

# Laparoscopic cholecystectomy in a situs inversus totalis patient: A case report

## Case Report

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### ABSTRACT

Situs inversus totalis (SIT) is a rare congenital disease in which the thoracic and abdominal organs are positioned in the sagittal plane in a way that is a mirror copy of the normal position. This placement of the organs is a mirror image of the normal position. Despite the fact that this condition does not have any influence on normal health or lifespan, its detection is essential for the treatment of a wide variety of disorders, especially those that need surgical intervention. We report a 33-year-old female with SIT with symptomatic gall bladder stones (Mucocele of gall bladder). Radiographic modalities confirmed the diagnosis. The patient was managed by laparoscopic cholecystectomy. The patient had a smooth postoperative course with an uneventful recovery. Laparoscopic cholecystectomy is a challenging procedure in patients with SIT with aberrant anatomy, mirror image port sites, difficult ergonomics, and hand-eye coordination, and longer operative time. It should be performed by an experienced laparoscopic surgeon.

**Key Words:** Case report, gall bladder stones, laparoscopic cholecystectomy, situs inversus.

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### INTRODUCTION:

Situs inversus, which is derived from the Latin phrase “Situs inversus Viscerum,” which means “inverted positioning of internal organs,” was discovered for the first time by Marco Severino in the year 1643<sup>[1]</sup>. Situs inversus totalis (SIT) is an extremely rare congenital abnormality in which the organs in the thorax and abdomen are positioned in a manner that is comparable to how they would normally be placed along the sagittal plane. The incidence of this illness is around one out of every 10 000 people being diagnosed<sup>[2]</sup>.

While SIT usually does not negatively affect overall health or life expectancy, its identification is crucial when managing various medical conditions, especially those requiring surgical procedures<sup>[3]</sup>. Performing laparoscopic cholecystectomy (LC) on patients with SIT poses distinct challenges, particularly for right-handed surgeons, as the surgical site must be re-oriented to the left upper quadrant. Additionally, the presence of related anomalies in the hepatobiliary system, such as a left-sided gall bladder, can complicate the surgery and heighten the risk of intraoperative complications. Nevertheless, with careful

anatomical assessment, minimally invasive surgical techniques remain both feasible and safe<sup>[4]</sup>.

This case report details the challenges faced during LC performed on a patient with SIT.

### CASE PRESENTATION:

The Scare 2020 criteria were implemented in the preparation of the current case report<sup>[5]</sup>. A 33-year-old female patient presented to Makkah Health Cluster, Ministry of Health, Saudi Arabia, with recurrent abdominal colic after fatty meals of about 1 year duration. The patient does not have any further psychiatric or physical problems. It was well known that she was an instance of SIT.

On physical examination, her height was 167 cm, her weight was 76.6 kg, and her BMI was 27.5. The abdomen was found to be soft and lax abdomen. There was no previous history of jaundice, fever, chills, or diarrhea in her medical history.

Routine preoperative laboratory investigations were normal. Abdominal ultrasonography and chest radiograph

of the patient confirmed SIT, in the form of a right-sided heart, left-sided liver, right-sided spleen, and stomach; (Fig. 1).

Abdominal ultrasonography revealed a distended gall bladder (12 cm), completely filled with clear mucinous fluid. The gall bladder wall thickness was normal. Multiple small stones are seen within the neck region of 3–6 mm in size. (Mucocele of gall bladder) (Fig. 2).

### Theater setup

In order to conduct the LC, the theater was reconfigured in a mirror image of its typical configuration. The surgeon and first assistant were located on the right side of the patient, while the second assistant and scrubbing nurse were located on the left side (Fig. 3).

### Operative details

The process of inducing anesthesia was carried out as regular, in the supine position. Using carbon dioxide gas, pneumoperitoneum was created by maintaining the pressure in the abdominal cavity at 14 mmHg. It was decided to introduce four ports: the primary port, which measured 10 mm, was placed in the infra-umbilical area; the second port, also 10 mm, was inserted in the sub-xiphoid region; and the third port, which measured 5 mm, was put in the left midclavicular line, while the fourth one was put below the costal margins, in the left anterior axillary region.

