



Proposal of an algorithm for the management of rectally inserted foreign bodies: a surgical single-center experience with review of the literature

Stefan Fritz^{1,2,3} · Hansjörg Killguss¹ · André Schaudt¹ · Christof M. Sommer⁴ · Götz M. Richter⁴ · Sebastian Belle⁵ · Christoph Reissfelder² · Steffan Loff⁶ · Jörg Köninger¹

Received: 10 January 2022 / Accepted: 24 May 2022

© The Author(s), under exclusive licence to Springer-Verlag GmbH Germany, part of Springer Nature 2022

Abstract

Background Retained rectal foreign bodies (RFBs) are uncommon clinical findings. Although the management of RFBs is rarely reported in the literature, clinicians regularly face this issue. To date, there is no standardized management of RFBs. The aim of the present study was to evaluate our own data and subsequently develop a treatment algorithm.

Methods All consecutive patients who presented between January 2006 and December 2019 with rectally inserted RFBs at the emergency department of the Klinikum Stuttgart, Germany, were retrospectively identified. Clinicopathologic features, management, complications, and outcomes were assessed. Based on this experience, a treatment algorithm was developed.

Results A total of 69 presentations with rectally inserted RFBs were documented in 57 patients. In 23/69 cases (33.3%), the RFB was removed transanally by the emergency physician either digitally ($n=14$) or with the help of a rigid rectoscope ($n=8$) or a colonoscope ($n=1$). In 46/69 cases (66.7%), the RFB was removed in the operation theater under general anesthesia with muscle relaxation. Among these, 11/46 patients (23.9%) underwent abdominal surgery, either for manual extraction of the RFB ($n=9$) or to exclude a bowel perforation ($n=2$). Surgical complications occurred in 3/11 patients. One patient with rectal perforation developed pelvic sepsis and underwent abdominoperineal extirpation in the further clinical course.

Conclusion The management of RFBs can be challenging and includes a wide range of options from removal without further intervention to abdominoperineal extirpation in cases of pelvic sepsis. Whenever possible, RFBs should obligatorily be managed in specialized colorectal centers following a clear treatment algorithm.

Keywords Emergency · Foreign body · Management · Rectum · Sepsis · Surgery

Background

Anorectal trauma due to foreign bodies is described in various circumstances [1]. Although complications after the insertion of rectal foreign bodies (RFBs) have rarely been

reported in the literature, clinicians in the field of gastroenterology, general surgery, and pediatric surgery regularly face this issue in emergency departments [2]. Other than for sexually driven purposes, RFB insertion may occur for medical, criminal, or psychiatric reasons [3]. Before visiting

Stefan Fritz and Hansjörg Killguss contributed equally.

✉ Stefan Fritz
stefan.fritz@mein.gmx

¹ Department of General, Visceral, Thoracic, and Transplantation Surgery, Klinikum Stuttgart, Kriegsbergstraße 60, 70174 Stuttgart, Germany

² Department of Surgery, Universitätsmedizin Mannheim, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany

³ Deutsches End- und Dickdarmzentrum, Mannheim, Germany

⁴ Department of Diagnostic and Interventional Radiology, Klinikum Stuttgart, Stuttgart, Germany

⁵ Department of Medicine II, Universitätsmedizin Mannheim, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany

⁶ Department of Pediatric Surgery, Klinikum Stuttgart, Stuttgart, Germany

the hospital, patients frequently try to remove the RFB by themselves [4]. In the emergency room, patients eventually present with constipation, rectal bleeding, or abdominal pain. The true incidence of RFBs remains unknown because there are no data available on how often RFBs are removed by the individual, with the help of the partner or with the help of other people in a private environment [4]. More recently, some authors have suggested that the incidence of RFBs is increasing [5].

Although transanal extraction without further measures or, if necessary, with appropriate tools and intravenous analgesedation is often successful, there is a relevant proportion of patients who will need general anesthesia with or without surgical exploration. In a systematic review including 93 patients, Kurer et al. report that general anesthesia was necessary in 72.0% of patients, spinal anesthesia in 17.2%, and sedation in 5.4% of cases [2]. Moreover, there is a significant risk of severe complications such as rectal perforation with consecutive sepsis or severe bleeding. In this context, the management of RFBs can be challenging, particularly with regard to choosing the most appropriate method of extraction [2].

The literature is sparse in terms of injuries due to RFBs and the need for surgical intervention. Most reported studies are case reports or describe only a small number of patients [4]. Accordingly, there is a lack of evidence-based therapeutic algorithms. In 2009, Kurer et al. performed a systematic review of colorectal foreign bodies that included a total of 193 patients [2]. In the reported series, 20/193 patients underwent abdominal surgery (10.4%).

Our report aimed to evaluate the therapeutic management of RFBs in a large single-center series with a focus on surgical treatment. To date, there is no standardized protocol for the treatment of affected patients, and various strategies have been described in recent years. Thus, a major goal of the study is to describe an algorithm for the treatment of rectally inserted RFBs.

Materials and methods

All consecutive patients who presented to the emergency department of our 2200-bed hospital between January 2006 and December 2019 with rectally inserted foreign bodies (RFBs) were retrospectively identified from a prospective electronic database. Clinicopathologic features, including age, sex, body mass index, comorbidity, known psychosocial disorders, the nature, and reported reason for the insertion of the RFB, were assessed. Patients with RFBs following oral ingestion or a medical intervention, such as placement of an endorectal sponge, were excluded from the study.

