

Case Report

Laparoscopic cholecystectomy in situs inversus with partially intrahepatic gallbladder: a case report

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ABSTRACT

Situs inversus totalis (SIT) is a rare condition with mirrored visceral organs. Biliary colic has delayed diagnosis in this cohort of patients. Laparoscopic cholecystectomy (LC) in such condition is a technically challenging procedure and requires preoperative imaging. We report a case of a 37 years old lady with pain in left upper abdomen for last 1 year. Upon evaluation, she was diagnosed with cholelithiasis with SIT. MRCP was done to delineate the anatomy. The patient underwent LC in a split-leg position with mirrored port position by a right-handed surgeon. The duration of surgery was 90 minutes and the patient was discharged uneventfully in 48 hours and was well on one-week follow-up. LC is considered a safe surgery in patients with SIT. It requires an experienced surgeon, re-training of visual-motor coordination and modification of surgical steps.

Keywords: Case report, LC, Situs inversus, Mirrored American technique, Mirrored French technique

INTRODUCTION

Situs inversus totalis (SIT) is a rare congenital disorder encompassing complete mirroring of all abdominal and thoracic organs to the opposite of the body.¹ The first LC in a case of SIT was done way back in 1991.² Multiple techniques have been employed and adapted for performing LC in this cohort of patients. This case report of performing LC in this cohort of patients. This case report of a patient with cholelithiasis and SIT has been reported in line with the SCARE criteria.³

CASE REPORT

We report a case of a lady aged 37 years who had complaints of intermittent mild pain in the left upper abdomen for the last 1 year. A sonogram of the abdomen showed the presence of multiple large calculi, the largest 19 mm, in a left-sided gall bladder. Further preoperative imaging including a skiagram of the chest and a magnetic resonance cholangio-pancreatography (MRCP) was done to delineate the altered biliary anatomy and confirmed the diagnosis of cholelithiasis along with the presence of SIT (Figure 1-3).

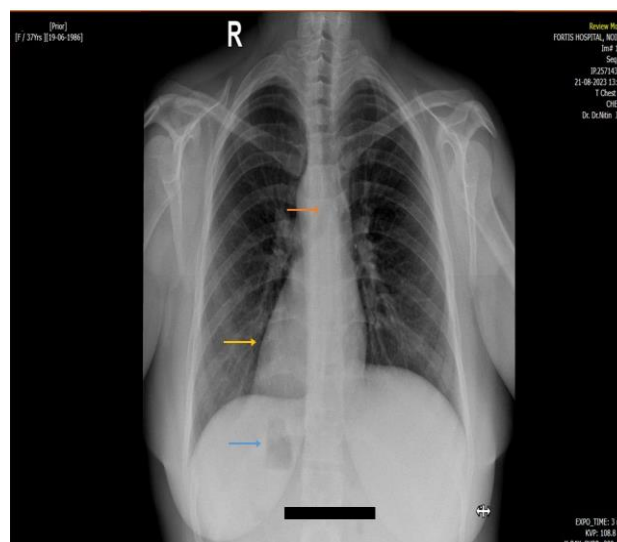


Figure 1: Chest X-ray PA view showing dextrocardia (yellow arrow), mirrored tracheal bifurcation (orange arrow) and right-sided gastric fundal shadow (blue arrow).



Figure 2: MRI of the abdomen showing right-sided stomach and left-sided liver and gall bladder.



Figure 3: MRCP of left-sided gall bladder (yellow arrow) and altered biliary anatomy.

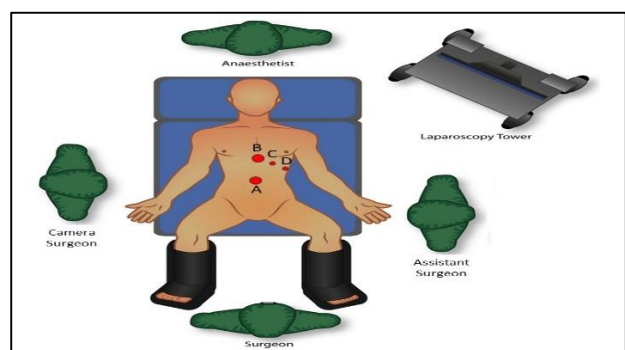


Figure 4: Operative room setup of surgery. Patient in French position. Port placement in 'Mir A' fashion.