The last three ports were inserted under direct vision. The umbilical port was used for the laparoscope, the sub-xiphoid port was used mainly for the dissection of the anterior surface of Calot's triangle, and the midclavicular port was used for both retraction and dissection of the posterior surface of Calot's triangle. The left anterior axillary port was used for gall bladder fundus retraction towards the left shoulder.

After entry of the camera port and insufflation, the patient was tilted to the right side for about 30°, and tilted head-up position about 30°. After entry, a general examination of the abdominal cavity was done to confirm the abnormal positions of internal organs. The liver was present on the left side of the abdomen, and the gall bladder was distended and tense.

Generally, right-handed surgeons performed dissection slowly in a vigilant manner, with a repeated judgment of the reversed anatomy to find out any suspected anomalies and to avoid the danger of any iatrogenic injuries.

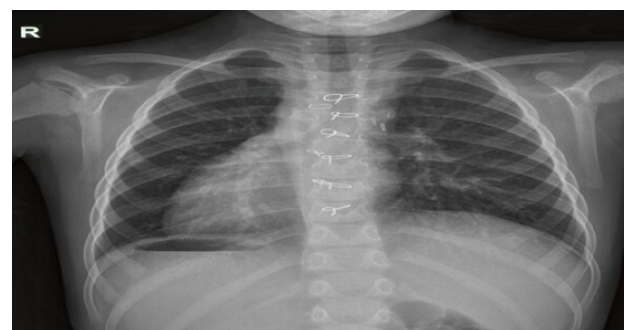
The posterior surface of Calot's triangle was dissected first by the right hand through the left midclavicular port, while the heartman pouch retracted anteriorly and to the right by the left hand through the sub-xiphoid port. The dissection started at the level of the gall bladder neck and

extended cautiously downwards to dissect the posterior surface of Calot's triangle.

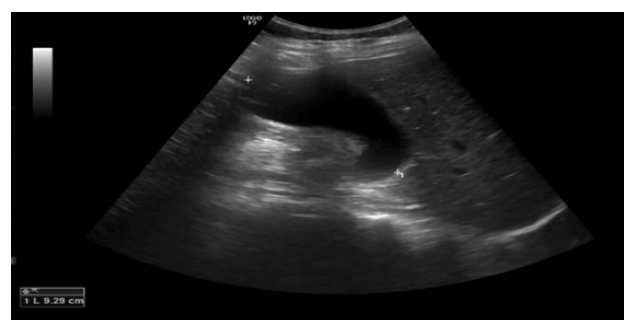
Dissection of the anterior surface of Calot's triangle was somewhat challenging. It was dissected slowly by the left hand of the right-handed surgeon through the sub-xiphoid port, while the heartman pouch retracted to the left by the right hand through the midclavicular port with somewhat difficult hand-eye coordination.

The cystic artery and cystic duct were skeletonized. Strasburg's view of safety was confirmed. The cystic artery was narrow and was managed through electrocautery. The cystic duct was wide, the gall bladder was dissected fundus-first, and the cystic duct was managed by Endotie (Fig. 4). Hemostasis was achieved. The gall bladder was extracted from the sub-xiphoid port within endobag. A prophylactic subhepatic drain of 19 French diameters was used.

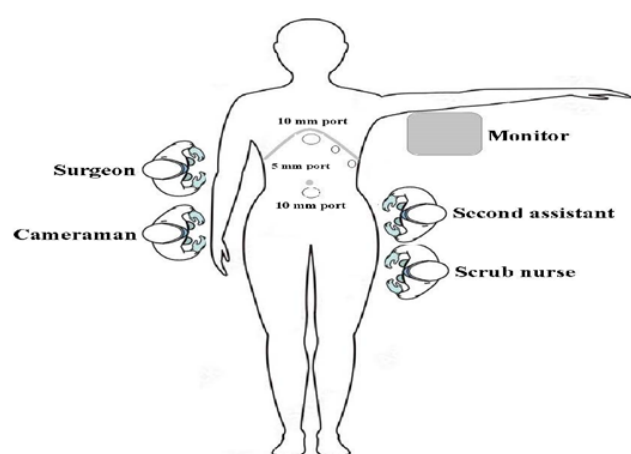
The operative time from skin incision to skin closure was 90 min. The patient had an uneventful recovery. She started oral fluids 6 h after surgery, the drain was removed after 24 h, and the patient was discharged home on oral analgesic.