Before medical treatment, a complete history evaluation and clinical examination of the patient were performed. Additionally, depending on anamnesis and symptoms, abdominal and/or chest X-ray or computed tomography (CT) was executed. Images were assessed and evaluated using our PACS online imaging system (GE Healthcare, Barrington, USA). Whenever feasible, the involved emergency physician tried to remove the RFB either digitally or with the help of a rectoscope or colonoscope. Only when indicated did patients undergo treatment in the operation theater under general anesthesia, if necessary, with surgical abdominal exploration. All operations were performed by certified general or specialized visceral surgeons. Patient- and clinical-related data were documented from the first presentation in the emergency department through the hospital admission episode until discharge.

Data were collected and processed using an Excel worksheet. Statistical analysis was performed using SAS® version 9.1 for Windows® (SAS Institute, Cary, NC, USA). Categorical variables are presented as absolute and relative frequencies. Differences between subgroups were determined by Student's *t* or Fisher's exact test as indicated. A *p* value of less than 0.05 was considered to indicate statistical significance.

Results

Characteristics of individuals

A total of 69 presentations with inserted and retained RFBs were reported in 57 patients over a 14-year study period. Children included: the patients had a median age of 39 years at hospital presentation (range: 4–65 years). Children excluded: the median age at presentation was 41 years (range: 16–65 years). Among all studied patients, 49/57 were males (86.0%), and 8 were females (14.0%).

The patient cohort included 51 adults and six children (Table 1). Among adults, 46 men and five women were noted, conforming to a ratio of approximately 9:1. Known psychiatric disorders were reported in 5/51 adults at hospital presentation (9.8%). Among these, two patients were reported to have schizophrenia, one patient had depression, and two patients had psychiatric disorders due to manifesting polytoxicomania. Five patients had known drug abuse, including consistent tetrahydrocannabinol (THC) consumption. A total of 4/51 patients (7.8%) were known to be serum positive for human immunodeficiency virus (HIV). Among the adults, 13 stated that they engaged in regular alcohol consumption (25.5%), and 13 revealed nicotine abuse (25.5%).

Table 1 Demographics and clinical features of patients with rectal foreign bodies

Feature		N	%
Age at presentation	Median: 39 years Range: 4–65 years		
Children/adults	Children (4–14 years)	6/57	10.5
	Adults	51/57	89.5
Sex	Male	49/57	86.0
	Female	8/57	14.0
Psychiatric disorders	Total children (4–14 years)	0/6	0.0
	Total adults	5/51	9.8
	Schizophrenia	2/51	3.9
	Polytoxicomania	2/51	3.9
	Depression	1/51	2.0
Regular alcohol consumption	Total adults	13/51	25.5
Nicotine abuse	Total adults	13/51	25.5
Drug abuse (including THC consumption)	Total adults	5/51	9.8
Human immunodeficiency virus (HIV serum positive)	Total adults	4/51	7.8

Among all 57 treated patients, six children up to the completed 14th year of age with a mean of 7.3 years (range: 4–14 years) were documented. In none of the affected children was a comorbidity or psychiatric disorder reported.

Initial presentation and diagnostics

All patients presented at the interdisciplinary Emergency Department of the Klinikum Stuttgart. Most of the patients reported themselves to have an inserted RFB with previous frustrated attempts of removal. In the majority of cases (52/69), the motive for insertion was obvious or presumed anal autoerotic stimulation (75.4%). With regard to adults, in six out of 63 cases (9.5%), the problem occurred accidentally during erotic stimulation with a partner. A total of 4/63 adults presented a plausible explanation for an accident (6.3%). In three cases, the exact circumstances in which RFB occurred remained unclear (4.8%).

With regard to the children, the following accident mechanisms were reported by the children themselves or their parents. A 14-year-old male teenager rectally inserted a pen. A 13-year-old female reported slipping in the bath and “falling” on a roll-on deodorant applicator. The other four children, with an age ranging between 4 and 5 years, inserted different objects during playtime (a small screw, a locking clip, a small Playmobil weapon, and a paper clip). In none of the reported cases, an indication of child abuse was observed.

After the patients' clinical histories were taken, they all received a medical examination including rectal digital palpation as well as abdominal ultrasound. Additionally, 28/69 patients (40.6%) received an abdominal X-ray examination

and three patients (4.3%) an abdominal computed tomography scan (CT).

Therapeutic management

In 23/69 cases (33.3%), the RFB was removed transanally by the emergency physician either digitally ($n = 14$), with the help of a rigid rectoscope ($n = 8$), or with a colonoscope ($n = 1$). In three of these cases (3/23), intravenous analgesedation was applied during the procedure. While removal of the RFB was unsophisticated and performed in the emergency room in one-third of the cases, 46 patients were further referred to the operation theater (66.7%). In these cases, the RFB was removed under general anesthesia with appropriate muscle relaxation. According to the classification system of the American Society of Anesthesiologists (ASA score), all patients treated in the operation theater were categorized as either ASA I or II (65.2% and 34.8%, respectively).

In 35/46 patients (76.1%), the RFB was removed under short general anesthesia digitally or with the help of a rigid rectoscope and appropriate forceps when indicated. In 12/35 cases, the surgeon intraoperatively described minor mucosal injuries (34.3%). In two of these cases, the mucosal rupture was repaired using absorbable, interrupted stitches (5.7%). Among patients treated in the operation theater, 11/46 ultimately underwent abdominal surgery (23.9%).

