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Case Report

Look, but to the left: A rare case of gallbladder sinistroposition and comprehensive literature review

Talal Almas [a,*], Muhammad Faisal Murad [b], Eyad Mansour [a], Muhammad Kashif Khan [b], Muneeb Ullah [b], Faisal Nadeem [b], Adil Shafi [b], Tarek Khedro [a], Mohammad Almuhaileej [a], Abdulaziz Abdulhadi [a], Abdulaziz Alshamlan [a], Vikneswaran Raj Nagarajan [a], Emad Mansoor [c]

[a] Royal College of Surgeons in Ireland, Dublin, Ireland
[b] Department of Surgery, Maroof International Hospital, Islamabad, Pakistan
[c] Division of Gastroenterology and Liver Disease, University Hospitals Cleveland Medical Center, Case Western Reserve University, Cleveland, OH, USA

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ABSTRACT

Left-sided gallbladder (LSGB) is a rare anatomic variation that, while benign in the context of its transposition, is of significant intraoperative importance. Due to its association with other anatomic anomalies involving key structures in the hepatobiliary system, discovering it intraoperatively as opposed to preoperatively suddenly increases the difficulty of a gallbladder procedure.

1. Introduction

Sinistroposition gallbladder or a left-sided gallbladder (LSGB) is a seldom anatomic aberration in which the gallbladder is located below the left lobe of the liver [1]. This anatomical aberration can be divided into three different anatomical abnormalities, including situs visceral inversus, right left-sided gallbladder, and true left-sided gallbladder [2].

Left-sided gallbladder (LSGB) is a term that describes an abnormally situated gallbladder, which exists in three different forms. The first form is a gallbladder that is located at the left upper quadrant of the abdomen as part of situs viscerus invertus (SVI); the entire content of the abdomen is situated in a mirrored position of the normal anatomical position. A LSGB that is not part of SVI is subcategorized into a true left sided gallbladder and a right sided gallbladder with abnormally located ligamentum teres. The former is located under segment III of the liver, to the left of ligamentum teres and the falciform ligament. The latter is considered a left sided gallbladder due to ligamentum teres abnormal translocation to the right side and is located under segment IVb of the liver [2].

The majority of the cases reported are correlated with a right-sided falciform ligament and are also known as a false left-sided gallbladder [3,4]. If the falciform ligament was not on the right side, it is known as a true-sided gallbladder, which is incredibly rare [4].

In 1886, Hochstetter was the first to describe the LSGB without situs viscerum inversus [5]. Ever since it was discovered, its prevalence has remained low, ranging between 0.04% and 1.1% [6]. In this case, the LSG is a solitary finding, in that the remaining viscera maintain their ordinary anatomical location.

Gallbladder diseases typically prompt urgent surgical intervention [7], which is when most cases of LSGB are in fact diagnosed. Moreover, it is usually associated with anatomical variation, including biliary tract anomaly, portal vein anomaly, liver segment IV atrophy, or alteration in the hepatobiliary anatomy [1]. This variation unfortunately confers a higher risk of bile tract injury during the surgery, requiring more delicate and careful operation [8].

Therefore, it is crucial to suspect the anomaly prior to the operation in order to prevent devastating injuries to the vascular and biliary structures. The unintentional ligation of the bile duct and left branch of the portal vein, for example, may compromise three-quarters of the liver blood supply, consequently leading to liver failure, biliary congestion, and eventually biliary leakage [9].

In our case, we report a rare finding of a left-sided gallbladder located underneath the left lobe of the liver and to the left of the falciform ligament with no other remarkable abnormalities. Consent was obtained from the patient prior to the writeup of the present case report. The current study has been reported in accordance with the SCARE criteria [9].

* Corresponding author. Royal College of Surgeons in Ireland, 123 St. Stephen's Green, Dublin, Ireland.
E-mail address: Talalalmas.almas@gmail.com (T. Almas).