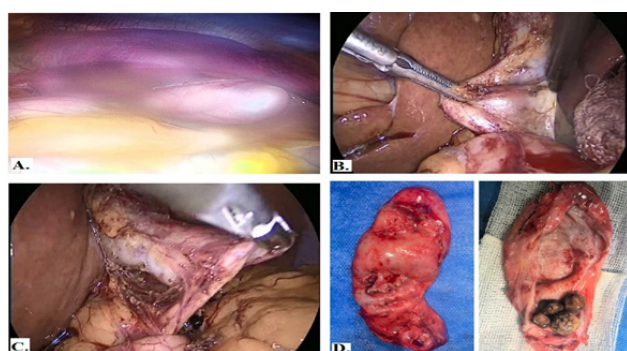
**Fig. 1:** Preoperative chest radiograph posteroanterior view confirming situs inversus totalis: dextrocardia, right-sided gastric gas bubble, and left-sided hepatic shadow.



**Fig. 2:** Ultrasound image revealed right-sided liver, distended gall bladder, and multiple small stones are seen within the gall bladder neck.



**Fig. 3:** Illustrates show operative theater setting and site and size of the ports.



**Fig. 4:** Intraoperative images: (a) Left-sided liver. (b) Posterior Clots triangle dissection. (c) Anterior Clots triangle dissection. (d) Gall bladder specimen.

## DISCUSSION

In the general community, SIT affects one in 8000 to one in 25 000 persons. Additionally, it has been connected to certain visceral deformities, including biliary atresia, intestinal malrotation, splenic deformity, vascular anomalies, and congenital heart disease<sup>[6]</sup>.

Because of the disease's peculiar appearance, which involves the transposition of bodily organs, it can be difficult to diagnose gallstones in individuals with SIT. This makes diagnosis and treatment more difficult, especially when the patient is unaware that they have SIT. LC is the gold standard of care for the treatment of symptomatic gallstones. Though the inverted anatomy may seem daunting, the ideas of LC are fundamentally the same. Nonetheless, surgeons have to adapt to the altered anatomy, which makes this a challenging procedure.

The first report of LC in a patient with SIT was made public in 1991. Recently, Enciu and colleagues reported 121 cases of LC in patients with SIT, after

searching MEDLINE, SCOPUS, Web of Science, and the Cochrane Library in their systematic review and meta-analysis<sup>[6,7]</sup>. The authors agree with Hassan and colleagues that the pathology of abdominal unilateral organs like gall bladder, appendix, or spleen usually results in confusing clinical presentation due to the unexpected location of the diseased organ. Abdominal ultrasonography and complementary computed tomography are crucial to recognize SIT anomaly and to point out the diseased organ. However, diagnostic laparoscopy is recommended just before starting the planned surgical procedure, such as cholecystectomy or appendectomy<sup>[8]</sup>.

In our case, we performed a chest radiography posteroanterior view, and abdominal ultrasonography confirming SIT before surgery and confirmed that the organs were in a mirror image of normal position (Figs 1 and 2).

When performing laparoscopic surgery utilizing various procedures on patients with SIT, the operating surgeon and the operating room crew face a significant obstacle. The targeted organ has been moved to a mirror-image location inside the abdominal or thoracic cavity; thus, the team needs to be prepared to use the mirror-image approach at every level. The anatomical differences seen in patients with SIT need repositioning of trocars and equipment, as well as adjustments to the locations of the surgeon, assistants, and monitor<sup>[9]</sup>. Like what is shown in (Fig. 3).

We recommend that the main surgeon should supervise by himself the arrangements of the theater and be sure that the monitor and other equipment are situated in the correct place as planned.