Surgical treatment via laparotomy

The indications for laparotomy were either the need for abdominal manual extraction of the RFB ($n = 9$) or the exclusion of a bowel perforation ($n = 2$). All eleven patients

underwent midline incision and surgical abdominal exploration. The median operation time was 134 min (range: 39–255 min). Two patients underwent laparotomy to exclude bowel perforation. Intraoperatively, neither case showed a bowel injury, and the surgery was terminated after the exploration. In another two cases, the RFB was digitally expressed in the aboral direction until it was accessible transanally. In another two cases, the RFB was directly accessed and removed via colotomy. In both cases, the incision was subsequently closed by a two-layer hand suture using 5–0 polydioxanone (PDS) threads.

In 5/11 cases (45.5%), unambiguous bowel perforation was noted intraoperatively. In two of these cases, a low anterior rectal resection with restoration of the bowel continuity was performed. In one of these two patients, a protective loop ileostomy was also constructed. Two patients underwent Hartmann's procedure without restoration of bowel continuity. In both cases, a terminal stoma of the descending colon was applied.

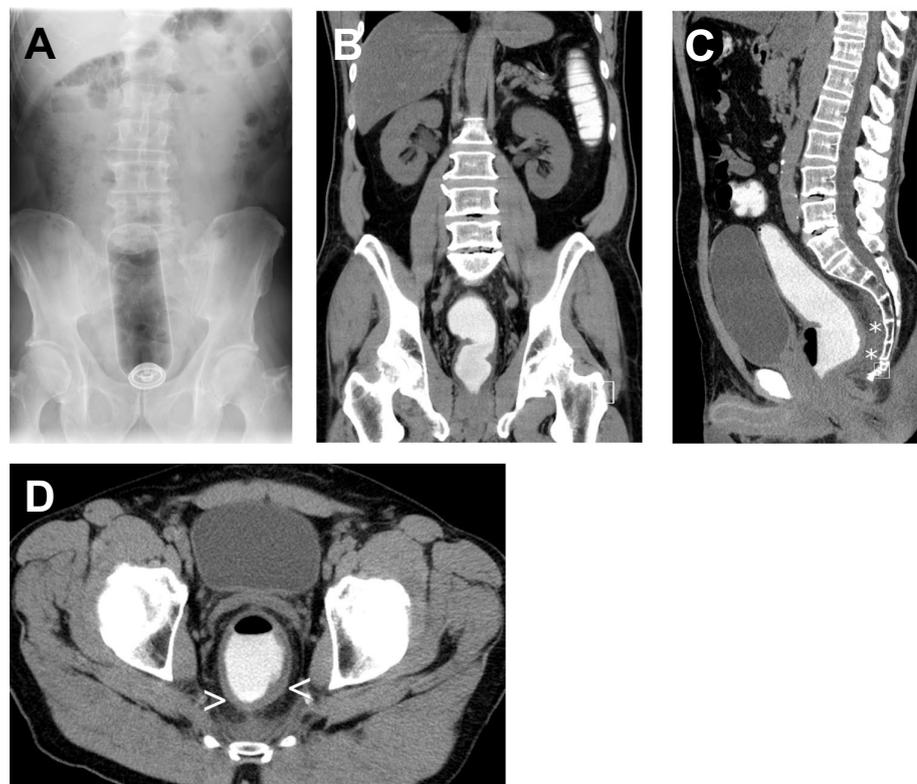
Outcomes and complications

Surgical complications occurred in 3/11 patients (27.3%). One patient developed an uncomplicated surgical wound infection after colostomy and removal of the RFB. Another patient had postoperative bleeding and underwent surgical

revision on the same day. The third patient developed pelvic sepsis after rectal perforation and Hartmann's procedure. The detailed clinical course of this patient is reported below. Overall, complications were only seen in patients with initial rectal perforation or, in one case, after colotomy.

An abdominal X-ray was performed in 10/69 patients (14.5%) to exclude bowel perforation after the intervention. Six patients underwent a CT scan (8.7%). In a 61-year-old male, there was no obvious bowel perforation after removal of a spray bottle, but CT imaging showed postinterventional reactive signs such as fluid within the pararectal fat and thickening of the rectal wall (Fig. 1). The patient had no clinical or laboratory signs of infection, and was discharged in a good physical condition on postoperative day 2. Among all 58 patients who did not undergo laparotomy, 30 were discharged on the day of RFB removal (51.7%). Twenty-eight patients were kept at least overnight in the hospital for follow-up after the intervention (48.3%). Among these patients, 22/28 were discharged on day 1 (78.6%), and six were discharged on day 2 (21.4%). The main reasons for admission were postinterventional monitoring to exclude a potential injury of the rectum wall, monitoring after intravenous analgesiation, and persistent pain or abdominal discomfort after removal of the foreign body.

