Surgical Management of Symptomatic Cholelithiasis in the Setting of Complete Situs Inversus

James Faraci[1], Simi Kalayilparampil[1] & Lynsey Daniels, MD[2]*

1 Lake Erie College of Osteopathic Medicine

2 Samaritan Medical Center Department of Surgery, Watertown, NY

Abstract

Background

Situs inversus totalis (SIT) is a rare congenital abnormality affecting approximately 1 in 10,000 people resulting in a mirror transposition of the thoracic and abdominal organs. In addition to the laterality disturbances, situs inversus totalis is associated with several other abnormalities including bronchiectasis, sinusitis, and deficient tracheobronchial cilia, known as Kartagener's syndrome. SIT leads to a delay in the diagnosis of abdominal pathologies including acute cholecystitis and cholelithiasis, as patients typically present with atypical, left, hypochondrial pain. In addition to diagnostic uncertainty, SIT also results in potential technical challenges.

Case Presentation

The patient is a 53-year-old female with a 4-year history of cholelithiasis with several episodes of biliary colic in the setting of complete situs inversus presented to the outpatient general surgery clinic for evaluation of left upper quadrant abdominal pain associated with fatty foods desiring surgical intervention. MRCP performed at the current presentation showed moderate gallbladder distention, cholelithiasis, and extrahepatic common bile duct dilation without evidence of acute cholecystitis or other source of obstruction. Decision was made to proceed with robot-assisted laparoscopic cholecystectomy. Eight millimeter robotic trocars were placed in a curvilinear manner with two on the left side, one in the mid-abdomen, and one on the right side of the abdomen. The gallbladder was found to be extremely distended making it difficult to retract cephalad. Thus, the decision was made to decompress it. There was also a large stone found at the gallbladder neck. All other aspects of the procedure proceeded in a routine fashion.

Discussion

The first successful laparoscopic cholecystectomy in a patient with situs inversus was performed in 1991 by Campos and Sipes, with subsequent reports describing a technically challenging procedure. Reports made mention of the use of an assistant for retraction, the use of a mirror image placement of ports and instruments, as well as various positionings of the surgeon to help alleviate some degree of the challenge of this procedure. Additionally, surgeon handedness has been found to make a difference. The contralateral disposition of the abdominal viscera, resulting in mirror image anatomy, poses a major technical challenge for the right-handed surgeon, who would now need to perform major steps of the procedure with his non-dominant hand. However, there is one school of thought that the use of robotic assistance can effectively alleviate this difference and thus may be preferred over laparoscopic cholecystectomy in the case of complete situs inversus.

Background

Situs inversus totalis (SIT) is a rare congenital abnormality affecting approximately 1 in 10,000 people resulting in a mirror transposition of the thoracic and abdominal organs. In addition to the laterality disturbances, situs inversus totalis is associated with several other abnormalities including bronchiectasis, sinusitis, and deficient tracheobronchial cilia, known as Kartagener's syndrome. SIT leads to a delay in the diagnosis of abdominal pathologies including acute cholecystitis and cholelithiasis, as patients typically present with atypical, left, hypochondrial pain. In addition to diagnostic uncertainty, SIT also results in potential technical challenges.

Case Presentation

The patient is a 53-year-old female with a 4-year history of cholelithiasis with several episodes of biliary colic in the setting of complete situs inversus presented to the outpatient general surgery clinic for evaluation of left upper quadrant abdominal pain associated with fatty foods desiring surgical intervention. Diagnosis of situs inversus was made incidentally on CT scan more than 3 year prior to current presentation, as seen in Figure 1.

Case Presentation (cont.)



Figure 1: Initial CT Abd/Pelvis demonstrating complete situs inversus in an otherwise healthy patient approximately 3 years prior to presentation with current chief complaint. No significant findings (Indication: R/O Pancreatitis)

All imaging prior to current presentation demonstrated cholelithasis without evidence of acute cholecystitis, as seen in Figure 1. Labs drawn prior to presentation demonstrated mild leukocytosis of 10.9 without transaminitis. The gallbladder was not able to be visualized on previous HIDA scan, as seen in Figure 2.

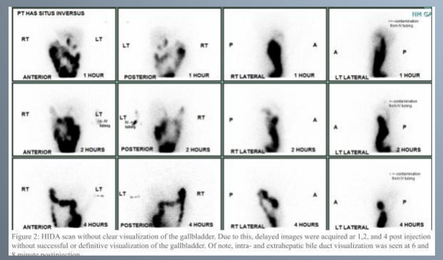


Figure 2: HIDA scan without clear visualization of the gallbladder. Due to this, delayed images were acquired at 1,2, and 4 post injection without successful or definitive visualization of the gallbladder. Of note, intra- and extrahepatic bile duct visualization was seen at 6 and 4 minutes respectively.

Patient stated that she started having a constant pressure on her left side with radiation to the right border on her sternum that would sometimes become sharp and stabbing in nature. She also endorsed N/V intermittently with one episode of frank bilious emesis. Physical examination at time of presentation did demonstrate tenderness to palpation in the RUQ without distention, rebound, or guarding. Decision was made to obtain an MRCP to evaluate for any possible aberrant biliary anatomy prior to surgical intervention. It showed no anatomic aberrancy, but did demonstrate a 1.5 low intensity filling defect in the neck of the gallbladder without choledocolithastasis, as shown in Figure 3.

Case Presentation (cont.)