A-Optical port, B-10 mm epigastric port, C-5 mm working port in left midclavicular line, D-5 mm working port in left anterior axillary line.

She underwent a LC in a split-leg position, performed by an experienced right-handed surgeon with mirrored American trocar positioning (mirror image of standard 4 port trocar positions). Operative set-up included monitor on patient's left shoulder area, surgeon standing between

legs of patient, camera assistant on right side and an assistant surgeon for retraction on the left side of patient. Pneumoperitoneum was achieved after standard painting and draping using Veress needle. A 10 mm optical port placed at umbilicus along with 3 working ports-10 mm below xiphisternum, 5 mm at left mid-clavicular line and 5 mm at left anterior axillary line (Figure 4). Thorough endoscopic abdominal exploration confirmed the presence of SIT and showed a left-sided gall bladder and liver with porta hepatis towards right side. Gall bladder and calot's triangle were identified. Critical view of safety was achieved. Cystic duct and cystic artery doubly clipped and ligated from epigastric port by changing position of surgeon to patient's right and using right hand to apply clips. Upper part of gall bladder partially intra-hepatic and encountered sinus in upper part of gall bladder bed. Gall bladder was dissected both from right and left sides and specimen was extracted from epigastric port in endo-bag. Hemostasis was achieved by placing local haemostatic agent at gall bladder bed (Figure 5). Total operative duration 90 min. Patient had uneventful post-op stay of around 48 hours and was discharged. Additional day of hospital stay was to observe for any rebleed from gall bladder bed. Histo-pathology report was suggestive of chronic cholecystitis. Patient was healthy and asymptomatic on follow-up after a week.

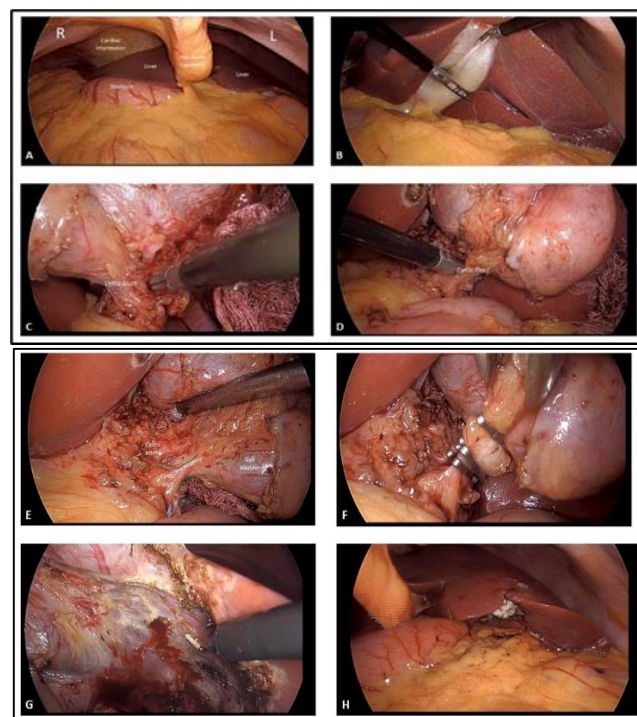


Figure 5 (A-H): Operative images of surgery. First view of right sided stomach and cardiac shadow and left-sided liver. Left-sided gall bladder after retraction of liver. Anatomy of Calot's triangle, left anterior view and right posterior view. Critical view of safety of dissected cystic duct and cystic artery in Calot's triangle. Doubly clipped cystic duct and cystic artery. Bleeding from sinus at gall bladder bed which was managed by using local haemostatic agent.

