

Systematic Review

Laparoscopic cholecystectomy in patients with situs inversus totalis: surgical challenges and technical adaptations

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ABSTRACT

Gallstone disease is one of the most common gastrointestinal disorders worldwide, and laparoscopic cholecystectomy has become the gold standard treatment for symptomatic cholelithiasis and acute cholecystitis. Situs inversus totalis (SIT) is a rare congenital condition characterized by mirror-image transposition of thoracic and abdominal organs, which may complicate both the clinical diagnosis and surgical management of biliary disease due to altered anatomical orientation. A targeted systematic review of the literature was conducted using the PubMed/Medline database to identify studies reporting laparoscopic cholecystectomy in patients with SIT. The search included publications from January 2010 to March 2026 using a combination of Medical Subject Headings (MeSH) and free-text terms related to situs inversus and laparoscopic cholecystectomy. Titles and abstracts were screened for relevance, followed by full-text review of eligible studies. Case reports and case series describing operative techniques, clinical presentation, and surgical outcomes were included. Data were extracted and synthesized narratively due to the heterogeneity of the available evidence. The literature search identified seven relevant studies, consisting primarily of case reports and small case series from multiple geographic regions. Most patients presented with symptomatic cholelithiasis or acute cholecystitis, often characterized by atypical left-sided abdominal pain due to mirror-image anatomy. Across the included studies, laparoscopic cholecystectomy was successfully performed with technical modifications such as mirrored trocar placement, adjusted surgeon positioning, and ergonomic adaptations during dissection. Postoperative outcomes were generally favorable, with most patients experiencing uneventful recovery and no significant intraoperative or postoperative complications. Laparoscopic cholecystectomy can be safely and effectively performed in patients with SIT when appropriate preoperative recognition and intraoperative technical adaptations are applied. Awareness of the reversed anatomical orientation, careful operative planning, and strict adherence to established principles of safe laparoscopic surgery are essential to minimize operative risk. Further multicenter studies are needed to better define standardized surgical strategies and outcomes in this rare clinical scenario.

Keywords: Situs inversus totalis, Laparoscopic cholecystectomy, Cholelithiasis, Acute cholecystitis, Mirror-image anatomy, Minimally invasive surgery, Hepatobiliary surgery, Trocar placement, Calot’s triangle, Critical view of safety

INTRODUCTION

Gallstone disease represents one of the most common gastrointestinal disorders worldwide, and laparoscopic cholecystectomy has become the gold standard surgical treatment for symptomatic cholelithiasis and acute cholecystitis due to its well-established advantages, including reduced postoperative pain, shorter hospital stay, and faster recovery compared with open surgery.¹ In routine practice, this procedure relies heavily on the surgeon's spatial orientation and a thorough understanding of hepatobiliary anatomy to safely achieve the critical view of safety and prevent bile duct injury.

SIT is a rare congenital condition characterized by a complete mirror-image transposition of the thoracic and abdominal organs relative to their normal anatomical positions. This anomaly arises from disturbances in the embryological mechanisms that establish left-right asymmetry during early development. The reported prevalence of SIT ranges from approximately 1 in 8,000 to 1 in 25,000 individuals in the general population, and most affected individuals remain asymptomatic unless associated anomalies or unrelated pathologies occur.^{2,3}

Importantly, SIT does not appear to increase the incidence of gallbladder disease. However, patients with SIT may develop common biliary conditions such as cholelithiasis or acute cholecystitis with a frequency similar to that observed in the general population.⁴ Despite this, the mirror-image configuration of the abdominal viscera can significantly alter the clinical presentation. In many cases, patients present with left upper quadrant or epigastric pain rather than the classic right upper quadrant pain associated with gallbladder pathology, which may result in diagnostic delays or initial misinterpretation during clinical evaluation.⁵

From a surgical perspective, SIT introduces unique technical and ergonomic challenges during laparoscopic cholecystectomy. The reversed anatomical orientation requires modifications in operating room setup, surgeon positioning, and trocar placement. Furthermore, the mirror-image anatomy can complicate dissection within Calot's triangle, particularly for right-handed surgeons who must adapt to performing critical maneuvers in a reversed spatial configuration. These factors may increase operative difficulty and necessitate specific technical adjustments to maintain procedural safety.⁶