Fig. 1 Removal of a rectal foreign body without obvious rupture of the bowel. **A** Conventional abdominal X-ray image demonstrating a spray bottle in the rectum before removal. **B–D** CT imaging after removal of the foreign body did not demonstrate a rupture of the bowel wall but slight reactive signs such as minimal fluid within the pararectal fat (asterisks) and thickening of the rectal wall (arrowheads) (**B** coronal image reconstruction; **C** sagittal image reconstruction; **D** axial image reconstruction)



Abdominoperineal rectum extirpation for pelvic sepsis

As reported above, one patient developed a severe clinical course with pelvic sepsis following rectal perforation. This patient was a 68-year-old male who suffered from idiopathic chronic pelvic pain syndrome. To relieve pain, the patient started manual internal therapy. Furthermore, he used a foreign body for manipulation — in the reported case, a glass bottle. While trying to remove the bottle by himself, the patient broke the bottle inside the rectum. The patient arrived 2 days later in the resuscitation room escorted by an emergency physician due to persistent rectal bleeding. The patient arrived in an unstable cardiopulmonary status. An abdominal CT scan revealed a broken bottle in the rectum with rectal perforation toward the retroperitoneum (Fig. 2).

Without delay, the patient underwent emergency laparotomy via midline incision. Due to rectal perforation with a consecutive pelvic abscess, Hartmann's procedure was performed, including placement of drainages in the pelvis. In the following days, the patient developed pelvic sepsis with anal sphincter necrosis. On day 3 after Hartmann's procedure, the patient underwent abdominoperineal rectum extirpation with soft tissue coverage using a vacuum-assisted black polyurethane foam sponge system (RENASYS GO® System, Smith & Nephew GmbH, Hamburg, Germany). After elective changes of the sponge system roughly every 5 days, the patient was discharged from the hospital on

postoperative day 75 with a nonirritating wound and secondary wound healing. On clinical follow-up examinations, the patient presented in good general condition with regular eating habits.

Patients with more than one presentation at different time points

A total of 3/57 patients were affected by an RFB more than once at different time points (5.3%). One male patient presented eleven times with different RFBs during a time episode of 12 years. At the age of 33 years, the patient presented for the first time with a retained 0.5 l PET bottle in the rectum. In the following years, six more RFB extractions were performed under anesthesia in the operation theater, and another three were unsophisticatedly performed in the emergency outpatient department. Figure 3 shows a series of three abdominal X-ray images with different RFBs in this patient. The affected patient suffered from known delusional paranoid schizophrenia.

Two other patients presented twice with RFBs in the emergency department of the Klinikum Stuttgart. The first patient was a 38-year-old male who underwent laparotomy with colotomy and extraction of an RFB in 2018. Roughly 1 year later, the patient presented again with a sigmoid perforation and subsequent severe abdominal peritonitis after insertion of an RFB. The second patient, a 36-year-old male, presented in 2017 with a retained RFB in the rectum. The

Fig. 2 Computed tomography imaging of a broken glass bottle in the pelvis. Computed tomography (CT) imaging of a crashed glass bottle in a 68-year-old male without an open rupture of the bowel in different cutting planes and with 3-D reconstruction. **A** CT coronal image reconstruction (soft tissue window) demonstrating the foreign body. **B** CT sagittal image reconstruction (bone tissue window) demonstrating details of the foreign body (crushed glass and free perirectal air [white asterisks]). **C** CT axial image reconstruction (soft tissue window) demonstrating details of the foreign body (crushed glass and free perirectal air [white asterisk]). **D** CT image with the volume rendering technique (VRT) demonstrating the 3D surface of the foreign body

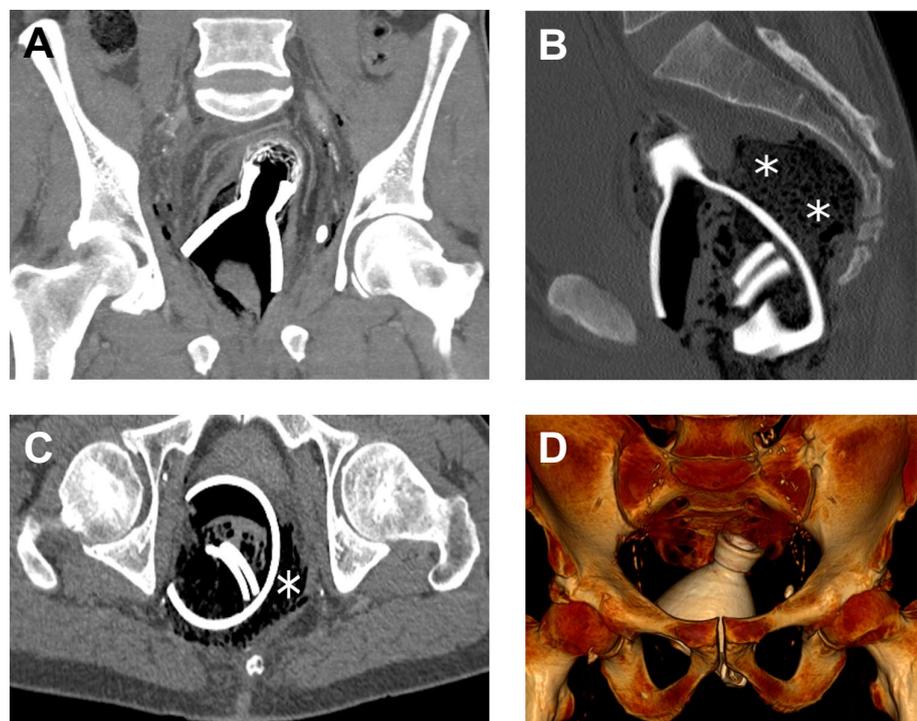
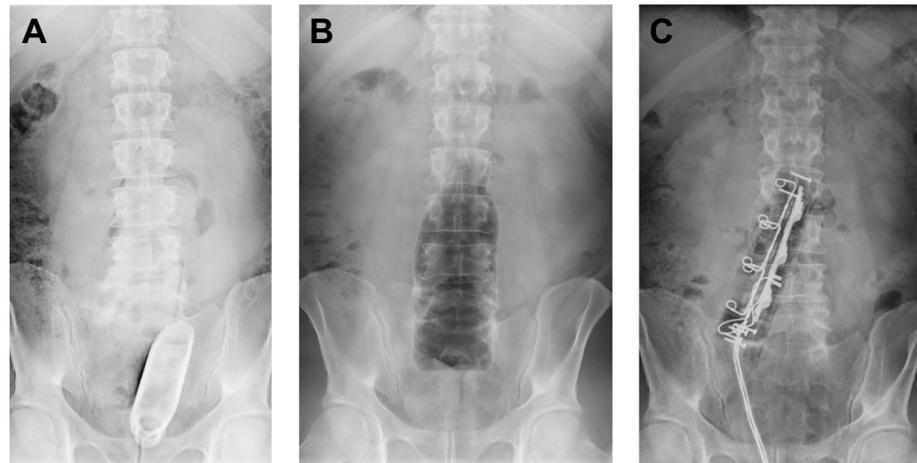