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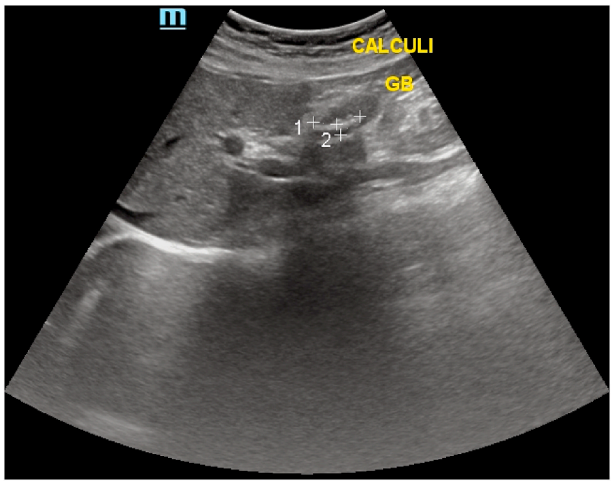

Fig. 1. Right upper quadraxnt ultrasound showing multiple calculi.

2. Case presentation

A 33-year-old married female presented to us with right hypochondrium pain radiating to both shoulders and back associated with nausea for the last 5 months. She noticed the episodes were increasingly distressing whenever she consumed fatty food. No comorbid conditions were present. General physical and systemic examination were unremarkable.

Her complete blood count and liver function tests were within normal limits. Abdominal ultrasound, however, presented multiple gallstones with no pericholecystic fluid, no gallbladder wall thickness and a normal calibre common bile duct (Fig. 1 and Fig. 2). However, this information was insufficient to conclude whether the gallbladder was an anatomic variant. It was only during the operative course that the aberrant anatomic location of the gallbladder was discovered.

She was planned for elective laparoscopic cholecystectomy. She tested positive for COVID-19 prior to surgery, and therefore the patient was deferred for surgery. Three weeks later, when the patient tested negative, she was admitted, and laparoscopic cholecystectomy was performed.

Per-operative findings after diagnostic laparoscopy showed a variant anatomy with the gallbladder located underneath left lobe of liver just below and to the left of falciform ligament (Figs. 3–5**).**The patient was discharged within 24 hours, and the recovery time was unremarkable.

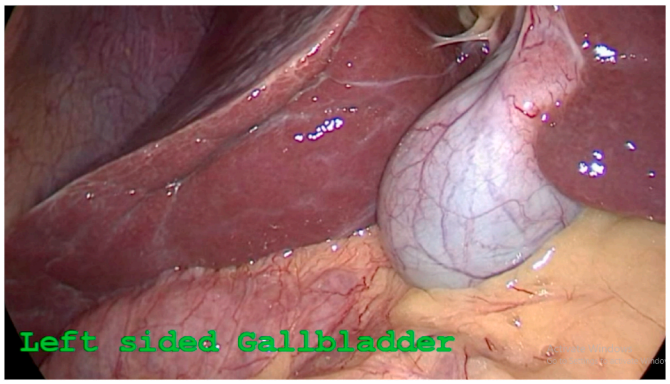

Fig. 3. Intraoperative image divulging a left-sided gallbladder.

Fig. 4. Port sites were modified for better and safer progress for surgery.

