

# A common procedure with a rare anatomical finding: a case report on a true left-sided gallbladder

Kees de Mooij, Maikel Bakens, Erik de Loos, Jan Stoot

Department of Surgery, Zuyderland Medical Center, Heerlen, Sittard-Geleen, The Netherlands

Correspondence to: Maikel Bakens. Department of Surgery, Zuyderland Medical Center, Heerlen, Sittard-Geleen, The Netherlands.

Email: m.bakens@zuyderland.nl.

**Abstract:** Left-sided gallbladders (LSG) are a rare group of congenital anomalies that are mainly discovered intraoperatively. The gallbladder can be situated on the left side in case of situs inverses or an abnormally right placed ligamentum teres hepatis. A true LSG (T-LSG) with no further congenital variation is a more infrequent presentation with a prevalence of 0.04–0.30%. We present a case report of a middle-aged woman with abdominal symptoms suggestive for cholecystolithiasis. While ultrasonography confirmed the diagnosis, it failed to diagnose the T-LSG preoperatively and thus no further imaging was performed. During the laparoscopic cholecystectomy the congenital anomaly was found but no surgical modifications were needed to guarantee an uneventful removal of the T-LSG. Postoperatively the patient was discharged the same day, no histological abnormalities were reported. Clinical symptoms in the case of a T-LSG do not differ from a normally positioned gallbladder; moreover, the variation is often missed on imaging. Upon finding a T-LSG intraoperatively surgeons can alter their port placement or patient positioning to ensure a better critical view of safety, we report a case in which these adjustments were not necessary to safely remove the gallbladder. However, surgeons should be aware of the altered biliary anatomy associated with T-LSG and adjust the procedure to their own preference in order to safely remove the gallbladder without the occurrence of intra- or postoperative complications.

**Keywords:** Laparoscopic cholecystectomy (LC); anatomy; anomaly

Received: 21 June 2018; Accepted: 07 August 2018; Published: 10 September 2018.

doi: 10.21037/jovs.2018.08.07

View this article at: <http://dx.doi.org/10.21037/jovs.2018.08.07>

## Introduction

Cholecystectomy is one of the most performed surgical procedures worldwide. It comprises the removal of the gallbladder for various indications such as symptomatic gallstones, cholecystitis, gallstone pancreatitis or malignancies of the gallbladder. Since the first performance by Mühe in 1985, laparoscopic cholecystectomy (LC) has become the standard procedure with only a small percentage of conversion (1). LC has minor and acceptable postoperative morbidity and mortality, provided that the patient has a normal anatomy.

The gallbladder lies in the gallbladder fossa beneath hepatic segments IVb and V (2). During the 4th gestational week of the embryological development the biliary system starts to develop from the duodenum by forming a hepatic

diverticulum, from this hepatic diverticulum the hepatic part will form the liver and the cystic part the biliary tree (3). Multiple congenital variations of normal anatomy of the gallbladder are known, such as agenesis, duplication, multiseptate, ectopic, and wandering gallbladder (4). In addition, variations in locations have been described as the gallbladder can be found intrahepatic, with transverse or retroverse displacement, or left-sided (5). Left-sided gallbladders (LSG), or sinistroposition, are a group of congenital anomalies that were described for the first time by Hochstetter in 1856 (6). LSG consists of three types; LSG intrinsic to situs viscerum inversus (S-LSG), LSG with an abnormally right-located falciform ligament (R-LSG), or true LSG (T-LSG) (7). A T-LSG is located left from a normally positioned ligamentum teres hepatis (LTH)



**Figure 1** Laparoscopic cholecystectomy of a true left-sided gallbladder (9).

Available online: <http://www.asvide.com/article/view/26975>

underneath the left hepatic lobe with the cystic artery crossing the common bile duct (CBD) from right to left. Sinistroposition has a prevalence of 0.1–1.1%, yet T-LSG is even more infrequent with a prevalence of 0.04–0.30% (8).

We report a case of a patient with a T-LSG that underwent LC for symptomatic gallstones at the Zuyderland Medical Center in The Netherlands.

## Case presentation

### *Patient and pre-operative work-up*

A 52-year-old female was seen at the outpatient clinic with colicky pain localized in the right upper quadrant of the abdomen, specifically arising after the ingestion of fatty meals. The colicky pain radiated to the back and had been present for two months before the consultation, without symptoms of obstruction, such as jaundice, colored urine, or pruritus. The patient did not smoke, did not take any medication, was allergic to succinylcholine, and had a non-contributing medical history. Besides her obesity, no aberrant findings were found with the physical examination.

The pre-operative work-up for symptomatic gallstones included abdominal ultrasonography and routine laboratory tests. The abdominal ultrasonography showed a thin-walled gallbladder containing multiple gallstones and the liver parenchyma had a diffusely increased echogenicity indicating steatosis hepatis. The abdominal ultrasonography was further reported as normal with slender intra- and extrahepatic bile ducts. Moreover, the routine laboratory tests showed mildly increased alkaline phosphatase, serum transaminases, gamma-glutamyl transferase, and cholesterol.