Fig. 3 Different rectal foreign bodies in the same patient. Exemplary series of conventional abdominal X-ray images with different types of rectal foreign bodies in a male patient who presented eleven times during the time period between 2006 and 2019. The patient was 33 years old at first presentation and suffered from delusional paranoid schizophrenia. **A** In 2010 with a glass bottle of furniture polish. **B** In 2014 with a 0.5-L PET plastic bottle. **C** In 2017 with a three-way socket adapter



patient underwent laparotomy with digital expression of the RFB. Approximately 20 months later, another RFB was transanally removed under general anesthesia without the need for a laparotomy.

Discussion

Presentation in clinics

Foreign bodies inserted into the rectum are not uncommon. Children excluded, the median age at presentation with an RFB was 41 years. This is in accordance with existing literature reports that describe a mean age at time of presentation of 44.1 years [2]. The majority of patients who presented with inserted RFBs were males. In the present series, the male-to-female ratio was approximately 9:1.

Undoubtedly, the most frequent reason for anal insertion of foreign bodies in adults is sexual pleasure [6, 7]. In the present series, the proportion of this motive was 84.1%. In addition to sexual activity, the following reasons for insertion of an RFB have been reported in the literature: personal care, self-treatment of hemorrhoids or pruritus ani, drug concealment, assault, “accidental,” psychiatric reasons, or alleviation of diarrhea or constipation [1, 2]. In our series, four cases of “accidentally” inserted RFBs were seen in adults (6.3%). In these cases, the reported explanation of the accident mechanism was plausible to the treating physician. The number is in accordance to current literature. Kurer et al., for instance, reported an incidence of 9.2% for accidental insertion of an RFB [2].

Moreover, it should be noted that psychiatric disorders can favor the incidence of RFB insertion. In the present study, a male patient with known paranoid schizophrenia presented eleven times with different RFBs during a time

period of 12 years. Patients presenting several times with RFBs have also been reported in previous literature [8, 9].

A certain lifestyle can also be considered a risk factor for hospital presentation with an RFB. In our series, 4/57 patients were known to have a positive HIV status (7.0%). This rate was significantly higher than that in the general population ($p < 0.01$). According to the Robert Koch Institute Germany (Epidemiologisches Bulletin 48/2020, www.rki.de/epidbull), it is estimated that at the end of 2019, approximately 90,000 patients were HIV positive in Germany, which corresponds to an incidence of only 0.1%. For self-protection, nurses and surgeons should keep these facts in mind during the medical treatment of adults with RFBs.

Rectal manipulation may improve complaints in the presence of chronic pelvic pain syndrome [10]. As reported in the literature, digital rectal stimulation, usually in the context of pelvic floor physical therapy, can help to relieve symptoms [11, 12]. In the present study, a 68-year-old male inserted a glass bottle to decrease pain.

Most series reported in the literature exclusively include adults. However, children can also be affected by RFBs. In the present series, the proportion of children was 8.7%. Reports about RFBs in children are very rare and mainly consist of case reports. Shao et al., for example, reported two children with rectally inserted foreign bodies [13]. Likewise, Mahapatra et al. reported a case of transrectal impalement of an incense stick in a child [14]. In our experience, especially in younger children, RFBs mostly occur accidentally during playtime. Recently, it has been assumed that RFB injury frequencies in children and adolescents are rising [15]. In contrast to this report, cases were distributed equally during the observation period in the present series. Thus, we cannot confirm the observation of Ayantunde et al. that the incidence of RFBs is increasing, neither in adults nor in children [5].

Therapeutic management

Following a careful recording and study of a patient's history, physical examination of the abdomen should be performed to rule out peritonitis [5, 16]. Additionally, a digital rectal examination is crucial to assess the location and nature of the RFB. In case of peritonitis, a surgical exploration either by laparotomy or laparoscopy is unequivocally indicated (Fig. 4). In case of uncertain peritonitis, radiological evaluation is usually more informative than laboratory tests [17]. Most objects are detectable upon conventional abdominal or pelvic X-ray [5]. For successful extraction of the RFB, knowledge about the shape, size, and nature of the object is important [18]. CT examination may be helpful to identify radiolucent RFBs such as fish bones or plastic objects. Moreover, patients with complications such as bowel perforation or high-lying objects that cannot be confirmed by plain radiography may benefit from CT scan [3].

