

Laparoscopic management of enterohepatic migrated fish bone mimicking liver neoplasm

A case report and literature review

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Abstract

Rationale: Accidental ingestion of a foreign body is common in daily life. But the hepatic migration of perforated foreign body is rather rare.

Patient concerns: A 37-year-old man presented with a history of vague epigastric discomfort for about 2 months.

Diagnosis: A diagnosis of the foreign body induced hepatic inflammatory mass was made based on abdominal computed tomographic scan and upper gastrointestinal endoscopy.

Interventions: The patient underwent laparoscopic laparotomy. During the operation, inflammatory signs were seen in the lesser omentum and segment 3 of liver. B- Ultrasound guided excision of the mass (in segment 3) was performed. Dissecting the specimen revealed a fish bone measuring 1.7 cm in length.

Outcomes: The patient recovered uneventfully and was discharged on day 5 after surgery.

Lessons: This study shows the usefulness of endoscopy for final diagnosis and treatment in foreign body ingestion. Early diagnosis and decisive treatment in time are lifesaving for patients with this potentially lethal condition.

Abbreviations: BUS = B ultrasound, CT = computed tomographic, MRI = magnetic resonance imaging.

Keywords: computed tomographic, foreign body, laparoscopy, review

1. Introduction

Perforation of the digestive tract caused by ingested foreign bodies is relatively uncommon. Enterohepatic migration of an ingested foreign body to the liver is extremely rare as the liver is

not in continuity with the gastroenteric lumen. Most patients present with hepatic abscess formation with severe morbidity and even mortality before definitive diagnosis. Herein, we report a rare case of enterohepatic migration of an ingested fish bone mimicking liver neoplasm and is successfully diagnosed and removed by laparoscopy. Additionally, this case is discussed together with relevant English literature collected by a PUBMED-based extensive review of the reported cases and found the majority of cases preoperative diagnosis is difficult to establish.^[1,2] As employed in our case, the minimally invasive procedure of laparoscopy is technically feasible and safe for both the diagnosis and treatment of patients with foreign body ingestion.

2. Case report

A 37-year-old man presented to the outpatient department with a history of vague epigastric discomfort for about 2 months. He had intermittent mild epigastric discomfort without nausea, vomiting, anorexia, pyrexia, and icterus. He also did not experience hematemesis, melena, passage of bloody stool, or altered bowel habits. Otherwise, he was fit and well with no significant medical history. His physical examination was essentially normal except for mild epigastric tenderness. Abdominal B ultrasound (BUS) scan revealed a 4*4 cm mixed echo mass without clear margins in the left lateral lobe of the liver. With an initial diagnosis of liver neoplasm, he was hospitalized for further evaluation. The complete blood count, serum biochemical analyses including liver enzymes, renal function, glucose level, lipid level, amylase, and tumor markers were all within normal limits. Abdominal computed tomographic (CT) scan revealed a hypodense 4*5 cm mass with ill-defined boundary in the left lateral lobe of the liver. The mass was in close