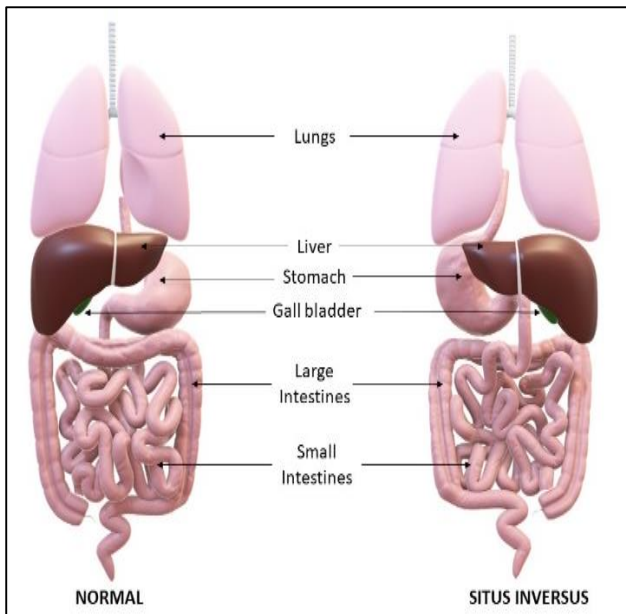


Figure 6: The mirrored positioning of abdominal and thoracic organs in SIT.

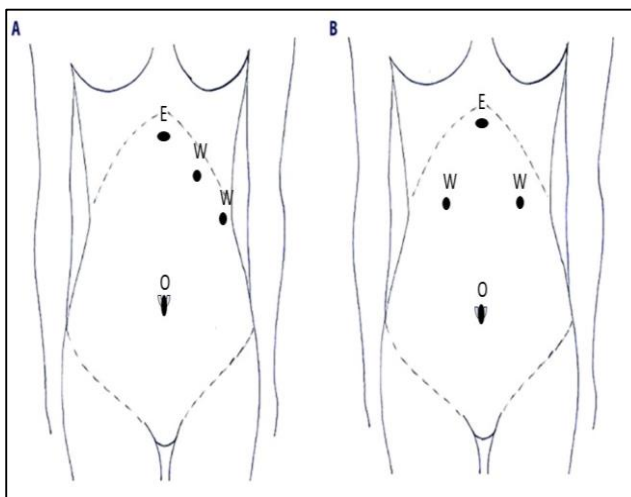


Figure 7 (A and B): The two common port positioning in laparoscopic cholecystectomy in situs inversus patients. 'Mir A' technique and 'Mir F technique'.

O-Optical port, E-Epigastria port, W-working ports.

DISCUSSION

SIT is a rare autosomal recessive disorder seen in 1 in 5000 to 20,000 live births.⁴ It is a congenital disorder wherein there is an abnormal 270-degree clockwise rotation of the visceral organs during the embryological development as opposed to the normal rotation of the same magnitude in the anti-clockwise direction which renders all the thoracic and abdominal organs to be present in the opposite side of the body than in a normal person (Figure 6).^{1,5} It can be associated with multiple other congenital abnormalities of the heart, kidneys and biliary system including Kartagener's syndrome and Yoshikawa's syndrome.^{6,7}

Minimally Invasive Surgery in a patient with SIT for any indication is a challenging endeavour. However, various laparoscopic procedures have been successfully done in patients with SIT. The range of surgeries encompasses both benign and malignant indications, across a multitude of abdominal organ systems including the upper gastrointestinal tract, stomach, colorectal and hepatobiliary.⁸⁻¹⁶ Lately, robot-assisted surgeries have been done in patients with SIT for malignant diseases.¹⁷⁻²⁰