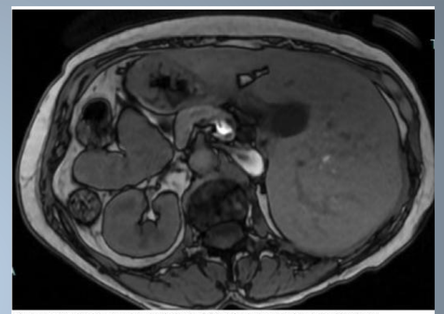


Figure 3: MRCP showing 1.5 cm low signal intensity filling defect in the neck of the gallbladder without choledocholithastasis being observed. Mild common bile duct dilatation measuring approximately 1 cm seen on the MRCP. (Indication: R/O Aberrant biliary anatomy prior to surgical intervention)

After the completion of the MRCP, the decision was made to proceed with a robot-assisted laparoscopic cholecystectomy. Pneumoperitoneum was established using the Veress needle in the RUQ, given the patient's anatomical abnormalities. The laparoscope was introduced using an 8 mm Optiview trocar in the right mid-abdomen. Additional 8 mm trocars were fanned across the upper abdomen with 1 on the right side and 2 on the left side, with representative postoperative images as seen in Figure 5.



Figure 4: Postoperative photo demonstrating port placement with upsized 12 mm port infraumbilically with some bruising noted.

The gallbladder was found to be extremely distended making it difficult to retract cephalad. Thus, the decision was made to decompress it. There was also a large stone found at the gallbladder neck. All other aspects of the procedure proceeded in a routine fashion. Specimen was sent to pathology and demonstrated mild chronic cholecystitis with cholelithasis.

Discussion

In this case report, a 53 year old female patient with known SIT presented with a 4 year history of cholelithasis with intermittent but worsening biliary colic associated with fatty foods, as well as nausea and vomiting. Imaging did not show any definitive evidence of acute cholecystitis. However, the decision was made to perform an interval cholecystectomy in a robot-assisted manner. The postoperative recovery was uneventful, and the pathology report demonstrated mild chronic cholecystitis with cholelithasis. This case underscores how many individuals with SIT have an extended period between initial presentation and definitive treatment. Additionally, the aberrant anatomy also increases the risk and complexity of the cholecystectomy necessitates alteration in surgical approach.

Patients with cholelithiasis in the setting of situs inversus totalis usually present with left-sided upper abdominal pain, although ten percent may present with right-sided upper abdominal pain (Al Khlaiwy et al., 2019). Due to a more vague clinical picture, the need for imaging is paramount. A LUQ ultrasound can confirm the presence of sonographic evidence of acute cholecystitis and choledococholithasis. MRCP may also be warranted to visualize the anatomy of the biliary tract, which is important when planning a surgical procedure of situs inversus and decreasing intraoperative complications.

Laparoscopic cholecystectomy is the treatment of choice for situs inversus totalis due to it being minimally invasive and having decreased postoperative complications compared to an open cholecystectomy. The challenges facing operating on a patient with mirrored anatomy are difficult but can be managed through careful planning of the surgical procedure. The first successful laparoscopic cholecystectomy in a patient with situs inversus was performed in 1991 by Campos and Sipes, with subsequent reports describing a technically challenging procedure. Reports made mention of the use of an assistant for retraction, different positioning of the surgeon, as well as the use of a mirror image placement of ports and instruments to help alleviate some degree of the challenges of this procedure (Moyon et al., 2020). It is relevant to mention that these documented difficulties disproportionately affect right handed surgeons, as the more technical aspects of dissection and clip application are most commonly carried out by the left hand. Previous attempts to utilize the right hand in the mirrored anatomy of SIT has yielded the need to cross the hands or hyperflex the trunk and frequently leads to contamination of the surgeon, such as frequently striking the anesthesia screen with left elbow (Machado & Chopra, 2006). These difficulties, among others mentioned, have led to increased intraoperative fatigue and total operative time.

Some of the modifications that have been described for this procedure include the surgeon standing on the right side of the patient along with the camera assistant, and the first assistant stands on the left side. Left-handed instruments are used to grasp Hartmann's pouch via the subxiphoid port, and the right hand is used to dissect through the left midclavicular subcostal ports (Salama et al., 2013). Another modified version of this technique involves the assistant retracting the gallbladder infundibulum while the surgeon performs the dissection through an epigastric port with their right hand. In addition, an approach involves the surgeon using their left hand for dissection through the subxiphoid port. Surgeons can also be positioned between the patient's legs while the patient in the Lloyd-Davies position, which is derived from the Trendelenburg position but with the legs abducted to allow access to the perineum..

However, most of the aforementioned difficulties were found with laparoscopic cholecystectomy without robotic assistance. Previously published case reports that have utilized robotic assistance have demonstrated a reduction in complexity of dissection, which ultimately leads to risk reduction from both intraoperative and postoperative complications (Meghana et al, 2023; Laos, Schlottman, & Masrur, 2023). The use of robotic assistance also allows for the use of port placement in a similar manner to a right sided robotic cholecystectomy due to the flexibility of instruments and the enhanced operative view compared to a cholecystectomy without robotic assistance. Importantly, this alleviates the relative disadvantage of a right handed surgeon.

Many variations of a traditional laparoscopic cholecystectomy have been utilized to accommodate for situs inversus totalis. However, many of these modifications have shown limited success, and therefore, a near complete switch to robotic assistance may be warranted. Future studies are needed to determine which of these methods provide the most optimal conditions for surgery and best outcomes for a patient with SIT. It is hoped through this case report that there can be a potential increased role for the use of robotic assistance to offset previously published difficulty in dissection and clip placement in a right hand dominant surgeon without robot assistance in a laparoscopic cholecystectomy.

References: *Full References Page Available at request*