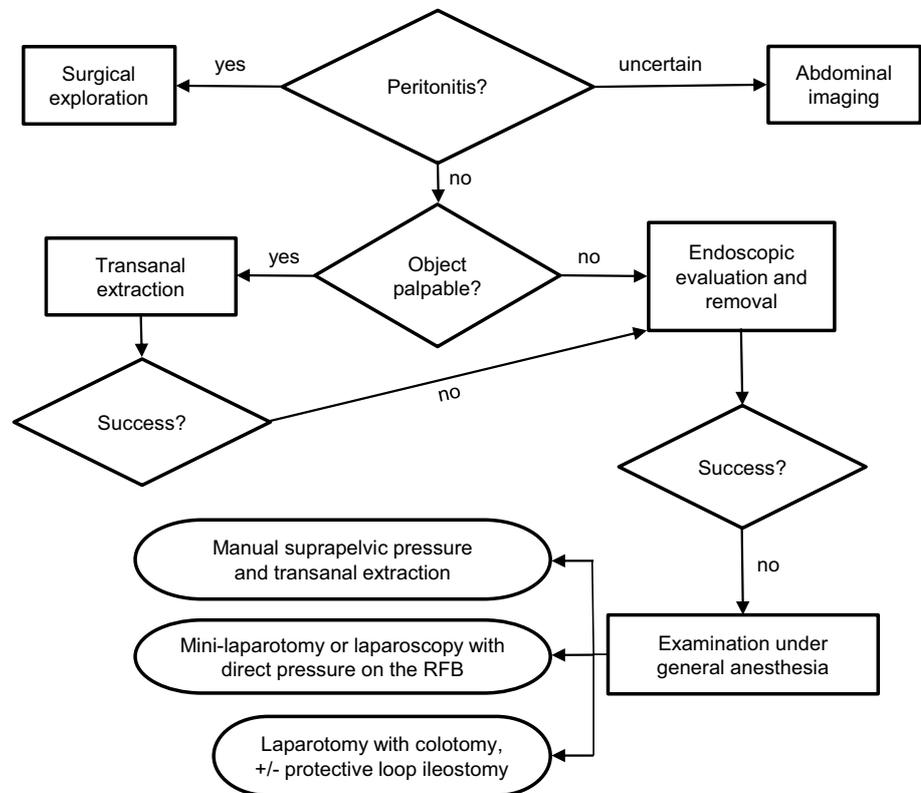
According to the existing literature and our own data [1], the best way to handle RFBs is to work from noninvasive to more-invasive methods in retrieving the retained objects. In Fig. 4, we propose an algorithm on how to manage rectal foreign bodies. It has been reported that approximately 60–90% of RFBs can be removed transanally at the patient's bedside in the emergency room using appropriate tools [19]. However, manual extraction without anesthesia is only possible

for low-lying objects [20]. The choice of the tool depends on the nature of the RFB. Obstetric tools, tonsil snares, sponge forceps, and bone-holding clamps have been used [2]. However, it is crucial that attempts to retrieve an RFB should not be forced, and the period of manipulation should not exceed 30 min [19]. Forceful and repeated efforts without sphincter relaxation may give rise to oral migration of the RFB or to a secondary iatrogenic rectal perforation [16].

In the present study, only 39.7% of the RFBs were removed in the emergency department without anesthesia. The authors believe that the decision to perform general anesthesia should be made early and liberally. Anesthesia with muscle relaxation has two significant advantages. On the one hand, removal can be performed painlessly under anesthesia. On the other hand, this approach helps relax the anal sphincter, which facilitates atraumatic retrieval of the object. Additionally, one person can apply suprapubic pressure from above the object, while the examiner tries to grasp the RFB digitally or with the help of an appropriate tool from below [18]. Potential injuries of the bowel wall can be excluded directly under vision by rigid rectoscopy or colonoscopy. Finally, in case of a complication or rectal perforation, surgical abdominal exploration can be performed in the same setting.

Overall, with the help of appropriate tools and precautions, RFBs can usually be removed safely, eventually with

Fig. 4 Algorithm management of rectal foreign bodies



the help of general anesthesia. In the present series, no single postmanipulation perforation was reported. Nevertheless, following transanal extraction of an RFB, a check endoscopy is useful to look for bleeding and mucosal injuries [2].

Surgical treatment

Rectal foreign bodies that are not amenable to manual transanal extraction present a therapeutic dilemma. In case of additional failure of endoscopic removal, surgical exploration is indicated [16]. Likewise, in the case of rectal perforation at the time of diagnosis, immediate laparotomy is crucial for a good clinical outcome. In cases with questionable rectal or sigmoid perforation, the decision for surgical exploration should be made liberally. A surgical exploration (when possible, laparoscopically) can be performed with a very low morbidity and no mortality. On laparotomy, the surgeon first should try to manipulate the RFB toward the rectum [3]. In some cases, the RFB can be moved aborally unless it is accessible transanally. Subsequently, the surgeon should carefully inspect the entire bowel wall to exclude iatrogenic injuries such as deserosation. In the case of a relevant maceration of the bowel wall, the construction of a protective loop ileostomy should be taken into account.

