow surgical sponges and tools to be detectable inside body cavities with the use of a hand-held device may represent one solution to reducing the incidence of FB in high-risk cases. Another solution consists of the liberal use of intraoperative radiography to verify the absence of FB in any procedure that is thought to be high-risk for FB or whenever surgical team suspicion for FB is present.

Authors’ Statements

Competing Interests

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. There were no financial support or relationships between the authors and any organization or professional bodies that could
pose any conflict of interests.

Authors’ contributions

RH, SB, DG, MN, SBH took part in the first operation. RH, MA, MRK took part in the second operation. RH led the operation in both times. MC did the pathological examination. All contributed to literature search and preparation of the manuscript. All authors approved the final manuscript.

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Written informed consent of the patient and her guardian was taken for publication of this case report.

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