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Significance of MRI in Bouveret's Syndrome

Impaction of a big gallstone in the duodenum, after migration through a bilioduodenal fistula, causing gastric outlet obstruction (GOO) is known as Bouveret's syndrome. In computed tomography (CT), pneumobilia and calcified bile stone in duodenal bulb leading to GOO is typical for diagnosis. Most of the cases presented to date are diagnosed with CT and their imaging features were discussed. On the other hand, there are very few published researches about the magnetic resonance imaging (MRI) findings of Bouveret's syndrome. In this paper, a case of Bouveret's syndrome diagnosed with MRI is discussed in the view of the present literature.

KEY WORDS: Bouveret's syndrome, Cholecystoduodenal fistula, Gastric outlet obstruction, Gallstone ileus, MRI

Introduction

Bouveret syndrome described by Leon Bouveret who reported two cases of GOO in 1896 [1]. It is reported that the syndrome's prevalence is highest among old people (with a median age of 74.1), females (65%) and patients with more than one comorbidity [2]. Therefore, endoscopic treatments are preferred since surgical treatments are associated with high mortality rates. When endoscopic interventions fail, simple surgical treatments such as duodenotomy, gastrotomy and stone extraction are performed [3].

Case Report

An 80-year-old male patient with a past medical history of cerebrovascular disease and hypertension was presented to the emergency department with complaints of nausea, vomiting and abdominal pain for about 1 month. On physical examination, distention in abdomen and pain in the epigastric region were revealed. On laboratory evaluation, his leukocyte count was 19 600, creatinine was 1.37 mg/dl, alkaline phosphatase was 67 U/L, and total bilirubin was 1.05 mg/dl. Contrast-enhanced CT revealed severe dilatation in the stomach, an isodense (isoattenuation to fluid) lesion in the duodenal bulb and air in the intrahepatic biliary ducts (Fig. 1A, B). MRI was applied to the patient since the diagnosis could not be made properly with these findings. A 3 cm gallstone in the duodenum leading to gastric outlet obstruction and a cholecystoduodenal fistula tract were visualized (Fig. 2A, B). With these findings, Bouveret's syndrome diagnosis was made for the patient. After nasogastric tube insertion and intravenous fluid resuscitation, the patient was taken to endoscopic examination. During the gastroscopy, a large gallstone just distal to the pyloric opening, located in the bulb was observed (Fig. 3). Unfortunately, all of the endoscopic attempts for stone

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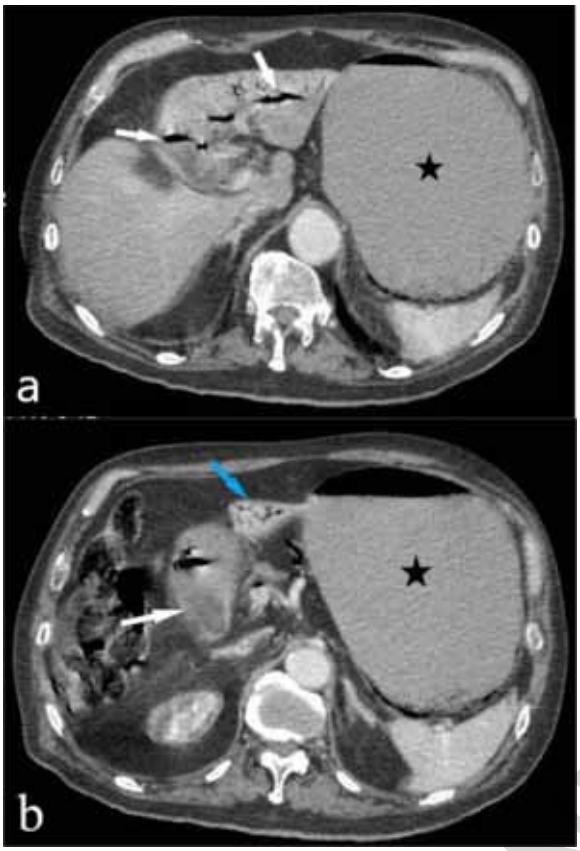

Fig. 1: Contrast enhanced axial CT; A) Pneumobilia (white arrow) and gastric outlet obstruction appearance (black asterix); B) Isodense lesion at duodenal bulb (white arrow), pneumobilia (blue arrow) and gastric outlet obstruction appearance (black asterix).

