Laparoscopic cholecystectomy for a left-sided gallbladder

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Abstract

Cholecystectomy is a common procedure. Abnormalities in the anatomy of the biliary system are common but an abnormal location of the gallbladder is much rarer. Despite frequent pre-operative imaging, the aberrant location of the gallbladder is commonly discovered at surgery. This article presents a case of a patient with the gallbladder located to the left side of the falciform ligament in the absence of situs inversus totalis that presented with right upper quadrant pain. A laparoscopic cholecystectomy was performed and it was noted that the cystic duct originated from the right side and that critical view was established with the identification of the cystic artery. The spectrum of the possible anomalies associated with left sided gallbladders is wide but does not preclude the successful performance of a minimally invasive cholecystectomy or any other hepatobiliary procedure.
CASE REPORT

The patient is a 64-year-old female with multiple medical problems including type II diabetes mellitus, a history of deep venous thrombosis and pulmonary embolism, kidney stones and hypertension who presented to the hospital with a five day history of sharp, right-sided abdominal pain radiating to her epigastric area, chest, bilateral back, right flank and right shoulder. This was the first time patient experienced this kind of pain, and she denied history of prior cholecystitis. She had a history prior extracorporeal shockwave ureteral lithotripsy, but the admitting discomfort was different from that of prior renal colic. Three months prior to the admission, the patient had colonoscopy and esophagogastroduodenoscopy, which were normal.

On physical examination she had stable vital signs and was afebrile. The abdomen was nondistended and nontender. Laboratory data on admission revealed a normal white cell count, normal total bilirubin, normal alkaline phosphatase, normal aspartate aminotransferase (AST) and normal alanine aminotransferase (ALT) amylase and lipase were not elevated. An abdominal ultrasound revealed gallbladder sludge with small calculi, no gallbladder wall thickening and no dilatation of the biliary tract. Computed tomography (CT) of the abdomen and pelvis showed gallstones without CT-evidence of cholecystitis, and biliary dilatation up to 9 mm. Secondary to the dilatation of the common bile duct (CBD) on the CT, magnetic resonance cholangiopancreatography (MRCP) was performed and demonstrated choledolithiasis without signs of cholecystolithiasis.

During this admission, laparoscopic cholecystectomy was performed. Upon insertion of the camera into the umbilical port, the gallbladder was visualized and was located immediately to the left of the falciform ligament, and below segment III of the liver. The gallbladder wall was mildly edematous. The cystic duct and the cystic artery were identified, and it was observed that the artery was to the right of the duct. After the identification of the critical view of safety, the cystic artery and the cystic duct were clipped and divided in a standard fashion. The operation was completed without difficulties and the patient recovered and was discharged home on the second postoperative day. Pathological evaluation identified multiple small, less that 1 mm stones and the thickness of the gallbladder wall measured 3 mm, consistent with chronic cholecystitis and cholelithiasis.

The CT scan of the abdomen did not appear to demonstrate an abnormal location of the gallbladder (Figure 1A) but the finding of the gallbladder to the left of the falciform ligament was present on preoperative MRCP (Figure 1B).

DISCUSSION

Left sided gallbladders without situs inversus are rare and have a prevalence of 0.04%-0.3%\(^2\,^3\). A distinction should be made between gallbladders that are truly left sided also referred to as sinistroposition and gallbladders located to the left of abnormally located right-sided round ligaments\(^9\). True left sided gallbladders exist because of two possible embryological etiologies. The first mechanism is due to the attachment and migration of the gallbladder to the left lobe in which case the cystic duct is in a normal anatomic position and crosses in front of the common duct from right to left, as is the case in the case reported herein\(^6\). The second mechanism is formation of the gallbladder by budding directly from the left side in which case the cystic duct joins the CBD or left hepatic duct from the left side\(^4\,^5\). Right-sided round ligaments on the other hand, are associated with a normal position and anatomy of the cystic duct, and with anomalous portal venous branching, which is crucial during the performance a hepatectomy, for example\(^3\).

Despite being truly left-sided, gallbladders with sinistroposition almost always cause right-sided symptoms when they become symptomatic making their preoperative diagnosis difficult\(^2\). It is believed that the visceral nerve fibers do no transpose with the gallbladder causing right-sided pain\(^1\). In the present case, the abnormal position of the gallbladder was only discovered at surgery, despite the patient having undergone preoperative ultrasound, CT, MRCP and endoscopic ultrasound, which is consistent with other case reports\(^2\,^5\). However, an intraoperative finding of a left sided gallbladder should not preclude the decision to proceed laparoscopically with minor modifications in the standard approach and port

![Figure 1 Radiological images of the abdomen. A: Computed tomography scan without contrast demonstrating the gallbladder to the left of the falciform ligament; B: Magnetic resonance cholangiopancreatography showing a dilated common bile duct on coronal view.](Image 306x476 to 479x618)
Donthi et al\[9\], for example, placed their ports in a mirror image to a typical right-sided standard laparoscopic cholecystectomy, achieving adequate exposure and traction for dissection. Keeping in mind the possible anatomic variations associated with the condition along with careful dissection and the establishment of the critical view of safety, with or without intra-operative cystic duct cholangiography, will minimize complications. Ligation and division of the cystic duct and artery should be close to the gallbladder. The surgeon should make every effort to identify key anatomic landmarks as one would attempt to do during a standard cholecystectomy. Cases of single port cholecystectomy have even been reported in patients with situs inversus without adverse occurrences\[9,10\]. A more comprehensive literature review of patients with left sided gallbladders without situs inversus undergoing surgery is summarized in Table 1.

