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Laparoscopic Management of Complicated Foreign Body Ingestion: A Case Series

Daryl K. A. Chia, Ramesh Wijaya, Andrew Wong, Su-Ming Tan

Department of Surgery, Changi General Hospital, Singapore

This study aims to demonstrate the safety and feasibility of laparoscopic management of complicated foreign body (FB) ingestion in a series of 5 patients. We present the merits of a minimally-invasive approach in this clinical setting from our series as well as published case reports. FB ingestion is occasionally complicated by abscess formation or perforation, requiring surgical intervention. Anecdotal reports of such cases managed by laparoscopic surgery have alluded to its merits over the conventional approach of open surgery. Over an 18-month period, 5 of 256 patients with FB ingestion at our unit were managed by laparoscopic surgery. Clinical and operative data were collected for this study. In all 5 cases, patients could not recall their FB ingestion and had normal plain radiographs. The diagnosis was made on a computed tomography (CT) scan. Laparoscopy was successfully employed to retrieve all FBs (fish bones), deroof abscesses, and primarily repair gastrointestinal perforations. The mean operative time was 69 minutes (55–85), utilizing 2 to 4 noncamera ports. There was no operative mortality and patients were discharged on average postoperative day (POD) 5 (2–8). Laparoscopic surgery is safe and feasible in small-diameter, complicated FB ingestion requiring surgical intervention and should be considered in similar patients.

Key words: Foreign body ingestion – Laparoscopy – Minimally-invasive surgery

Surgical management is rarely indicated in the context of foreign body (FB) ingestion, with a vast majority of FBs passing through the gastrointestinal[1] tract uneventfully or retrieved successfully via endoscopy.[1,2] It is considered only when endoscopic retrieval has failed, or when complications of FB ingestion have occurred. These complications are usually due to GI perforation and have a wide spectrum of clinical presentations, including localized or generalized peritonitis, abdominal wall abscesses, and intra-abdominal abscesses.[3]

While the mainstay of surgical management has been an abdominal laparotomy, there have been isolated case reports where patients with complicat-

Corresponding author: Ramesh Wijaya, MRCS, Department of General Surgery, Changi General Hospital, 2 Simei Street 3, Singapore 529889.
Tel.: +65 62601709 or +65 98378705; Fax: +65 68503551; E-mail: ramesh_wijaya@cgh.com.sg

Table 1 Operative and postoperative data

	Total (n = 5)
FB characteristics[a]	
Mean size, cm	3.23 (2.2–4.5)
Laparoscopic surgery data	
Mean time, min	69 (55–85)
No. of non-camera ports used per patient	3.2 (2–4)
Postoperative data	
Mean POD discharge	5.2 (2–8)

[a]Range reflected in brackets ( )

ed FB ingestion were successfully managed with minimally-invasive surgery (MIS).[4–10] The potential benefits of a laparoscopic approach in abdominal surgery are well known and include reduced postoperative ileus and pain, smaller incisions and superior cosmetic results, shorter duration of hospitalization, and earlier return to work and a decreased incidence of postoperative hernias.[4,11]

This paper presents the largest case series to date of 5 consecutive patients, who were managed via laparoscopic approach for complicated FB ingestion. We aim to review and report the salient clinical features of this series of patients to demonstrate that laparoscopic management is safe, feasible, and should be considered when managing FB ingestions in a similar clinical setting.

Materials and Methods

Over an 18-month period, 256 patients presented with FB ingestion to our center. Of these, 5 patients were managed surgically via laparoscopic approach. Records of relevant clinical and demographic data, presenting symptoms, investigations, operative procedures, and length of hospitalization were reviewed after obtaining Institutional Review Board (IRB) approval. Operative findings and data were collected. These included FB size, location, number of ports used, and total operative time.

Results

Four of the 5 patients in our series were male, with a mean age of 58.8 (47–68) years. None had any prior history or risk factors for FB ingestion. Only 1 patient had prior abdominal surgery—an open cholecystectomy. The clinical presentation in all 5 patients was characterized by complaints of upper abdominal pain, with none of the patients providing a clear history of FB ingestion. Only 2 patients were febrile at presentation; both were eventually found to have intra-abdominal abscesses. One of these 2 patients had an erythematous abdominal wall mass on examination.

