Int Surg 2016;**101**:347–351
DOI: 10.9738/INTSURG-D-16-00109.1

Case Report

Case Report of Situs Inversus Totalis and Laparoscopic Cholecystectomy

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Laparoscopic cholecystectomy (LC) in patients with situs inversus totalis (SIT) characterized by transposition of organs to the opposite side of the body can be technically challenging. A 43-year-old Hispanic woman presented with epigastric pain radiating to the chest and back, intermittently over 3 months, but worse on day of admission. During the cardiac workup, she was noted to have dextrocardia. The patient had a left-sided Murphy's sign, propagating a workup that confirmed SIT, including an ultrasound showing cholelithiasis and normal ducts. The patient underwent an LC and was found to have choledocholithiasis. An endoscopic retrograde cholangiopancreatography cleared the common bile duct of a choledocholith. LC is the gold standard for cholecystitis. It is the second most common laparoscopic procedure conducted worldwide. When SIT is encountered, feasibility and technical difficulty in diagnosis and treatment of such cases pose challenges due to contralateral transposition of the visceral organs. Difficulty is encountered when exposing the triangle of Calot/critical view of safety and especially when conducting a cholangiogram. As such, added time is usually required to conduct the procedure. Conducting an LC in a patient with SIT is feasible when performed by an experienced laparoscopic surgeon. The diagnosis and initial presenting signs and symptoms are different from the patient with a normal anatomy. The surgical skills of the surgeon are challenged, especially in the right hand–dominant individual. The mindset of the surgeon requires changing the critical thinking when conducting a mirror image dissection.

Key words: Triangle of Calot – Critical view of safety – Laparoscopic cholecystectomy – Situs inverses totalis – Transposition of internal organs

In 1987, Mouret performed the first laparoscopic cholecystectomy (LC) in France. Since then, it has become the gold standard operation for cholelithiasis.[1,2] Situs inversus totalis (SIT) is a rare, autoso-

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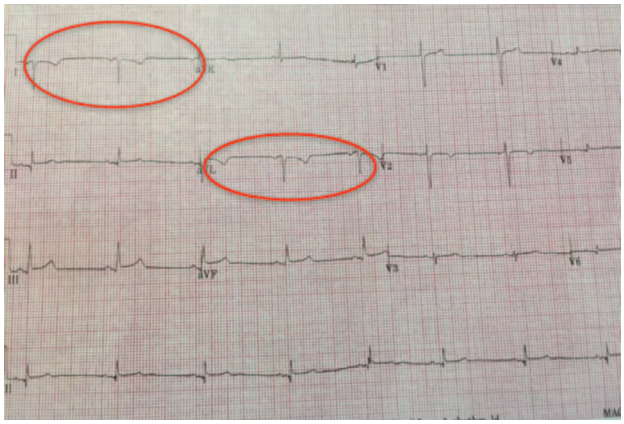

Fig. 1 First EKG showing lead reversal.

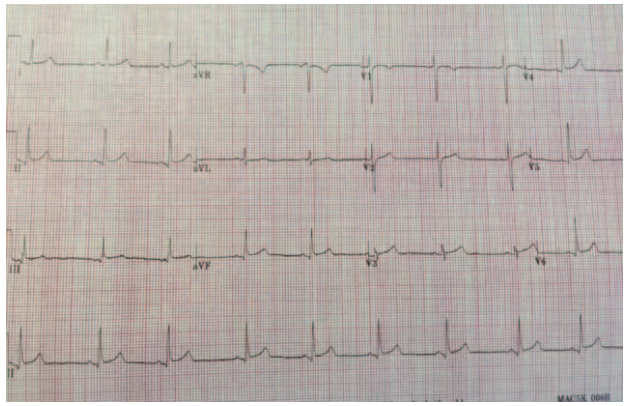

Fig. 2 Right-sided EKG showing normal sinus rhythm.

mal recessive disorder wherein there is reversal of the usual "handedness" of visceral topography.[3,4] Aristotle first noted reversal of the position of the spleen and liver in animals.[5] In humans, it was first reported by Fabricius in 1600.[1,2,4,5] The incidence is thought to be in the range of 1 in 10,000 to 20,000 births, or 0.04% to 0.30%.[1,3,6,7] Appendicitis is the most commonly reported surgical disease described in conjunction with SIT, whereas reports of SIT and biliary disease are few.[5]

This is a case report of a patient with history suggestive of intractable biliary colic/acute cholecystitis and SIT (with suspected choledocholithiais), who underwent an LC with intraoperative cholangiogram (IOC) and was confirmed to have choledocholithiasis that was managed by endoscopic retrograde cholangiopancreatography (ERCP).