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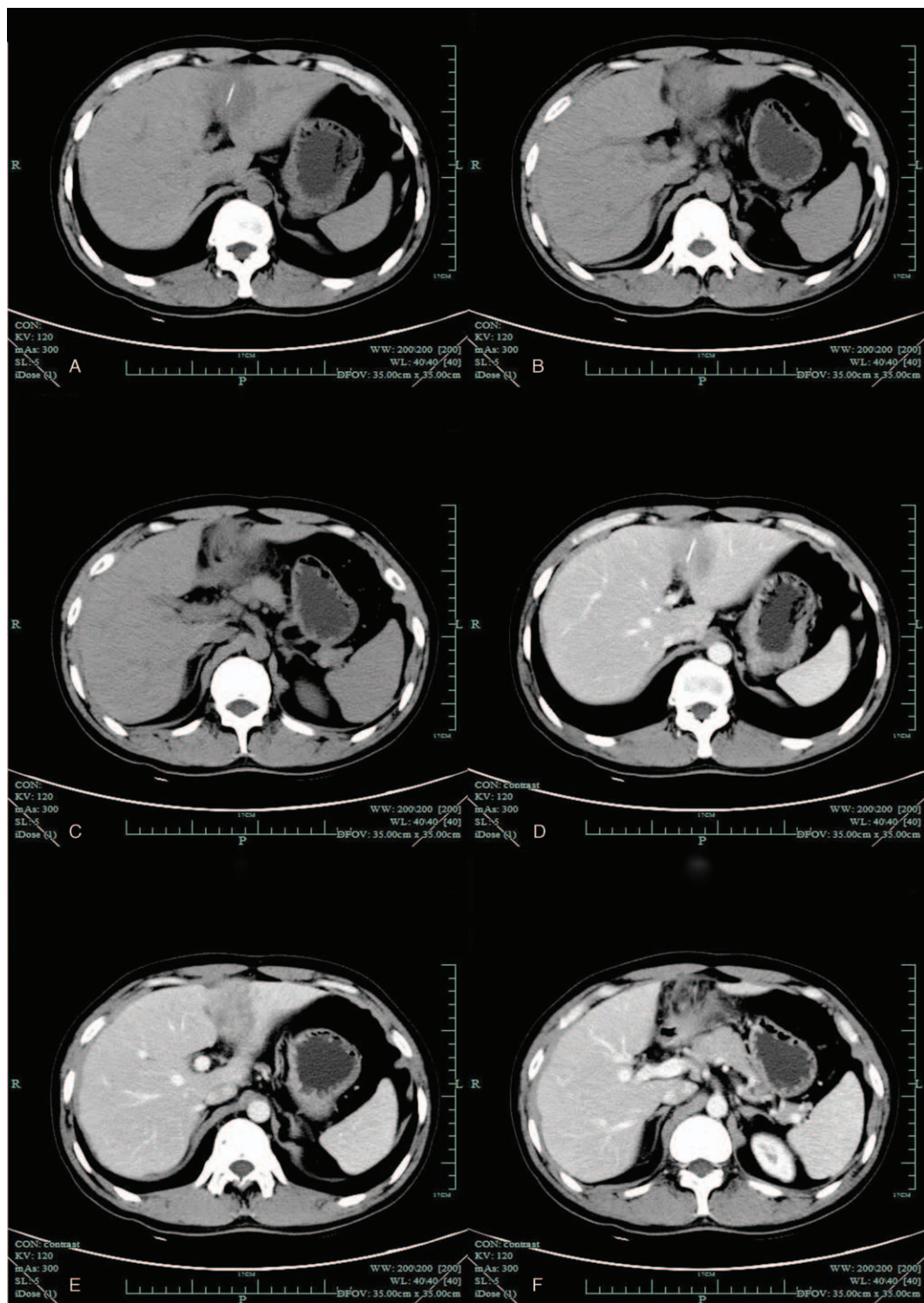


Figure 1. Plain and contrast-enhanced CT scan: a hyperdense linear foreign body embedded in a hypodense mass within segment 3 of the liver. The surrounding lesser omentum between the mass and gastric antrum become edematous and thickened. (A, B, and C: plain scan; D, E, and F: contrast-enhanced scan). CT = computed tomographic.

proximity to the falciform ligament and was slightly enhanced in the enhancement scan. The surrounding lesser omentum between the mass and gastric antrum appeared edematous and thickened. Inside the mass, there was a hyperdense, linear object measuring 2 cm in length, foreign body considered first. There was no evidence of hematoma, abscess, and pneumoperitoneum. (Fig. 1). However, the patient denied any history of percutaneous trauma

of epigastrium (no cutaneous scar) or previous abdominal operation and could not recall any history of foreign body ingestion in a repeated detailed medical history inquiry. Thus, a subsequent upper gastrointestinal endoscopy was performed but it showed no bleeding, erosion, ulcer, perforation, or foreign body. Therefore the tentative diagnosis of the foreign body induced hepatic inflammatory mass was yielded and the other

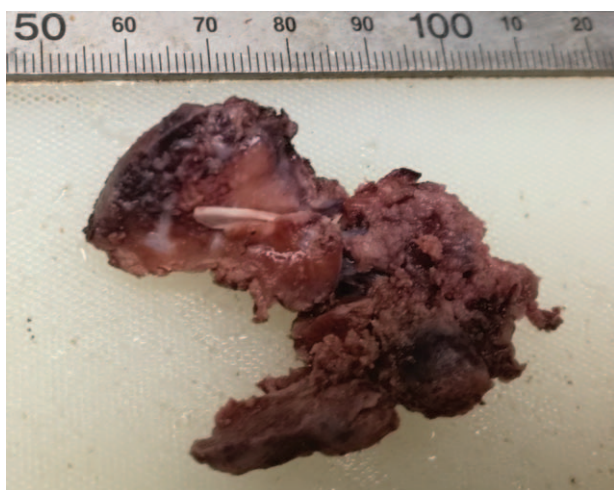


Figure 2. Foreign body (fish bone) embedded in the dissected liver specimen.

presumable diagnoses might be portal pyaemia with incidental calcified granuloma, infected calcified granuloma, or malignant neoplasm complicating calcification. As malignant tumor could not be ruled out and the nature of the linear object within the mass was unidentified by imaging, he underwent a diagnostic laparoscopic laparotomy accordingly.