The ergonomics of the surgery and overall patient outcomes during an LC in SIT patients are greatly influenced by a number of surgeon-specific parameters, port placement, and dissection approaches. Only ~7% of surgeons are left-handed, compared to nearly 90% of surgeons are right-handed. Right-handed surgeons are therefore given preference in the design of surgical instruments and surgeon education. But in order to operate on a left-sided gall bladder, the surgeon must retrain their brain to adjust to the new anatomy and deal with problems like the instruments' interlocking, their left hand's hyperflexion, and their changing position during dissection, all of which can lead to early fatigue<sup>[10]</sup>.

Regarding the use of a drain, in spite of controversy regarding the insertion of the drain after LC, the authors preferred to fix the prophylactic subhepatic drain to allow early detection of any biliary leak from the unnoticed iatrogenic event during the procedure or unnoticed accessory duct leak in such cases with

unsuspected biliary anomalies. The drain was fixed through the left anterior axillar port site and was removed after 24 h.

Regarding operative time in our case, it consumed 90 min from skin incision to skin closure. This time was about double the time of LC in non-situs invsesus cases performed by the same surgeon.

In summary, mirror image anatomy makes hand-eye coordination difficult and challenging. The surgeon should be patient and make dissection slowly. Dissection of the posterior surface of Calot's triangle first as much as possible by the right hand improves ergonomics and safety. The surgeon should be vigilant and perform repeated judgmental evaluations of the anatomy to avoid any danger of iatrogenic injuries for the suspected biliary anomalies.

## CONCLUSION

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LC is a technically challenging procedure in patients with SIT with aberrant anatomy, mirror image anatomy and port sites, difficult ergonomics and hand-eye coordination, and longer operative time. It should be performed by an experienced laparoscopic surgeon, with repeated judgmental evaluation of the anatomy. Dissection of the posterior surface of Calot's triangle by right hand first improves ergonomics and safety.

### *Consent for publication*

The patient's written informed consent was obtained in order to publish this case report and the accompanying photographs. The editor-in-chief of this publication is capable of reviewing a copy of the written assent that was provided in response to a request.

## CONFLICT OF INTEREST

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There are no conflicts of interest.

## REFERENCES

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1. Sharada S, Chaitanya KK, Suseelamma D. Situs inversus totalis (dextroversion) – an anatomical study. *Anat Physiol* 2012; 2:112.
2. Hong SK, Suh KS, Kim HS, Ahn SW, Yoon KC, Kim H, *et al.* Pure laparoscopic right hepatectomy in a patient with situs inversus totalis: a case report. *Medicine* 2017; 96:e7910.
3. Suh BJ. A case of gastric cancer with situs inversus totalis. *Case Rep Oncol* 2017; 10:130–135.
4. Lochman P, Hoffmann P, Kočí J. Elective laparoscopic cholecystectomy in a 75-year-old woman with situs viscerum inversus totalis. *Wideochir Inne Tech Maloinwazyjne* 2012; 7:216–219.
5. Agha RA, Franchi T, Sohrabi C, Mathew G, Kerwan A. The SCARE 2020 Guideline: Updating Consensus Surgical CASE REport (SCARE) Guidelines. *Int J Surg* 2020; 84:226–230.
6. Matsumoto T, Okawa T, Asakura Y, Sakamoto H, Arimoto A, Yokoyama K, *et al.* Laparoscopic cholecystectomy in a patient with situs inversus totalis: report of a case with surgical tips. *AME Surg J* 2023; 3:10.
7. Enciu O, Toma EA, Tulin A, Georgescu DE, Miron A. Look beyond the mirror: laparoscopic cholecystectomy in situs inversus totalis-a systematic review and meta-analysis (and report of new technique). *Diagnostics* 2022; 12:1265.
8. Hassan AA, El-Sabagh A, Helmy AH. Laparoscopic management of acute appendicitis in situs inversus totalis. *EJS* 2008; 27:213–215.
9. Aburayya BI, Obeidat LR, Kitana FI, Al Khatib O, Romman S, Hamed OH. Complete common bile duct injury after laparoscopic cholecystectomy in situs inversus totalis: a case report, review of the literature and illustrative case video. *Int J Surg Case Rep* 2024; 115:109265.
10. Baxi K, Jha N, Khurana V, Neeli D, Dogra L. Laparoscopic cholecystectomy in situs inversus with partially intrahepatic gallbladder: a case report. *Int Surg J* 2023; 10:1854–1858.