A description of the difficulties encountered during the case is provided, including nuances of performing the procedure and the benefits of ambidexterity. A review of the total number of cases to date was conducted.

Case Presentation

A 43-year-old Hispanic woman presented to the Emergency Department (ED) with a 4-hour history of severe, sharp, and unrelenting midepigastric and left upper quadrant (LUQ) abdominal pain, radiating to the chest and back with associated nausea and vomiting. In the last 3 months, she had 2 similar episodes that resolved spontaneously. She denied fever, chills, jaundice, melena, hematochezia, or diarrhea. Her medical history was significant for latent tuberculosis, obesity, and prediabetes mellitus. Her only surgical history was a cesarean section 11 years prior. The medications she was taking included estradiol and a vitamin D supplement. On clinical examination, the patient had normal vital signs and no jaundice. Significant pertinent positives included an abdominal examination with moderate tenderness in the epigastrium/LUQ and a left-sided Murphy's sign. During her workup for cardiac etiology, she was noted to have lead reversal on the electrocardiogram (EKG; Fig. 1) with negative ischemic changes and normal troponins. A right-sided EKG (Fig. 2) showed normal sinus rhythm. A chest X-ray (CXR; Fig. 3) showed dextrocardia. Due to elevated transaminases [aspartate aminotransferase (AST): 562 IU/L, alanine transaminase (ALT): 338 IU/L, alkaline phosphatase (ALP): 67 IU/L, total bilirubin (Tbili): 1.5 mg/dL], an ultrasound of the abdomen was conducted depicting reversal of visceral organs, cholelithiasis with gallbladder (GB) wall thickening (4 mm; Fig. 4), a common bile duct (CBD) of 4 mm, and a positive sonographic

Fig. 3 Chest X-ray.

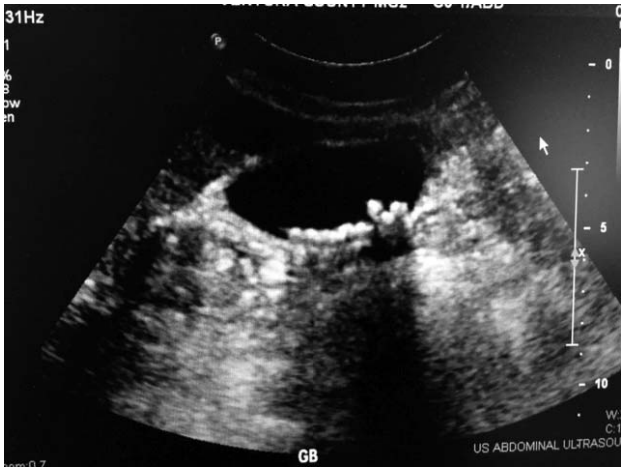

Fig. 4 Gallbladder ultrasound showing cholelithiasis.

Murphy's sign. A computed tomography scan of the abdomen and pelvis (Fig. 5) was performed, confirming SIT. She was admitted for a planned morning LC. On entry into the operating room, her morning labs were as follows: AST, 786 IU/L; ALT, 1148 IU/L; ALP, 79 IU/L; Tbili, 2.5 mg/dL.

Fig. 5 Computed tomography scan of the abdomen and pelvis.

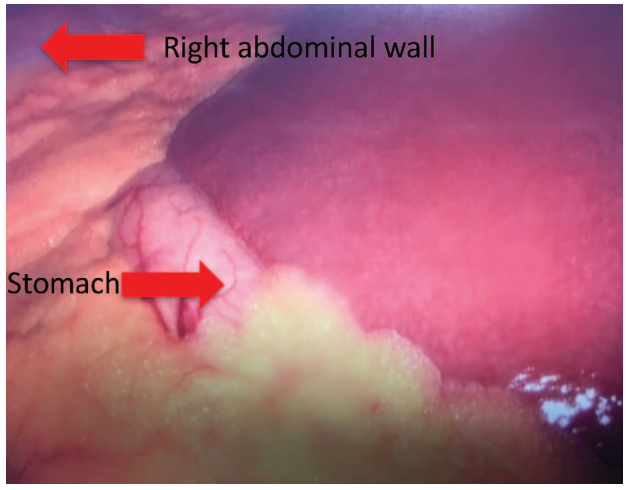

Fig. 6 The stomach on the right side of the abdomen.