During the operation, inflammatory signs were confirmed in the lesser omentum and segment 3 (Couinaud) of the liver. Whilst the ligamentum teres hepatis and the left part of hepatoduodenal ligament were also involved in the adhesive fibrotic tissues. After the dense adhesive area of the edematous and thickened lesser omentum was dissected gently, no fistulous communication was confirmed between either the stomach or the duodenum and the visceral surface of the liver. Further through inspection also could not identify the site of perforation. We believed that the patient had experienced a minor perforation, which sealed quickly before eliciting any obvious peritonitis. However, as the foreign body

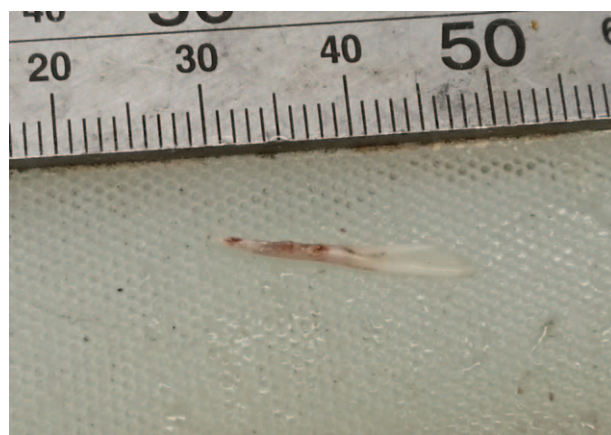


Figure 3. Removed foreign body (fishbone, 1.7 cm in length).

was completely embedded in the parenchyma of liver and the margin of the lesion could not be localized by direct visualization under the laparoscope, we performed BUS guided excision of the mass (in segment 3) in intact condition. The confirmation of the complete removal of both the mass and foreign body was obtained by BUS and fluoroscopy. Dissecting the specimen revealed a fish bone measuring 1.7 cm in length (Figs. 2 and 3). Intraoperative frozen section revealed features of hyperemia, hemorrhage accompanied by fibrous tissue hyperplasia, and chronic inflammatory cell infiltration without malignant cells in the mass. The definitive diagnosis of inflammatory mass secondary to enterohepatic migration of fish bone was established thereby. Postoperative histological examination of the specimen (hematoxylin and eosin stain; original magnification, 100× and 400×, Figs. 4 and 5) revealed lymphocyte infiltration (Fig. 5, bold arrow), some fracture red blood cell (Fig. 5, slim arrow), all of which suggested an inflammation.

He recovered uneventfully and was discharged on day 5 after surgery. At follow-up, he was progressing well without

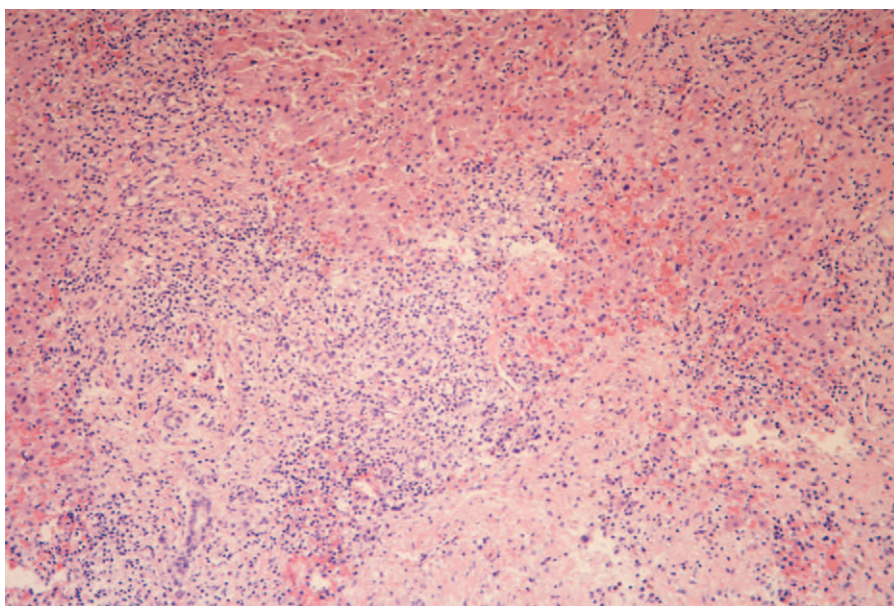


Figure 4. Histological exam of the specimen (hematoxylin and eosin stain; original magnification, 100×).