None of the FBs were visualized on plain radiographs and none of the patients had radiographic evidence of GI perforation. Computed tomography (CT) imaging of the thorax, abdomen, and pelvis revealed the FB in all 5 cases, 3 of which were complicated by abscess formation. One patient had an FB extending through the stomach wall into the liver, associated with a hepatic abscess. The other 2 abscesses were located in the liver and peritoneal cavity extending into the abdominal wall respectively, with the FBs completely visualized within the abscess cavity in both cases. The remaining 2 FB ingestions were complicated by perforation. Endoscopy was attempted in 4 of the 5 patients, but the FB was not visualized. Endoscopy was not attempted in 1 patient who was hemodynamically unstable and admitted to the medical intensive care unit (MICU).

The FBs were visualized and successfully removed in all 5 patients via laparoscopic approach. There were no conversions to open surgery. The 5 FBs were all fish bones, with an average length of 3.23 cm (Table 1). They were located in the stomach (3), liver (1), and abdominal wall (1). Intraoperatively, gastric perforations were noted in 3 patients and repaired with intracorporeal suturing. In the remaining 2 patients where the FB was found outside the GI tract, gastric insufflation and methylene blue test via nasogastric (NG) tube was used as an adjunct to the standard diagnostic laparoscopy that included examination of the entire small bowel and colon. This was done to confirm that there was no presence of gastric perforation due to earlier CT scan findings as well as intra-operative findings of induration and inflammation in the region of the stomach. The 2 hepatic abscesses and single intraperitoneal abscess extending into the abdominal wall were deroofed and drained successfully. Abdominal drains were placed in patients with abscesses for drainage postoperatively.

Postoperatively, 1 patient developed an acute myocardial infarction (AMI). He initially presented with septic shock and was admitted to the MICU, requiring vasoactive agent support. CT imaging thereafter revealed the source of the sepsis to be a hepatic abscess secondary to a complicated FB ingestion. All 5 patients were eventually discharged well and followed up on an outpatient basis. There

were no other postoperative morbidities such as wound infection, postoperative ileus, or intra-abdominal collections. There was no mortality in this series. The average postoperative day (POD) of discharge and operative findings are shown in Table 1.

Discussion

Only a minority of patients with accidental FB ingestion will require surgical intervention. Eighty percent to 90% of FBs pass asymptomatically through the GI tract within a week and can be managed conservatively.[3,12] Patients who present early tend to be acutely symptomatic, where endoscopic retrieval is the mainstay of treatment. Between 1% and 14% of FB ingestions will eventually require surgery, usually in the context of (1) failed endoscopic retrieval, (2) the patient's unsuitability for endoscopy, or (3) the presence of complications.[13,14]

The most common complication is GI tract perforation, which has a well-described incidence rate of <1% in existing literature.[2,4] The manifestation of such perforations can generally be classified in 3 categories: (1) local (focal peritonitis), (2) regional, when it lodges and causes symptoms in an adjacent organ (*e.g.,* liver abscess, pancreatic abscess), or (3) generalized peritonitis.[3] The other complications of FB ingestion are GI tract obstruction and bleeding, but were not encountered in our series.

Patients who present after a relatively indolent course are usually unable to recall an episode of FB ingestion, as we saw in our series of patients.[12,15–17] All of our patients presented with nonspecific abdominal pain and normal radiographs. However, all 5 patients were subsequently found to have complicated FB ingestion secondary to fish bones. This is likely because the minimal calcium in fish bones can easily be obscured by soft tissue or fluid.[3] Ngan *et al*[18] found the sensitivity of plain radiographs picking up fish bone FBs to be only 32%, hence the utility of CT scans in our patients. In our series, surgical intervention was indicated in the presence of symptoms, together with CT-evidence of complicated FB ingestion. The intra-abdominal abscesses were successfully deroofed and drained and all the FBs were removed in all 5 patients. Our case series suggests that MIS is safe and feasible when applied consistently to patients with FB ingestion who present in this particular manner, similar to numerous prior case reports.[4–10]