Patients with SIT have no increased risk of developing cholelithiasis but when present, there is an unusual presentation of biliary colic with epigastric or left upper abdominal pain, which may lead to delayed diagnosis.^{6,21,22} Patients have also presented with complications related to cholelithiasis like biliary pancreatitis or cholangitis.⁸ LC is the gold standard for the management of cholelithiasis. In patients with SIT, the procedure is not contraindicated and is considered safe with no reported conversion to open procedures.²² Robotic cholecystectomy has also been performed in this cohort of patients.²³ There have also been reports of performing additional procedures such as laparoscopic common bile duct exploration.²⁴⁻²⁶

A sonogram of the abdomen should be accompanied by high-resolution preoperative and intraoperative imaging techniques to delineate the anatomy and prevent iatrogenic injuries. In a recent analysis of nearly 120 patients, it was seen that nearly 50% underwent high-resolution imaging like CT scan, MRCP, HIDA scan or Cholangiogram. Preoperative ERCP was done in nine patients, one patient underwent intraoperative ERCP, nearly 10% of patients required intraoperative cholangiogram and ICG was used in 2 patients.⁸

There has been no consensus regarding the standard techniques of LC in SIT. The procedure is technically challenging and multiple modifications have been made based on the biliary anatomy and surgeon's convenience. While performing a LC in this cohort of patients, various surgeon-specific factors, and the placement of ports along with dissection techniques play a vital role in the ergonomics of the surgery and overall patient outcomes. Like most of the general population, nearly 90% of surgeons are right-handed whereas only about 7% are left-handed.⁸ The design of the surgical instruments and training of surgeons is thus moulded in the favour of right-handed surgeons. However, to perform surgery on a left-sided gall bladder, the surgeon needs to re-train their brain to adapt to the new anatomy, and to battle with issues related to the interlocking of the instruments, hyperflexion of the surgeon's trunk and left hand, and change in position for dissection all resulting in early fatigue.⁸

The operating room setup and operative techniques have been modified by various surgeons as per their convenience. The patient may be placed in the American position wherein the patient lies supine and the surgeon

and assistant stand on the same side, or the in French position wherein the patient is in low-lithotomy position with surgeon standing between the legs and assistant on one side. The two more commonly used port positioning systems are the mirrored American ('MirA') and mirrored French ('MirF') methods of performing LC. In the more widely used 'MirA' technique, the surgeon and assistant stand on the left side of the patient in the supine position, with the ports placed exactly opposite to the standard four-port technique. In the 'MirF' technique, the surgeon stands in between the patient's leg who is placed in a Lloyd-Davies position, the optical port is placed at the umbilicus, a 10mm port is the epigastrium and two 5mm working ports are placed in the midclavicular line in the subcoastal region on both sides (Figure 7).⁸ Many modifications have been made to the port positioning, set up of the operating room, and placement of optical and working ports. There have been reports of using a reduced number of ports and single-incision laparoscopic surgery along with some novel modifications.^{8,27-28} Percutaneous sutures have also been used for retraction of gall bladder.²⁹

The average duration of surgery in patients with cholelithiasis and SIT is around 70 minutes. The surgery was completed earlier when proper pre-operative imaging and planning were done. It was increased when additional procedures were required in cases with complications related to cholelithiasis.⁸ The most challenging aspect of the surgery is the dissection of the calot's triangle.^{21,30} Left-handed surgeons have faster outcomes, probably due to increased ergonomics. The 'MirF' technique has the shortest duration of surgery, while single-port techniques have been seen to take longer. The novel modifications in the port position did not show any improved surgical duration.⁸ The length of hospital stay in these patients is around 2 days and is related only to the type of disease.⁸

CONCLUSION

SIT is a rare congenital disorder of malrotation of visceral organs causing them to be present on the opposite side of normal in the body. Biliary colic in this cohort of patients presents atypically and thus has a delayed diagnosis. Diagnosis and confirmation of altered anatomy requires a high degree of suspicion and high-resolution preoperative and/or intraoperative imaging techniques to prevent iatrogenic injuries. LC is a safe procedure for cholelithiasis in this scenario but requires modifications in the operative technique depending on biliary anatomy and the surgeon's dexterity and training.

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