### *Pre-operative preparation*

Routine laboratory tests and electrocardiography (ECG) were performed in the context of pre-operative preparation.

### Equipment preference card

Materials used for laparoscopy were Olympus Visera Elite OTV-S190 and Olympus Visera Elite CLV-S190. The camera that was used was the Olympus Endoeye 10 mm 30 degree.

### Procedure

A routine LC was performed. The T-LSG was observed when introducing the camera subumbilical after a pneumoperitoneum was created by Veress needle. LTH was normally positioned. We started dissection in order to create a critical view of safety. The cystic artery was dissected by coagulation and clips were placed. Next, we clipped the CBD. No further anatomic variations were observed and the cholecystectomy was performed without complications. A video of the procedure is available online following the link in *Figure 1*.

### *Role of team members*

The team consisted of a gastrointestinal surgeon and a resident in surgery performing the surgical procedure. Furthermore, an anesthesiologist, an anesthesiology assistant and two surgical assistants were part of the team. Introduction of the trocars was done by the resident. The cholecystectomy was performed by the gastrointestinal surgeon.

### Post-operative management

Post-operatively the patient recovered swiftly and was discharged home the same day, within 6 weeks she returned to the outpatient clinic for wound inspection and check-up. No histological abnormalities were reported.

## Discussion

Multiple embryological explanations have been suggested for the existence of LSG without situs inverses. One theory describes the development of two gallbladders adjacent to the LTH during the early embryological stages. The main gallbladder on the right side of the LTH will show atrophy

and eventually disappear. This concept explains a cystic duct which drains the left hepatic duct or the CBD on the left side. Another theory suggests that the gallbladder initially develops normally from the hepatic diverticulum, however, the connection with the developing left lobe of the liver induces a migration of the gallbladder to the left of the LTH (10). This modality explains the long cystic duct that crosses the CBD from left to right and drains the latter on the right side. None of the theories mentioned above can fully explain a T-LSG, the exact mechanism of the aberrant development of T-LSG remains unknown.

While some cases describe the identification of T-LSG pre-operatively, most cases with this congenital anomaly are discovered intra-operatively (11). Since the visceral pain fibers do not transpose with the gallbladder, a patient with T-LSG will still experience right upper quadrant abdominal pain radiating to the back with a positive Murphy's sign with cholecystitis (12).

Although it is not possible to distinguish a T-LSG on clinical symptoms, it can be diagnosed with MRI or CT-cholangiography. A number of anatomical variations are associated with a T-LSG, i.e., complete or partial situs inverses, atrophy of hepatic segment IV, duplicated or hypoplasia of the CBD, intrahepatic bile ducts, and abnormal pancreato-biliary junction (13). If these variations are found on imaging, the presence of a T-LSG should be taken into account. Clarifying anatomy pre-operatively is paramount to ensure the surgeon is well prepared and the risk of complications is minimized.

LC on a T-LSG is associated with a higher risk on intra-operative and post-operative complications (14). This is partially due to the higher incidence of aberrant biliary anatomy in T-LSG, while abnormalities of the portovenous system are of less importance during LC (8). The inability to recognize a T-LSG can cause complications such as bile leakage, liver failure, and liver resection (15).

If T-LSG is diagnosed pre-operatively, the traditional LC port placing can be adjusted to ensure better exposure of Calot's triangle and other critical structures (16). Different case reports have suggested altered port placing, such as mirror-image port placing on the left side, accessory port placing, modifications of the sub-xiphoid trocar, or a single-incision dual-port approach (17-20). While the patient is usually positioned left-side up with LC, when using the mirror-image port placing the patient can be placed in lithotomy to ensure better surgical accessibility (19,21). Some case reports suggest that when a T-LSG is diagnosed intra-operatively, an intra-operative cholangiogram

should be performed to clarify biliary anatomy before the dissection of the T-LSG takes place (8,16). This dissection can be performed both normograde and fundus-first retrograde since no statement on the outcome has been made regarding the manner of dissection. Lastly, when critical view cannot be acquired, converting to an open resection is endorsed to minimize the risk of complications.

### *Tips, tricks and pitfalls*

As demonstrated by this case report, it is possible to perform a LC with traditional port placement and patient positioning without pre-operative MRI or CT-cholangiography. However, to minimize the risk on intra- and postoperative risks we suggest an MRI- or CT-cholangiography is made when the aberrant anatomy is diagnosed pre-operatively. When the anomaly is found intra-operatively a cholangiogram may be performed in case of doubt. Regarding the port placement and patient positioning, there is no clear evidence to establish a certain preference, and this should be performed by surgeon's preference in acquiring critical view of safety.