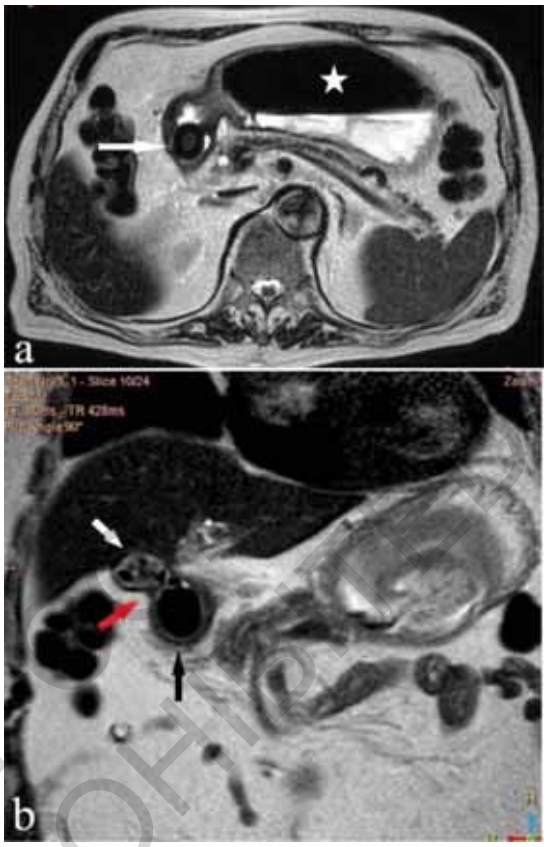

Fig. 2: A) Axial T2 MRI: Gall Stone, hypointense at periphery and hyperintense centrally (white arrow), causing gastric outlet obstruction at duodenal bulb (white asterix); B) Coronal T2 MRI: cholecystoduodenal fistul tract (red arrow), signal void appearance gall stone at duodenal bulb (black arrow) and gall bladder (white arrow).

extraction, accompanied by fluoroscopy were failed. As a result, the patient was taken into operation.
Intraoperative findings at gastrotomy showed a 3 cm impacted stone in the bulbus (Fig. 4) and was extracted (Fig. 5). After the gastrotomy closure, it was seen that the passage from pylorus to duodenum was sufficient. Hence, no additional surgical procedures were performed. A temporary and mild cerebrovascular attack developed in the early postoperative period. The patient was discharged uneventfully on the 14th postoperative day.

Discussion

Gallstones are still one of the most common health problems and develop signs/symptoms of complication with a rate of 6%. Among these complications, gallstone ileus is one of the rare ones. In etiology, development of a biliary enteric fistula is blamed for ileus. Fistulas can be caused by chronic inflammation due to the pressure of the stone in the gallbladder or common bile duct adjacent to the intestinal segment, impaired arterial blood flow, reduced venous drainage, the development of pressure necrosis in the intestinal wall and ultimately the passage of the stone into the intestinal system [4]. The most common form of biliary enteric fistula is cholecystoduodenal fistula (with a rate of *60%).*
Choledochoduodenal, cholecystocolic, choledochocolic and cholecystogastric fistulas are other less common forms of fistula. Gallstone ileus most often develops in the terminal ileum (60-70%). It can also develop in proximal ileum (25%), distal jejunum (10%), colon, duodenum and distal stomach. More rarely, gallstones pass through the cholecystoduodenal or cholecystogastric fistula, leading to gastric outlet obstruction by lodging in the pylorus or proximal part of the duodenum; which is known as Bouveret's syndrome (2-3%) [5].
The most common symptoms in Bouveret's syndrome are nausea, vomiting (86%) and epigastric abdominal pain (71%).In addition to these, cases presented with upper gastrointestinal hemorrhage, weight loss and anorexia have also been reported. On physical examination, tenderness, distension and dehydration findings are also common [2]. One of the first examinations to be made in diagnosis is plain abdominal radiography. The rate of diagnosis is 20% when pneumobilia and calci-

Fig. 3: Endoscopic appearance of impacted gall stone at duodenal bulb.