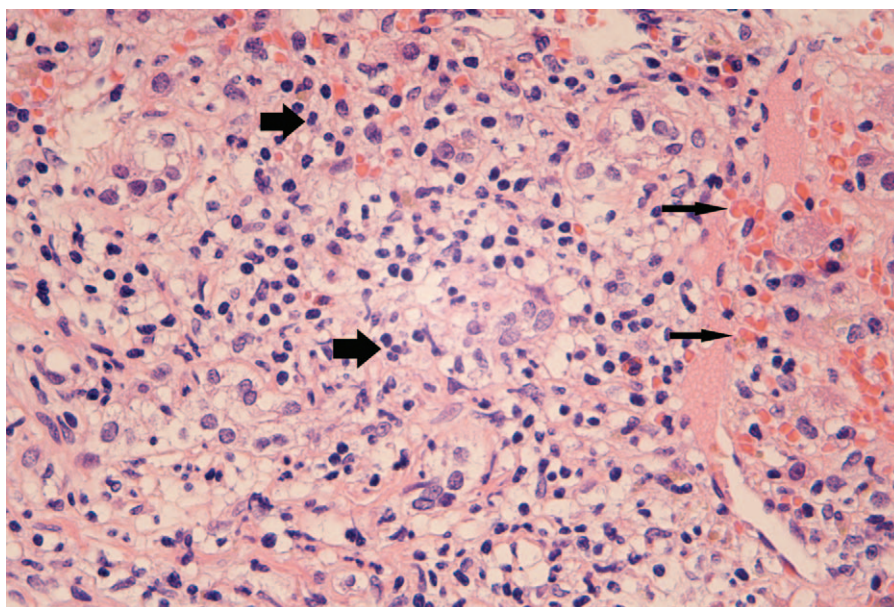


Figure 5. Histological examination of the specimen (hematoxylin and eosin stain; original magnification, 400 \times) reveal lymphocyte infiltration (bold arrow), some fracture red blood cell (slim arrow).

complication, his liver function is normal and resumes full-time work 1 month after the surgery. He denied the recurrence of any of his preoperative symptoms 4 months after the surgery in the follow-up.

3. Discussion

Accidental ingestion of foreign bodies is not rare and the vast majorities (80–90%) of ingested foreign bodies spontaneously pass through the gastrointestinal tract uneventfully within 1 week.^[3,4] In fact, less than 1% of patients who ingested a foreign body become symptomatic, it is usually secondary to obstruction or perforation of the gastrointestinal tract.^[2,4] Development of liver abscess secondary to ingested foreign body migration is even more uncommon, and the first case was reported by Lambert and colleagues in 1898.^[6] Since then, literature regarding this disease have increased, especially in the past 4 decades. In the present study, we just focus on the enterohepatic migration of ingested foreign body and aim at summarizing its characteristics and the proper way of management.

3.1. Literature review

A systematic PUBMED survey of all English language literatures published since 1980 was finished by using the keywords “liver mass,” “hepatic abscess,” “inflammatory pseudotumor,” “foreign body,” “toothpick,” “fishbone,” “chicken bone,” or “needle.” All literature collected from the search were reviewed carefully and only cases with an ingested foreign body that penetrated directly into the liver were included in the present study. The following variables were analyzed: gender; age; type hepatic lesion; site of liver involved; type and size of foreign body; treatment performed (endoscopy, surgery, intervention, and autopsy); and duration of hospitalization. Cases with insufficient quality or incomplete data were excluded. Finally, 80 papers^[3,4,7–83] with 86 cases were selected for analysis in the present study. All statistical analyses were performed using

commercially available software (SPSS, version 18.0 for Windows). Data were expressed as mean \pm SD. The Student *t* test was used for comparison of 2 different sets of continuous values. Differences were considered statistically significant when $P < .05$.