The FBs found vary in different countries, reflecting the variation in dietary practices. In the Asian setting, the most common accidental dietary FB ingested tends to be fish bones.[19] Of note, fish bones have a small cross-sectional diameter and may pass further into the GI tract. The incidence of GI perforation by sharp FBs has been reported to be 15 to 35%.[11,13] Law *et al* [8] suggests that the whole peritoneal cavity can be explored adequately via the laparoscopic approach, with the versatility of intra- or extra-corporeal repair. We believe that the small cross-sectional diameter of fish bones, the only FB in our series, makes it amenable to laparoscopic retrieval and tends to create smaller perforations that can be repaired with intracorporeal suturing. In addition, for FBs found outside the stomach, this laparoscopic approach can be combined with gastric insufflation and methylene blue tests via an NGT to rule out subclinical stomach perforation as performed in our case series. Although our case series reports fish bones as the only type of FB, Wu *et al* [5] suggests that laparoscopy is advantageous because of the increased magnification and light resulting in reflection off metallic FBs, making identification and retrieval procedures easier. This may be relevant for nondietary FBs with similar size and small cross-sectional diameter, such as pins and sewing needles.

Other advantages of MIS for complicated FB ingestion include a shorter duration of hospitalization and less postoperative pain, decreased incidence of postoperative hernias and better cosmetic outcomes, safety of pneumoperitoneum for laparoscopy in patients with morbid obesity, and chronic obstructive pulmonary disease (COPD), smaller surgical incision, and decreased risk of wound infection or dehiscence.[4,5,7,20,21] This was demonstrated in all the patients in our series, where there was no evidence of postoperative morbidity except for 1 patient in our series who developed an AMI.

However, this illustrates the advantage of an MIS approach for a patient who was admitted to the MICU with septic shock secondary to an intra-abdominal abscess. This patient required vasoactive agent support and would have been a poor candidate for open surgery. This consideration was also made by Lanitis *et al*,[11] who proposed that laparoscopic surgery for complicated FB ingestion may decrease operative morbidity in high-risk patients, as compared to a conventional laparotomy. This patient was discharged well on postoperative day (POD) 7, despite the AMI.

However, laparoscopic surgery also has its limitations. In patients with prior abdominal sur-

gery and resultant adhesions, laparoscopic surgery may be a technical challenge, with an increased risk of injuring bowel or other organs if extensive adhesiolysis is required.[22] Despite this, 1 patient in our series with a prior open cholecystectomy underwent laparoscopic removal of FB in the upper abdomen successfully. This case illustrates that prior surgery is only a relative contraindication to laparoscopic management of complicated FB ingestion.

With regards to length of stay after laparoscopic management of FB ingestion, literature shows that asymptomatic patients who have undergone laparoscopic removal of ingested sewing needles were discharged on POD 1.[4,6,11] However, symptomatic patients often have underlying complications of GI perforation such as local or regional inflammation (*e.g.*, perforation of the pancreas[5] or gallbladder[23]), spillage into the peritoneal cavity,[7,8] or abscess formation,[24] and require a longer hospital stay ranging from POD 3 to 8. On average, our series suggests that patients who present with perforation or abscess formation and undergo laparoscopic management of complicated FB ingestion can be discharged on POD 5 (range, POD 2–8).

Currently, published literature has described numerous case reports using laparoscopic techniques for the management of complicated FB ingestion.[4–10] In this series, our patients did not encounter any operative morbidity or mortality and had good postoperative recovery, demonstrating that this method may be adopted safely and with good outcomes in carefully-selected patients. However, larger prospective cohort studies will be needed in the future to demonstrate that a laparoscopic-first approach in complicated FB ingestion has consistent potential benefits in terms of morbidity as well as mortality outcomes.

We report the largest case series to date of 5 patients who have undergone successful laparoscopic surgery for complicated FB ingestion. As demonstrated in our series, this method is technically feasible and safe. It should now be considered in patients with FB ingestion, particularly if the FB is of a small cross-sectional diameter, and when it is complicated by perforation and/or abscess formation.

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