In the series of Kokemohr et al., the authors analyzed the reports of 20 patients who were treated due to an RFB between 2006 and 2016 [4]. Among these patients, only two were transferred to the operating room where the RFB was removed under general anesthesia. In none of these patients was surgical exploration needed. Compared to that series, our series reported eleven patients with a total of five rectal perforations triggered by the insertion of the RFB. In the case of rectal perforation with a subsequent pelvic abscess, anterior rectal resection with anastomosis or Hartmann's procedure is usually indicated. Currently, severe pelvic trauma is associated with a mortality of up to 10% [21]. The management of severe pelvic sepsis should be in line with the surgical treatment of penetrating pelvic trauma [22]. Key principles in the management of penetrating rectal injuries include the varying use of direct closure of the bowel wall, fecal diversion, presacral drainage, and, in distinct cases, rectal washout [23]. Overall, the management of patients with pelvic sepsis is complex, should be interdisciplinary, frequently includes combined modalities, and often requires several reinterventions [21, 24].

Follow-up

Even after successful extraction, RFBs can lead to delayed rectal or sigmoid perforation or significant bleeding [7]. Thus, it is important to determine whether the patient should stay in the hospital for a short-term follow-up [25]. Without the need for a laparotomy, outpatient treatment or a hospital

stay overnight is frequently sufficient. In case of a potential injury of the bowel wall, hospital admission is advisable. To rule out rectal injury after transanal extraction of an RFB, the authors recommend direct visualization using a rigid proctoscope or a flexible sigmoidoscope when indicated [9]. Additionally, depending on clinical symptoms, an algorithm including colonoscopy and/or CT scan with rectal filling can be helpful (Fig. 5). When clinical symptoms such as abdominal pain or peritonitis persist for more than 24 h, CT-scan or, alternatively, a surgical exploration is indicated. For a persistent abdominal abscess, an interventional drainage may be indicated. Depending on the degree of contamination and sepsis, a diversion colostomy or protective loop ileostomy can be taken into account (Fig. 5).

In cases of postinterventional symptoms of fecal incontinence or a lax anal sphincter, it would be worthwhile to reassess such patients 3 months after removal of the RFB [2].

Psychologic and psychiatric aspects of rectal foreign bodies

One of the most common clinical problems for treating physicians is delayed patient presentation in the hospital and the fact that patients first try to remove the objects themselves [5, 7]. In some cases, these trials may cause migration of the RFB further orally or can cause damage to the bowel wall, which can aggravate peritonitis and sepsis in cases of rectal perforation [16, 19]. Moreover, many affected patients may not report the whole truth due to embarrassment or possible psychiatric issues [7, 26]. While most patients reveal the presence of an RFB, some are not forthcoming and initially present with rectal bleeding, constipation, diarrhea, or rectal/abdominal pain [2]. When dealing with patients with an inserted RFB, the

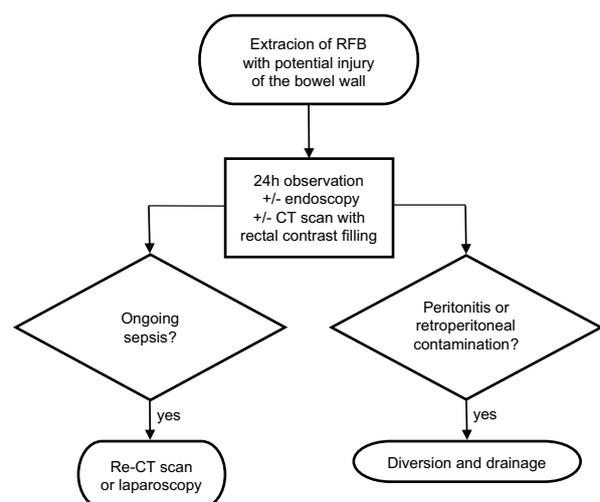


Fig. 5 Algorithm after the extraction of rectal foreign bodies

responsible medical personnel have to provide empathy and compassion and at the same time maintain a nonjudgmental view of the clinical case [1]. Patients must be reassured that they are in a safe and professional environment. In any case, their dignity and confidentiality must be maintained [2]. In adults, involuntarily inserted RFBs are almost always exclusively associated with cases of rape and sexual assault [17]. In children and elderly persons with mental disorders, involuntarily inserted RFBs are occasionally observed.

Conclusions

The diagnosis of an RFB requires immediate intervention to relieve symptoms and prevent complications. Medical treatment depends on the size, type, spatial configuration, material, and position of the foreign body. Even for experienced gastroenterologists or colorectal surgeons, the extraction of retained rectal foreign bodies can be challenging. In many cases, the foreign body can be successfully removed transanally in the emergency department using manual or endoscopic extraction or a combination of both. However, in the case of an impacted or not easily extractable RFB due to the effect of a vacuum in the lumen or the fragile nature of the object itself, the mode of extraction has to be determined cautiously. When rectal perforation occurs, surgical removal of the RFB is indicated to solve the problem and avoid abdominal or pelvic sepsis. Severe pelvic floor sepsis with a subsequent need for rectal extirpation rarely occurs but necessitates intensive care treatment and, eventually, several surgical reinterventions.