3.2. Patient demographics and risk factors of foreign body ingestion

Of the reviewed 86 cases, there are 48 male and 38 female patients. The mean age of these patients is 51 ± 19 years (ranging from 5 months to 86 years). With regard to the risk factors of foreign body ingestion, numerous groups “at risk” of ingested foreign body perforation have been identified in the literature, including prison inmates, psychiatric patients, alcoholics, children, elderly peoples, selected professions (carpenters and dressmakers). Other conditions include eating quickly, hot or cold beverages, cognitive impairment, and people who wear dentures.^[71,84] The wearing of dentures is a well-described risk factor because they can eliminate the tactile sensation of the palatal surface. This palatal sensory feedback is a protective mechanism for identifying small, sharp, or hard textured objects included in the food bolus.^[5,90] Dental factors also have been reported in up to 80% of foreign body ingestion cases especially in elderly peoples who have hypopsephasia of the palatal surface and degradation of palatal sensory feedback with age.^[84,90] Wearing dentures and the usage of toothpicks are also reported to be risk factors for a foreign body-related hepatic abscess.^[73] In the present review, 3 cases are reported with psychiatric or cognitive impairment patients with a mean age of 30.5 years old. Meanwhile, these patients usually ingest foreign body intentionally and this behavior has a tendency to be repeated. There are 6 cases in the present study with patients under the age of 17 and all of them had ingested a foreign body of the metallic needle by accident. Needle seems to be the most common foreign body causing perforation and boys are more frequently involved than girls. It may be attributed to their

carelessness and immature palatal sensory feedback, especially in child and infant.

3.3. Site of perforation

Theoretically perforation can occur anywhere along the gastrointestinal tract, however, it usually occurs at areas of angulation or narrowing such as the pylorus and ileocecal junction.^[1] Actually, the most common sites of perforation of the gut are ileocecal junction and rectosigmoid region.^[2,75] However, the common perforation sites of enterohepatic migrated foreign body reported are the stomach (pylorus included) and duodenum.^[9] In the present review, 44 cases have a gastric perforation (pylorus included) while 18 cases get duodenal perforation, agreeing with previous studies.^[33,37] Colon takes the third place of the most common site of perforation reported (6 cases).^[19,42,55–57,70] A proposed hypothesis stated that a thicker gut wall (stomach and colon) can make the foreign body to perforate more gradually, and the close proximity of the omentum and adjacent organs, such as the liver assists in “sealing” the perforation site without gross intra-peritoneal spillage of gastrointestinal contents.^[84,85] Moreover, the surrounding inflammatory adhesion might form even before the perforation sealed. This hypothesis can explain the considerable asymptomatic period of time between foreign body ingestion and appearance of overt symptoms as well as regional rather than diffuse peritonitis in these cases. With regard to the source of migrated foreign body, foreign bodies penetrating the left lobe of liver usually come from the proximal 2 parts of duodenum, pylorus, and gastric antrum while foreign bodies penetrating the left lobe of liver may also come from the ascending colon, hepatic flexure of the colon, and transverse colon.^[60] The predominant location of hepatic involvement induced by foreign body penetration is the left lobe which is in contrast to cryptogenic hepatic abscesses that often affect the right lobe.^[60] In the present review, foreign bodies penetrating the left lobe of liver directly through stomach are identified in 36 cases (including 23 cases in left lateral lobes), right unilobular involved in only 1 case, bilobular involved in 2 cases; while foreign bodies penetrating the left lobe of liver directly through duodenum are identified in 10 cases (including 6 cases in left lateral lobes), right unilobular involved in 7 case, bilobular involved in 1 case. Caudate lobe involvement is diagnosed in 3 cases from stomach and 1 case from duodenum. In the 6 cases with colon perforation, left unilobular involvement is detected in 1 case as right unilobular involvement is detected in 5 cases (Table 1). According to the review, foreign bodies piercing through the stomach are more likely to involve the left lobe especially the lateral lobe than that of the “duodenal perforation group” ($P=.002$) while the “colon perforation group” is more frequent to appear right lobe involvement which is in contrast to that of the “stomach perforation group” ($P<.001$).

3.4. Nature of foreign body

Ingested foreign bodies vary from countries and depend on dietary habits. Reported foreign bodies include metallic or plastic objects such as needle,^[32] coin,^[87,91] metallic wire,^[28] pen,^[10] dental plate,^[86] and toothbrush;^[57] organic objects such as animal bones (fish^[8] chicken,^[18] and rabbit^[88]), or shell,^[82] wooden objects such as toothpick,^[29] clothespin^[12] or some plan,^[14] and other objects. With regard to penetrated foreign bodies, objects that cause perforation are usually sharp, pointed,

Table 1

Sites of gastrointestinal tract perforation and sites of hepatic penetration (totally 68 cases^{*}).