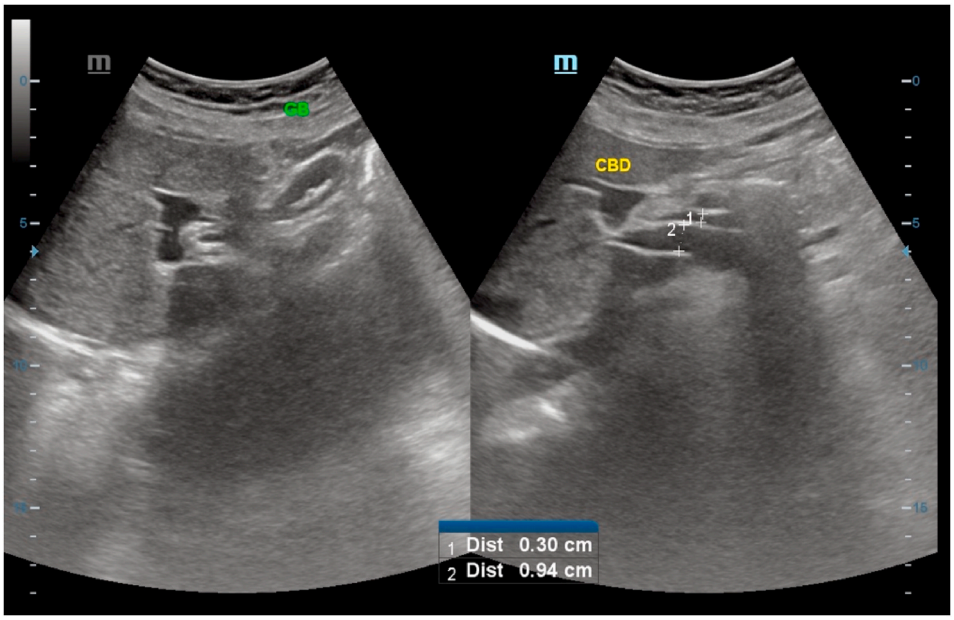

Fig. 2. Left: Gallbladder replete with gallstones**. Right**: Common bile duct with normal calibre and morphology.

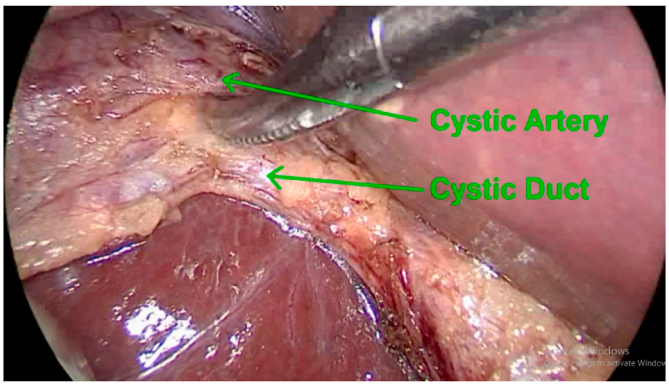

Fig. 5. Intraoperative image demonstrating cystic artery and cystic duct.

3. Discussion

The gallbladder is a hollow organ that is responsible for the production and storage of bile and bile salts, and it is normally located in the right upper quadrant of the abdomen. Anatomically, the gallbladder lies beneath the liver segments IV and V and has an inferior peritoneal surface [10]. In most people, the gallbladder is located to the right of the falciform ligament, whereas in 0.04%–1.1% it is abnormally located to the left side [11].

Embryologically, three main processes explain the development of LSGB without SVI. The first process involves normal embryological development of the cholecystic bud from the hepatic diverticulum. The bud then migrates to the left side and becomes situated under the liver. The second processes describe the development of a gallbladder on each side of ligamentum teres. The left sided gallbladder persists while the right sided gallbladder gradually atrophies and disappears [12]. As stated in categorisation of LSGB, the development can be attributed to the abnormal location of ligamentum teres in the right side.

Inflammation of the gallbladder, cholecystitis, classically presents with right upper quadrant abdominal pain, nausea, vomiting, and fever; with the pain may also radiate to the right shoulder and/or the back, as seen in our patient [13]. The malposition of the gallbladder to the left side does not affect the neural supply or the innervation as the central nervous system does not transpose. Therefore, gallbladder disease such as cholecystitis presents with typical signs and symptoms in 75% of patients with LSGB [14,15]. This, in addition to the fact that LSGB is rarely diagnosed by preoperative ultrasonography alone, most of the cases are only diagnosed intraoperatively. While ultrasonography falls short for LSGB, other imaging modalities such as magnetic resonance cholangiography and computerized tomography cholangiography are beneficial in detailing the anatomy and confirming a LSGB [14,16]. In practice, other findings can raise the suspicion of LSGB, including abnormal intrahepatic portal vein branching or an absent liver segment IV [8]. Furthermore, other anatomical variations in the hepatobiliary,

Table 1
MR = magnetic resonance. US = ultrasound. CT = computed tomography. TB = tuberculosis.