In conclusion, a left-sided gallbladder is an unusual anatomic variant. Patients commonly present with typical biliary colic and cholecystitis symptoms. The abnormal location might not be discovered until the start of the laparoscopic procedure. Proper anatomic identification of key landmarks will permit most or all of these procedures to be performed using minimally invasive techniques.

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Table 1  Literature review of previously reported left-sided gallbladders without situs inversus undergoing surgery

| Ref. | Location | Reported number of patients | Clinical presentation | Diagnosis made pre-op? | Surgical treatment (cholecystectomy) | Comments |
|------|----------|-----------------------------|-----------------------|------------------------|--------------------------------------|----------|
| [1]  | Hungary  | 1 in 2536                   | Right sided abdominal pain | No                     | Open                                 | Sinistroposition |
| [2]  | The Netherlands | 5 in 1764 | Right sided abdominal pain | 1 of 5                 | Laparoscopic                          | Emphasis on right sided round ligament/reported 105 cases in literature until then |
| [3]  | Japan    | 3 in 1621                   | Cholecystitis, 2 incidental during liver surgery | No                     | Open                                 | Used drop infusion cholangiography for diagnosis and CT scan |
| [5]  | India    | Case report                 | Right sided abdominal pain | No                     | Laparoscopic                          | Dextrocardia present |
| [6]  | India    | 1 in 1258                   | Right sided abdominal pain | No                     | Laparoscopic                          | Associated with liver cysts |
| [7]  | United Kingdom | Case report | Right sided abdominal pain | No                     | Open                                 | Diagnosis by radio-opaque stone on the left side |
| [11] | Japan    | Case report                 | Incidental/liver cancer | Yes                    | Open                                 | Intra-op cholangiogram performed |
| [12] | Greece   | Case report                 | Epigastric pain         | No                     | Laparoscopic                          | Intra-op cholangiogram performed |
| [13] | Ohio, United States | Case report | Right sided abdominal pain | No                     | Laparoscopic                          | Intra-op cholangiogram performed |
| [14] | Serbia   | 2 patients                  | 1 asymptomatic/1 right sided abdominal pain | No                     | Open                                 | Associated with liver cysts |
| [15] | India    | Case report                 | Right sided abdominal pain | No                     | Open                                 | Associated with liver cysts |
| [16] | United Kingdom | Case report | Epigastric pain | Yes                    | Open                                 | Associated with liver cysts |
| [17] | Florida, United States | Case report | Right sided abdominal pain | No                     | Laparoscopic                          | Associated with liver cysts |
| [18] | New York, United States | Case report | Right sided abdominal pain | No                     | Open                                 | Associated with liver cysts |
| [19] | Tunisia  | Case report                 | Right sided pain        | No                     | Laparoscopic                          | Normal intra-op cholangiogram |
| [20] | Japan    | Case report                 | Back pain               | No                     | Laparoscopic                          | Associated right portal vein anomaly |
| [21] | St. Louis, United States | Case report | Right sided pain | No                     | Laparoscopic                          | Associated with portal vein anomaly |
| [22] | South Korea | Case report | Right sided pain | No                     | Laparoscopic                          | Associated with portal vein anomaly |
| [23] | Japan    | Case report                 | Right sided pain        | Yes                    | Laparoscopic                          | Associated with portal vein anomaly |
| [24] | South Korea | 3 | Omphalocele with herniated liver | Yes | None | Association with omphalocele |
| [25] | Japan    | 2                           | Right sided pain        | No                     | Laparoscopic                          | Associated with hypoplasia of the left lobe of the liver |
| [26] | Japan    | Case report                 | Right sided pain        | No                     | Open                                 | Associated with hypoplasia of the left lobe of the liver |
| [27] | Japan    | Case report                 | Right sided pain        | No                     | Open                                 | Associated with hypoplasia of the left lobe of the liver |
| [28] | Japan    | Case report                 | Living donor transplant | No                     | Open                                 | Associated with hypoplasia of the left lobe of the liver |
| [29] | South Africa | Case report | Right sided pain | Yes | Laparoscopic | Diagnosed on CT pre-op |
| [30] | China    | 3                           | Living donor transplant | Yes                    | Open                                 | Diagnosed on CT pre-op |
| [31] | Italy    | Case report                 | Right sided pain        | No                     | Laparoscopic                          | Diagnosed on CT pre-op |
| [32] | Japan    | 3                           | Living donor transplant | Yes | Open | Diagnosed on CT pre-op |

CBD: Common bile duct; DIC: Drop infusion cholangiography; MRCP: Magnetic resonance cholangiopancreatography; CT: Computed tomography.
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