Site of penetration	Stomach	Duodenum	Colon
Liver involvement			
Left lateral lobe	23 (33.7%)	6 (8.7%)	1 (1.5%)
Left internal lobe	7 (10.2%)	3 (4.5%)	0
Left lobe [†]	8 (11.7%)	1 (1.5%)	0
Right lobe [†]	1 (1.5%)	6 (8.7%)	5 (7.5%)
Bilobular	2 (3.0%)	1 (1.5%)	0
Caudate lobe	3 (4.5%)	1 (1.5%)	0

^{*} In the rest of the cases the site of gastrointestinal tract cannot be clearly identified even in the surgery just like our reported case.

[†] Left lobe means both internal and lateral lobe involved. Right lobe means any part of right lobe involved.

or elongated, yet all of the aforementioned foreign bodies have been reported for penetration. The incidence rate of foreign body enterohepatic migration in the present reviewed 86 cases are fishbone (45.3%), toothpick (23.2%), needle (14.0%), chicken bone (8.1%), clothespin (2.3%), toothbrush (2.3%), rosemary twig (1.2%), pen (1.2%), lobster shell (1.2%), and metal wire (1.2%). However, some previous studies hold that the shape or size of objects cannot predict the risk of perforation as opposed to the spontaneous passage,^[89] such as elongated blunt head objects can perforate the mucosa after erosion due to pressure from longstanding impaction.^[23] The size of migrated foreign bodies in reviewed papers varies from 1 cm (fishbone) to 20 cm (toothbrush) and their shape varies from sharp (sewing needle) to blunt (toothbrush). It is reasonable that the longer the foreign body is the higher possibility the perforation happens. Hence perforation and migration of small-sized foreign body is less reported and more difficult to detect than that of the longer foreign body. Thus it is rational to pay more attention to the diagnosis and treatment of these patients. In our reported case, the size of the migrated fishbone is 1.7 cm. Though it is not the shortest migrated foreign body ever reported, but to the best of our knowledge, it is the shortest enterohepatic migrated foreign body removed by laparoscopy. Moreover, how such a short foreign body penetrates and embedded deeply into the liver remains unclear.

3.5. Clinical presentation

Depending on the type of foreign body ingested and the site of perforation, the presentation of the patients can vary considerably. Hence it often causes confusion at presentation and can masquerade as numerous differential diagnoses.

The clinical manifestations of patients with enterohepatic migrated foreign body consist of features of perforation that includes peritonitis, perforation abscess formation, fistula, and hemorrhage), and features of hepatic lesion (abscess, inflammatory mass, and inflammatory pseudotumor) that include pyrexia, epigastralgia, and abnormal liver function. Note that most of the aforementioned features and symptoms are nonspecific. Moreover, hardly any patients in these cases tend to recall the specifics of the ingestion. Therefore in the absence of a reliable history, the migration of an ingested foreign body may result in a silent clinical course or acute abdomen or chronic inflammation even radiological suggestive of a neoplasm.^[51] Most of the reported cases of liver abscess caused by direct penetration of the foreign body through the gastrointestinal tract present relatively severe symptoms of hyperpyrexia, epigastric

megalga even shock. In our reported case, the patient was diagnosed hepatic inflammatory mass and presented relatively lighter symptoms of vague epigastric discomfort without pyrexia that is consistent with the symptoms of a previous reported patient who presented fishbone migration complicating hepatic inflammatory mass or inflammatory pseudotumor.^[4,45,79] Interestingly, in all 12 patients with needle ingestion in the present review, half of them do not present any overt lesion in liver during their clinical course, that means their livers remain “normal” (no abscess or other inflammatory lesion formed) after the direct penetration of the needle. On the other hand, in all 7 patients with “normal liver” in the review, 6 of them have ingested needle. This finding may be partly explained by that animal bones or toothpicks are usually swallowed in a meal or just after a meal and have more likelihood to penetrate with gross spillage of gastrointestinal contents. This is in contrast to needle ingestion which is barely related with meal.