	Age and sex	Patient characteristics	Radiological findings	Surgical treatment	Intraoperative findings
Saafan et al. [2]	26 F	Recurrent RUQ colicky pain, nausea, vomiting for 2 months, history of PCOS	US Abd: contracted gallbladder with large 1.8 cm stones. MRI Abd: gallbladder located left of ligamentum teres hepatis inferior to segment III	Laparoscopic cholecystectomy with four-port technique	LSGB diagnosed
Nagendram et al. [8]	35 F	RUQ pain for 2–3 months post-vaginal birth	US Abd: gallstones	Laparoscopic cholecystectomy	Gallbladder against left lobe of liver between segments III and IV, left of falciform ligament. Cystic duct was narrowed
Colovic et al. [17]	42 F	8-year history of intermittent epigastric pain	–	Open surgery for symptomatic liver cyst	LSGB incidentally diagnosed intraoperatively; attached to inferior surface of left lateral hepatic segment to the left of the round ligament
Colovic et al. [17]	70 F	15-year history of recurrent biliary colic	US Abd: gallbladder stone and liver cyst	Open surgery	LSGB incidentally diagnosed intraoperatively; cystic duct anatomy was normal, joining the common bile duct from the right side
Pereira et al. [18]	56 M	Biliary colic	MR cholangiopancreatography: gallbladder left of falciform ligament and cystic duct entering common hepatic duct	Laparoscopic cholecystectomy	LSGB diagnosed
Hirohata et al. [23]	86 M	Acute upper abdominal pain	CT Abd: gallbladder centrally dislocated, wall enhancement discontinued. MRI Abd: gallbladder thickened and swollen	Laparoscopic cholecystectomy with flexible and optimal port site	LSGB diagnosed, round ligament attached to right side of gallbladder
Printes et al. [24]	60 M	Admitted with severe RUQ pain, hypertensive, history of pleural TB and biliary lithiasis	US Abd: suggestive of biliary lithiasis	Laparoscopic cholecystectomy and umbilical herniorrhaphy	LSGB diagnosed, found in left hepatic lobe, with thin walls and stones
Di Bella et al. [25]	72 F	Admitted due to acute cholecystitic	–	Open surgery from initial explorative laparoscopy	LSGB diagnosed during explorative laparoscopy
Roli et al. [26]	76 F	Admitted due to acute cholecystitis	–	Laparoscopic cholecystectomy	LSGB diagnosed during laparoscopy
Nguyen et al. [27]	49 F	Admitted due to intermittent RUQ pain for 3 days	US Abd: cholelithiasis without dilatation of the bile ducts	Laparoscopic cholecystectomy	LSGB diagnosed during laparoscopy, cystic duct joined the common hepatic duct on the right side, and the cystic artery crossed anterior to the common bile duct in a right-to-left direction
Zoulamoglou et al. [28]	31 M	6-month history of colicky RUQ pain that progressed over 3 days and radiated to right flank	US Abd: gallstone about 18 mm in diameter	Laparoscopic cholecystectomy	LSGB diagnosed during laparoscopic cholecystectomy; attached to inferior hepatic segment III and left of the round ligament

gastrointestinal, and the genitourinary system have been associated with LSGB, with those of the hepatobiliary system being more common. These variations include an underdeveloped or a duplicated common biliary duct, infra-portal bile duct, and pancreatic anomalies like annular pancreas and dorsal pancreas agenesis [15,17]. Gastrointestinal anomalies include duodenal malrotation and polysplenia whereas the genitourinary anomalies include intrapelvic ectopic testes [17].

Although laparoscopic cholecystectomy of a LSGB is safe, it is associated with higher risk of complications such as common bile duct injury [18,19]. Therefore, surgeons are advised to have a more careful approach by limiting diathermy use as well as careful division of structures to avoid potential intraoperative injury [16]. Some studies even recommend additional measures such as the use of intraoperative cholangiogram as it might be useful in verifying the biliary tract anatomy [20]. Modifying the laparoscopic port sites is also suggested by some studies to improve surgical outcomes and to minimise the risk of potential complications [20,21]. In order to better study the underlying anatomical aberration, we conducted a comprehensive literature search. The results obtained are delineated by Table 1 below [22–29].

4. Conclusion

Laparoscopic cholecystectomy is a generally safe procedure, even in the rare case of a LSGB. Most cases of a LSGB are diagnosed intraoperatively, and this sudden discovery during the procedure can increase the difficulty, duration, and stress of the procedure due to the other potential anatomic anomalies that LSGB is associated with in the hepatobiliary system. Therefore, the identification of the LSGB should ideally be done preoperatively, a strategy that is also hindered by a few key factors: it is an extremely rare anatomic anomaly, it does not present with any characteristic clinical signs or symptoms, and it is not easily identifiable on ultrasonography's relatively low-resolution. Surgeons should be aware of the techniques that can be utilized intraoperatively in order to minimize the risk of complications and improve patient outcomes.

Provenance and peer review

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Ethical approval

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Disclosures

N/A.

Declaration of competing interest

N/A.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amsu.2021.103016.

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