Acknowledgements The authors would like to thank the members of the Department of Emergency, Klinikum Stuttgart, for their contribution to the study. Moreover, the authors thank Sandra Cseledes for data collection and Angelika Hildebrandt for English language editing.

Authors' contributions SF, HK, and CMS were responsible for data collection. SF, HK, and JK analyzed and interpreted the patient data. SF, HK, JK, and CMS were major contributors in writing the manuscript. AS, GMR, SB, CR, and SL contributed significantly by proofreading the manuscript. All authors read and approved the final manuscript.

Data availability The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate The study was designed as an observational retrospective analysis. The study did not influence the therapy in any way.

Consent for publication The present manuscript does not contain any individual person's data in any form.

Conflict of interest The authors declare no competing interests.

References

- Shaban Y, Elkbuli A, Ovakimyan V et al (2019) Rectal foreign body causing perforation: case report and literature review. *Ann Med Surg (Lond)* 47:66–69
- Kurer MA, Davey C, Khan S et al (2010) Colorectal foreign bodies: a systematic review. *Colorectal Dis* 12(9):851–861
- Kim JH, Um E, Jung SM et al (2020) The management of retained rectal foreign body. *Ann Coloproctol* 36(5):335–343
- Kokemohr P, Haeder L, Fromling FJ et al (2017) Surgical management of rectal foreign bodies: a 10-year single-center experience. *Innov Surg Sci* 2(2):89–95
- Ayantunde AA, Unluer Z (2016) Increasing trend in retained rectal foreign bodies. *World J Gastrointest Surg* 8(10):679–684
- Schellenberg M, Brown CVR, Trust MD et al (2020) Rectal injury after foreign body insertion: secondary analysis from the AAST contemporary management of rectal injuries study group. *J Surg Res* 247:541–546
- Goldberg JE, Steele SR (2010) Rectal foreign bodies. *Surg Clin North Am* 90(1):173–84 (**Table of Contents**)
- Huang WC, Jiang JK, Wang HS et al (2003) Retained rectal foreign bodies. *J Chin Med Assoc* 66(10):607–612
- Lake JP, Essani R, Petrone P et al (2004) Management of retained colorectal foreign bodies: predictors of operative intervention. *Dis Colon Rectum* 47(10):1694–1698
- Polackwich AS, Shoskes DA (2016) Chronic prostatitis/chronic pelvic pain syndrome: a review of evaluation and therapy. *Prostate Cancer Prostatic Dis* 19(2):132–138
- Bharucha AE, Lee TH (2016) Anorectal and pelvic pain. *Mayo Clin Proc* 91(10):1471–1486
- Masterson TA, Masterson JM, Azzinaro J et al (2017) Comprehensive pelvic floor physical therapy program for men with idiopathic chronic pelvic pain syndrome: a prospective study. *Transl Androl Urol* 6(5):910–915
- Shao F, Shen N, Hong Z et al (2020) Injuries due to foreign body ingestion and insertion in children: 10 years of experience at a single institution. *J Paediatr Child Health* 56(4):537–541
- Mahapatra RS, Priyadarshi V, Madduri VK, et al. 2014 Transrectal impalement of an incense stick in a child presenting as foreign body in the urinary bladder. *BMJ Case Rep* 2014.
- Fischer J, Krishnamurthy J, Hansen S, et al. (2019) Austere foreign body injuries in children and adolescents: a characterization of penile, rectal, and vaginal injuries presenting to emergency departments in the United States from 2008 to 2017. *Pediatr Emerg Care*
- Yildiz SY, Kendirci M, Akbulut S et al (2013) Colorectal emergencies associated with penetrating or retained foreign bodies. *World J Emerg Surg* 8(1):25
- Ye H, Huang S, Zhou Q et al (2018) Migration of a foreign body to the rectum: a case report and literature review. *Medicine (Baltimore)* 97(28):e11512
- Anderson KL, Dean AJ (2011) Foreign bodies in the gastrointestinal tract and anorectal emergencies. *Emerg Med Clin North Am* 29(2):369–400
- Ikram S, Singh S, Kallam R, et al. (2017) A play that went wrong: unique presentation of bowel perforation from an unusually large per-rectal foreign body. *BMJ Case Rep* 2017.
- Coskun A, Erkan N, Yakan S et al (2013) Management of rectal foreign bodies. *World J Emerg Surg* 8(1):11
- Arvieux C, Thony F, Broux C et al (2012) Current management of severe pelvic and perineal trauma. *J Visc Surg* 149(4):e227–e238
- Hornez E, Monchal T, Boddaert G et al (2016) Penetrating pelvic trauma: initial assessment and surgical management in emergency. *J Visc Surg* 153(4 Suppl):79–90

23. Ahern DP, Kelly ME, Courtney D et al (2017) The management of penetrating rectal and anal trauma: a systematic review. *Injury* 48(6):1133–1138
24. Clemens MS, Peace KM, Yi F (2018) Rectal trauma: evidence-based practices. *Clin Colon Rectal Surg* 31(1):17–23
25. Cologne KG, Ault GT (2012) Rectal foreign bodies: what is the current standard? *Clin Colon Rectal Surg* 25(4):214–218
26. Fleres F, Ieni A, Saladino E et al (2018) Rectal perforation by inadvertent ingestion of a blister pack: a case report and review of literature. *World J Clin Cases* 6(10):384–392

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.