3.6. Diagnostic approaches

Early diagnosis and retrieval of a foreign body involved in gastrointestinal tract perforation is critical for avoiding morbidity and mortality.^[4] However, early diagnosis is challenging due to the lack of specific findings, the patient’s unawareness about the ingestion and low index of suspicion of this condition by the medical team. Note that there can be a considerable timespan of months to even years between the incident of ingestion and appearance of symptoms of inflammatory mass or abscess.^[19] If the correct diagnosis of foreign body perforation is not made timely, percutaneous interventional drainage of the abscess could result in recurrence or persistence of the abscess even life-threatening sepsis. So that in refractory abscesses after interventional drainage and application of antibiotics, foreign body migration must be considered as potential pathogenesis, despite its rarity. Clinicians should also be aware of possible ingestion of foreign bodies in elderly individuals wearing dental prosthetic devices.

Imaging techniques such as X-ray, BUS or CT scan are optional. The choice depends on not only the symptom of the patient but also the nature and size of the foreign body. As the degree of radio-opacity of the foreign body varies with the different type,^[29] and even with bony radiopacity, because of the masking effect of the soft tissue mass, fluid collection around the penetrated foreign body and the absence of free gas in the abdomen, plain radiograph is unreliable in this rare condition.^[49] Ultrasound is useful in detecting the presence of hyperreflective foreign bodies regardless of their orientation and even if it is radiotransparent. Nowadays, BUS is treated as an alternative screening technique for its noninvasion, convenience, and radiation-free.^[34]

However, it is not always reliant due to factors such as the patient’s body habitus, the operator’s performance and the site of perforation.^[2] CT scan is now the golden standard for the diagnosis of foreign body migration owing to its high resolution and accuracy.^[71] Foreign body usually appearing as a hyperdense linear object under CT. CT scan in cases of foreign body ingestion can also determine the presence of a perforation, the extent of intra-abdominal inflammation either with or without abscess formation and adjacent organ impairment.^[4] On account of tomographic angle and the thickness of cuts, linear foreign body lying between adjacent CT cuts maybe barely visible. Moreover, signs of resultant bowel perforation, however, may not always be evident on an ordinary CT scan.^[2] As a consequence, coronal or

sagittal reconstructive or repeated CT scan and a high index of suspicion are necessary for the diagnosis. magnetic resonance imaging (MRI) is usually contraindicated for its relatively low accuracy and in condition when metallic objects cannot be completely ruled out.^[60] Endoscopy (gastroduodenoscopy and colonoscopy) is the preferred choices for the assessment and management of objects lodged in upper or lower gastrointestinal tract because of their capacity of visualization of areas involved in the perforation. Unfortunately, the accuracy may reduce in some chronic cases of perforation or migration with healed mucosa^[4] and endoscopy does not allow examination of the mid-gut.^[1] The decision of operation before clear diagnosis establishment is always hard arduous to make. Despite advances in imaging quite a few diagnoses are still made during the operation. Laparoscopy may be a choice when the patient with severe agnogenic acute abdomen.

In our reviewed papers the migration of foreign body is identified by CT alone in 29/86 cases, by CT and BUS in 28/86 cases, by CT and X-ray in 11/86 cases, as well as by X-ray and/or BUS in 6/86 cases. Eight patients are found foreign body migration by X-ray, BUS, and CT scan combined. Three patients are not correctly diagnosed until surgery (laparotomy or laparoscopy). Diagnosis was not established in 3 cases until autopsy.^[11,17,20] MRI is adopted in 5 cases but never facilitate any correct diagnosis. As a result, the combination of different imaging tests should be suggested to the patient with occult liver abscess or abdominal pain.

3.7. Treatment and prognosis in the era of laparoscopy

To remove or not remove the migrated foreign body in the liver is the key problem. Withdraw of accidentally detected asymptomatic foreign body remains somewhat controversial. According to available data, the rate of resolution without removal of the foreign body is 9.5%.^[60] The choice should be made based on several aspects as relative size, orientation of the tip pointing, possibility of migration into the bloodstream or other adjacent organs, abscess or neoplasm formation, internal or external biliary fistula,^[92] and the situation may change alter dramatically in the period of follow-up.^[33,61] For individuals with poor tolerance, unstable vital sign or contraindications of the removal procedure, conservative and supportive therapies are acceptable as the first move. If an improvement of the situation was confirmed by a subsequent reassessment, the removal of the foreign body might be still available. In other conditions, removal of the foreign body is the treatment of choice. Strategies for the removal of foreign bodies penetrating directly into the liver through gastrointestinal tract include laparotomy as well as laparoscopy, endoscopy, BUS/CT guided percutaneous interventional approaches and their combinations. When there is a strong suspicion of bowel perforation by a foreign body or if a foreign body was detected by imaging with liver impairment, surgery is the mainstay of diagnosis and treatment.^[19] As previously reported, once established the correct diagnosis cure is achieved in virtually all cases (46 of the 47 cases reported) treated by surgery were successful, mostly by laparotomy, and only 2 by laparoscopy.^[60] Actually, as the crucial step of treatment, laparotomy is definitely effective but also invasive. Whereas in the present review, much more laparoscopies are performed than before as time goes on. Meanwhile, open surgery, endoscopy, and medication therapies are relatively less employed than before owing to the extensive use of laparoscopy. Since 2011, more than half of the surgeries are performed by laparoscopy (Table 2). In