The patient underwent an LC with IOC, with the surgeon standing on the patient's right side. The 11-mm ports were placed in the umbilicus and epigastrium identical to a standard right-sided cholecystectomy, although the 11-mm port was directed toward the LUQ. The 5-mm ports were located in the LUQ, in a mirror-image fashion. The patient was placed in the reverse trendelenburg/modified right lateral decubitus position. On initial diagnostic laparoscopy, the patient had complete SIT (Figs. 6 and 7) and a chronic/acutely inflamed gallbladder. The fundal grasper was anchored to the drape (to free up the assistant). The Hartmann's pouch grasper was used to laterally and inferiorly deviate the gallbladder with the surgeon's right hand, whereas the triangle of Calot/critical view of safety (TOC/CVS) was dissected with the left hand (LH) via the epigastric port.

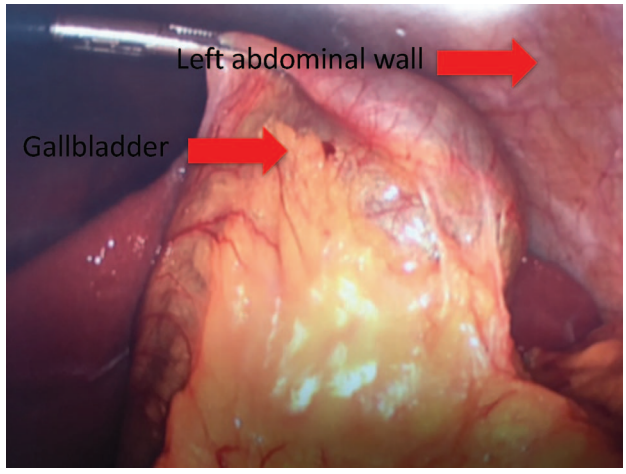

Fig. 7 The gallbladder on the left side of the abdomen.

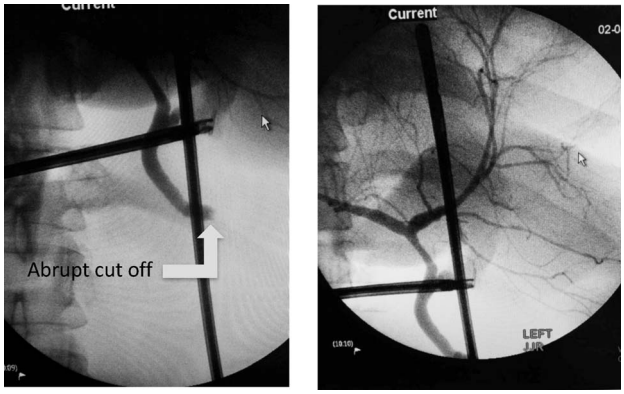

Fig. 8 Intraoperative cholangiogram.

Occasionally, the dissection was switched to the right hand (RH) (also via the epigastric port) while the assistant held the Hartmann's grasper, when the dissection became tedious. Hemoclips were applied with the LH. The CBD was accessed with the RH for the IOC (Fig. 8) and revealed absent flow of contrast into the duodenum. The GB was eventually dissected off the liver (Fig. 9) and retrieved from the umbilical port site. On postoperative day 1, the patient underwent an uneventful ERCP (Fig. 10) with sphincterotomy and retrieval of a single choledocholith. She was subsequently discharged home 8 hours later and was doing well on her postoperative clinic visit. Her post-ERCP labs prior to discharge were improving: AST, 387 IU/L; ALT, 931 IU/L; ALP, 84 IU/L; Tbili, 1.9 mg/dL.

Discussion

Situs inversus is divided into 2 types: situs inversus partialis, which involves the thoracic organs (dextrocardia) or abdominal organs, and SIT, which involves both the thoracic organs and abdominal viscera. Associated abnormalities may be found, including bronchiectasis, sinusitis, and deficient tracheobronchial cilia resulting in the Kartagener syndrome.[1,2,4,6,8] The normal development requires a 270° counterclockwise rotation that yields normal anatomy. In SIT, the 270° rotation is in the clockwise direction. The male to female ratio is 1:1, and there is no racial predilection.[9] It is important to note that the finding of a left-sided gallbladder does not necessarily indicate transposition.[5]