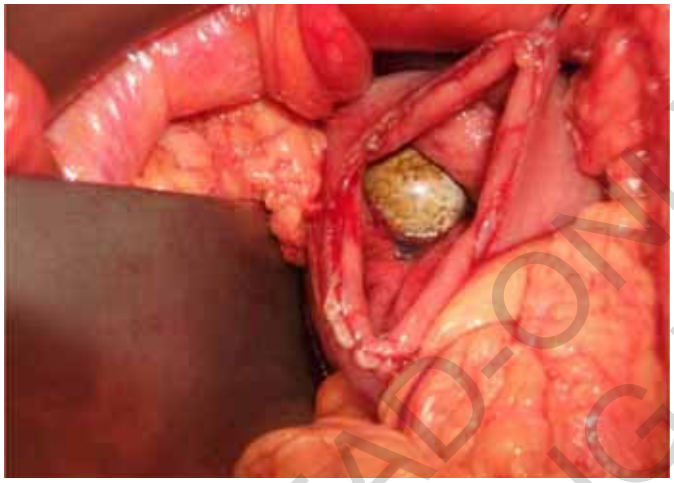

Fig. 4: Stone at bulb, after gastrotomy.

fied mass (stone) are detected in direct abdominal films. The diagnosis is usually made with CT (with a rate of 60%). Typical signs of Bouveret's syndrome in CT are pneumobilia and impacted calcified gallstones in duodenum [6]. As in the presented case here, in 15-25% of cases, the exact diagnosis may be difficult to be made because impacted stone may appear isodense to adjacent fluid (Fig. 1B). In such cases, MRI helps a lot for a proper diagnosis [7]. In MRI, gallstones are best seen as signal voids in T2- sequences. According to the structural features of gallstones, peripheral hypointensity can be seen as central in T2 sequences (Fig. 2A). It is generally difficult to define the cholecystoduodenal fistula tract directly in CT or MRI visualizations. In our case, the fistula tract was demonstrated in MRI (Fig. 2B). The exact diagnosis of Bouveret's syndrome is made by gastroscopy. In gastroscopy, impacted large gallstones, leading to duodenal or gastric outlet obstruction are observed (Fig. 3).

Fig. 5: Extracted gall stone.

Cases with Bouveret syndrome are usually observed in elderly people and patients with more than one comorbidity. Therefore, the most preferred treatment modality is endoscopic stone removal. In the endoscopic intervention; forceps of different sizes and shapes, biliary balloons, basket catheters, and side view duodenoscopes are used. The success rate in these methods is about 10%. In addition to these, endoscopic lithotripsy, extracorporeal lithotripsy, and intracorporeal electrohydraulic lithotripsy are also suggested interventions [4]. However, endoscopic treatment failure is still 42% which is linked to the size of the stone by current papers. In our case, the stone size was 3 cm and it was the main reason behind our choice of surgical decision.

In surgical treatment, enterotomy and stone extraction (enterolithotomy), cholecystectomy and fistula repair can be performed. In the presence of a patent ductus cysticus, and if there is no residual stone in the gallbladder, it is unnecessary to perform fistula repair since the bilioenteric fistula would be largely self-sealing. In the literature, enterotomy and stone extraction are defined as adequate treatment modalities. In other surgical treatments, the mortality rate may rise up to 30%.

Conclusion

MRI is extremely useful, for showing cholecystoduodenal fistula and especially in cases of undiagnosed isodense gallstones causing gastric outlet obstruction. The first treatment option in Bouveret's syndrome is endoscopic intervention. In cases where endoscopic treatment is unsuccessful, the simplest surgical treatment, enterolithotomy, should be preferred.

Riassunto

L'arresto di un grosso calcolo biliare nel duodeno, perché migrato attraverso una fistola bilioduodenale, con conseguente ostruzione al deflusso del chimo gastrico

(gastri outlet obstruction - GOO) costituisce la sindrome di Bouveret. Per la diagnosi la tomografia computerizzata (TC), può dimostra pneumobilia e la calcificazione del calcolo biliare nel bulbo duodenale, che rappresentano i segni tipici che portano alla diagnosi di GOO. La maggior parte dei casi presentati fino ad oggi viene perciò diagnosticata con TC e le caratteristiche dell'imaging sono state discusse. D'altra parte, ci sono pochissime ricerche pubblicate sui risultati della risonanza magnetica (MRI) della sindrome di Bouveret. In questo articolo, un caso di sindrome di Bouveret diagnosticato con MRI è discusso nella visione della presente letteratura.

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