Table 2**Type of surgery for the treatment of enterohepatic migrated foreign bodies (totally 86 cases)*.**

Published time	1980–2010	2011–2018
Open surgery	39	16 [†]
Laparoscopy	1	17
Endoscopy	5	1
Percutaneous intervention	0	1
Medication	5	2

* In 1 case, 1 foreign body was removed by endoscopy, another foreign body was removed by open surgery.

[†] Including 3 cases of laparoscopy that convert to open surgery.

the case we reported, laparoscopy was also successfully performed for both diagnosis and treatment. It is suggested by a previous study that laparoscopy is advantageous because of the increased magnification of the operating field and light resulting in the reflection of the foreign body, providing better identification of the foreign body, small vessels and other structures, and making the retrieval procedures easier.^[93]

Minimally invasive hepatectomy and gastrectomy have been expanded over the past 2 decades. Although majority of major hepatectomies are still performed as an open surgical procedure in the regional hospital, laparoscopic approach is considered the gold standard treatment for lesions located in the left lateral lobe of the liver (segment II and III).^[94,95] In patients with prior abdominal surgery and resultant adhesions, laparoscopic surgery may be a technical challenge, with an increased risk of organ or vessel injury if extensive adhesiolysis is required.^[68] With recent advances of endoscopic instruments, transluminal therapies can be performed via the gastrointestinal tract when there is a sinus tract between the liver abscess and the intestine. In case the foreign body partly remains in the lumen of gastrointestinal tract, endoscopy is particularly appropriate. It can also be performed in combination with percutaneous interventional procedure in selected cases. However, both of the procedures can be technically demanding.^[57] What needs to be emphasized is that no matter which procedures adopted, make sure there is no foreign body residual and the perforation site is sealed firmly if possible.

With respect to the prognosis, the mean postoperational hospitalization duration (POD) after the foreign body removal laparotomy is 8.7 ± 3.2 days (ranging from 3 days to 14 days) whilst the laparoscopic group has significantly shorter mean POD of 4.5 ± 3.1 days (ranging from 1 day to 12 days) ($P < .001$). In the papers reviewed there are 4 cases of death reported, 2 of the victims^[11,17] received medications only, 1 died of a heart attack 8 days after a successful percutaneous interventional removal of a fish bone,^[44] the last victim died of pre-/intraoperative misdiagnosis of fish bone induced hepatic abscesses.^[20] These reported cases underline the lifesaving effect of early diagnosis and proper way of treatment for this potentially lethal condition.

In summary, we report a rare case of enterohepatic migration of an ingested fish bone mimicking liver neoplasm and is successfully removed by laparoscopy. To the best of our knowledge, it is the shortest (1.7 cm) enterohepatic migrated foreign body removed by laparoscopy ever reported. A review of the literature highlights the crucial role of CT scan in this rare condition. The key to make this potentially difficult diagnosis is to have a high index of clinical suspicion. As employed in our case, the minimally invasive procedure of laparoscopy is

technically feasible and safe for both diagnosis and treatment of patients with foreign body ingestion, particularly when the gastrointestinal tract perforation and/or abscess formation is suspected. Conservative observation of an asymptomatic ingested foreign should be treated with caution. Early diagnosis and decisive treatment in time are vital in patients with life-threatening conditions.

Author contributions

Chao Wang and Jun Chen wrote the original draft and edited it. Jianyong Zhuo, Xue Wen participated in the specimen and data collection. Qi Ling, Haijun Guo and Zhikun Liu searched the library and found the resource. Xiao Xu, Shusen Zheng conceived of the study, and participated in its design and coordination and helped to draft the manuscript. All authors read and approved the final manuscript.

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