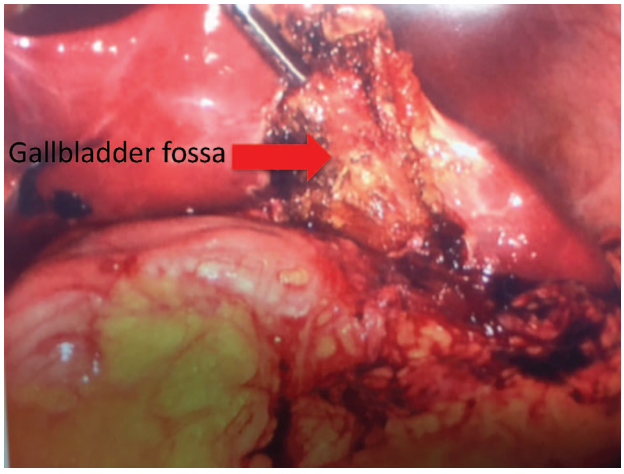

Fig. 9 After gallbladder dissection off the liver.

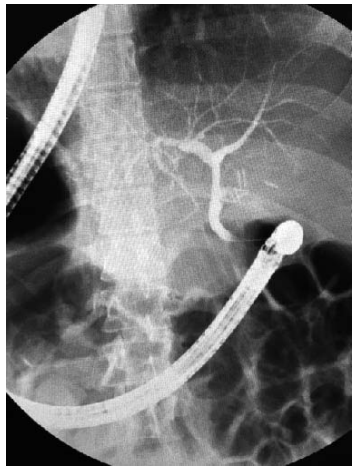

Fig. 10 ERCP cholangiogram.

In the evaluation of patients with SIT, the location of pain can be variable and confusing. De Pol (1933; cited in Takei *et al*[5]) first reported the discrepancy between localization of signs and symptoms and the site of the actual disease process. Rao *et al*[10] noted that 60% of patients with left-sided cholelithiasis had left-sided pain, 30% had midepigastric pain, and about 10% had right-sided pain. This may delay the diagnosis of symptomatic gallstones.[3,5–7,11,12] Patients with SIT who are scheduled for LC should be assessed preoperatively for any potentially serious cardiac or respiratory abnormalities.[7] Interestingly enough, our patient had a CXR for workup of latent tuberculosis 21 years ago, and a pre–cesarean section CXR 11 years ago, but was never informed of her diagnosis of dextrocardia.

There have been approximately 40 reports of open cholecystectomies in the prelaparoscopic era.[3] In 1991, Campos and Sipes reported the first successful LC in a patient with SIT with a symptomatic gallstone.[1,6] Since then, a total of 79 LCs have been reported.[13] This report is the 80th. No conversion to open surgery has been reported,[1] nor

has evidence of bile duct injuries been reported.[5] Most procedures have been conducted via the standard 4-port LC. There has been a description of a 3-port LC[1,2] and a single incision laparoscopic surgery in patients with SIT.[13]

Our procedure was performed with a combination of LH and RH dissection of the TOC/CVS, due to moderate ambidexterity of the surgeon. Ergonomic challenges have been described in the literature when RH surgeons perform the procedure.[1] Although there has been a description of performing such a procedure by having the surgeon stand at the foot of the bed (in between the patient's legs while the patient is in the Lloyd-Davis position) and crossing hands/instruments to retract the Hartmann's pouch while dissecting the TOC/CVS,[6] we performed this case with the surgeon on the patient's right side. Due to ergonomic challenges that can arise and the need for reorientation of visual-motor skills to the LUQ, the procedure may be prolonged. Procedure length has been described from 65 to 120 minutes, depending on the operative findings and the need for IOC. Our procedure length was 106 minutes. An argument could have been made for an ERCP preoperatively, but the gastroenterologist would have recommended an LC with IOC or magnetic resonance cholangiopancreatography, especially because the patient's CBD was normal (4 mm) on ultrasound. Because the operating room was ready and available, we chose to proceed with the surgery. To date, there have been 5 cases of LC in patients with SIT presenting with choledocholithiasis, requiring ERCP. This case makes the sixth case.[1]

Conclusion

LC is feasible in patients with SIT. The procedure is less taxing when performed by an experienced surgeon with some level of ambidexterity. It is usually performed safely, as the dissection is often conducted meticulously while prolonging operative time. The surgeon should be prepared for the anatomical reversal. With the advent of robotic surgery, this technology may lessen the difficulty with dissection. ERCP in patients with SIT could be challenging. Finally, patients with SIT should be encouraged to wear a medical alert bracelet.

Acknowledgments

The authors thank our librarian, Janet Parker, for providing all the review articles.

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