### **Conclusions**

A T-LSG is a rare congenital anomaly that every surgeon performing LCs should be able to identify. Whether it is found pre-operatively or intra-operatively, effort should be taken to clarify biliary anatomy since T-LSG is associated with aberrant anatomy. This anomaly may increase the risk of intra- and postoperative complications. Regarding the LC, traditional patient positioning and port placement can be used. It should be performed by surgeons' preference in order to acquire critical view of safety.

### **Acknowledgments**

*Funding:* None.

### **Footnote**

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/jovs.2018.08.07>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related

to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

**Open Access Statement:** This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

## References

1. Reynolds W Jr. The first laparoscopic cholecystectomy. *JLS* 2001;5:89-94.
2. Castaing D. Surgical anatomy of the biliary tract. *HPB (Oxford)* 2008;10:72-6.
3. Ando H. Embryology of the biliary tract. *Dig Surg* 2010;27:87-9.
4. Gross RE. Congenital anomalies of the gallbladder: A review of one hundred and forty-eight cases, with report of a double gallbladder. *Arch Surg* 1936;32:131-62.
5. Nagendram S, Lynes K, Hamade A. A case report on a left sided gallbladder: A rare finding during cholecystectomy. *Int J Surg Case Rep* 2017;41:398-400.
6. Newcombe JF, Henley FA. Left-Sided Gallbladder. A Review of the Literature and a Report of a Case Associated with Hepatic Duct Carcinoma. *Arch Surg* 1964;88:494-7.
7. Quah GS, Ng IE, Punch G, et al. True left-sided gallbladder: a rare anatomical anomaly and its associated surgical challenges. *ANZ J Surg* 2018. [Epub ahead of print].
8. Abongwa HK, De Simone B, Alberici L, et al. Implications of Left-sided Gallbladder in the Emergency Setting: Retrospective Review and Top Tips for Safe Laparoscopic Cholecystectomy. *Surg Laparosc Endosc Percutan Tech* 2017;27:220-7.
9. de Mooij CM, Bakens MJ, de Loos ER, et al. Laparoscopic cholecystectomy of a true left-sided gallbladder. *Asvide* 2018;5:740. Available online: <http://www.asvide.com/article/view/26975>
10. Alharthi S, Bernon M, Krige JE. Beware the left-sided gallbladder. *S Afr J Surg* 2012;50:88-9.
11. Ishii H, Noguchi A, Onishi M, et al. True left-sided gallbladder with variations of bile duct and cholecystic vein. *World J Gastroenterol* 2015;21:6754-8.
12. Qureshi I, Awad Z. Aberrant presentation of the gallbladder during laparoscopic cholecystectomy. *JLS* 2009;13:605-7.
13. Bender EA, Springhetti S, Shemisa K, et al. Left-sided gallbladder (sinistroposition) with duplication of the common bile duct. *JLS* 2007;11:148-50.
14. Moo-Young TA, Picus DD, Teefey S, et al. Common bile duct injury following laparoscopic cholecystectomy in the setting of sinistroposition of the gallbladder and biliary confluence: a case report. *J Gastrointest Surg* 2010;14:166-70.
15. Velimezis G, Vassos N, Kapogiannatos G, et al. Left-sided Gallbladder in the Era of Laparoscopic Cholecystectomy: A Single-center Experience. *Am Surg* 2015;81:1249-52.
16. Nastos C, Vezakis A, Papaconstantinou I, et al. Methods of safe laparoscopic cholecystectomy for left-sided (sinistroposition) gallbladder: A report of two cases and a review of safe techniques. *Int J Surg Case Rep* 2014;5:769-73.
17. Bonomo SR, Veenstra BR, Komar TM, et al. Single-incision cholecystectomy for left-sided gallbladder. *JLS* 2014;18:338-41.
18. Donthi R, Thomas DJ, Sanders D, et al. Report of laparoscopic cholecystectomy in two patients with left-sided gallbladders. *JLS* 2001;5:53-6.
19. Reddy PK, Subramanian RV, Yuvaraja S. Laparoscopic cholecystectomy for left-sided gallbladder (sinistroposition). *JLS* 2005;9:356-7.
20. Zografos GC, Lagoudianakis EE, Grosomanidis D, et al. Management of incidental left-sided gallbladder. *JLS* 2009;13:273-5.
21. Zoulamoglou M, Flessas I, Zarokosta M, et al. Left-sided gallbladder (Sinistroposition) encountered during laparoscopic cholecystectomy: A rare case report and review of the literature. *Int J Surg Case Rep* 2017;31:65-7.

doi: 10.21037/jovs.2018.08.07

**Cite this article as:** de Mooij K, Bakens M, de Loos E, Stoot J. A common procedure with a rare anatomical finding: a case report on a true left-sided gallbladder. *J Vis Surg* 2018;4:192.