Rationale

Although laparoscopic cholecystectomy in patients with SIT has been reported in the surgical literature for several decades, most of the available evidence is limited to isolated case reports and small case series due to the rarity of the condition. As a result, the current body of evidence remains fragmented, with considerable variability in reported operative strategies, port placement techniques, and surgeon positioning.^{7,8}

Given these challenges, synthesizing the available literature is essential to identify common operative approaches and highlight practical strategies that facilitate safe laparoscopic dissection in the context of mirror-image anatomy. A structured review of the existing evidence may also help clarify technical considerations related to achieving the critical view of safety, adapting port placement configurations, and overcoming ergonomic limitations inherent to this rare anatomical variant.

Objectives

The objectives of this systematic review are to provide a comprehensive synthesis of the current literature on laparoscopic cholecystectomy in patients with SIT. Specifically, this review aims to summarize the anatomical considerations, diagnostic implications, operative modifications, and surgical outcomes reported in previous studies, with the goal of offering practical guidance for surgeons who may encounter this rare anatomical scenario in clinical practice.

METHODS

Literature search

A targeted literature search was conducted using the PubMed/Medline database to identify studies describing laparoscopic cholecystectomy in patients with SIT. PubMed was selected due to its comprehensive coverage of peer-reviewed biomedical literature and for indexing the principal journals in surgery, gastroenterology, and minimally invasive surgery.

The search was limited to publications from the past 16 years (January 2010-March 2026) in order to capture contemporary surgical techniques and perioperative management strategies associated with laparoscopic biliary surgery. This time frame was selected because earlier reports frequently described outdated laparoscopic equipment and operative approaches that differ from current surgical practice. The last search was conducted on March 15, 2026.

The search strategy combined Medical Subject Headings (MeSH) and free-text terms using Boolean operators. The following search string was applied: ("situs inversus totalis" OR "situs inversus") AND ("laparoscopic cholecystectomy" OR "cholecystectomy" OR "gallbladder surgery").

The initial search yielded a total of 34 articles. Titles and abstracts were screened to identify studies specifically addressing cholecystectomy performed in patients with SIT. After removing articles that did not meet the eligibility criteria, 7 studies were considered relevant and included in the qualitative synthesis. Duplicate records were removed prior to screening.

Given the rarity of SIT and the limited availability of large clinical studies, both case reports and case series were included to provide a comprehensive overview of the surgical experience reported in the literature. All selected studies were incorporated throughout the manuscript to support the clinical discussion and technical considerations associated with laparoscopic cholecystectomy in this rare anatomical context.

Selection criteria

Inclusion criteria consisted of the following: peer-reviewed articles published between January 2010 and March 2026; studies reporting laparoscopic or minimally invasive cholecystectomy performed in patients with SIT; clinical studies, case series, or case reports describing operative techniques, intraoperative findings, or surgical outcomes; and publications available in English with accessible full text.

Exclusion criteria included the following: experimental studies, animal models, or purely anatomical descriptions without clinical surgical correlation; conference abstracts, editorials, or commentaries lacking clinical data; and studies describing situs inversus without specific reference to cholecystectomy or biliary surgery.

The study selection process was performed manually. Titles and abstracts were initially screened for relevance,

and full texts of potentially eligible studies were subsequently reviewed. Data extraction focused on study design, patient demographics, clinical presentation, diagnostic methods, operative setup, trocar placement, technical modifications, operative time, and postoperative outcomes.

Due to the heterogeneity of the available evidence and the predominance of case reports and small case series, the findings were synthesized using a qualitative and descriptive approach rather than a quantitative meta-analysis. The identification, screening, and inclusion process of the studies is summarized in Figure 1.

PRISMA flow diagram illustrating the study selection process for this systematic review. A total of 34 records were initially identified through a PubMed/Medline database search. After title and abstract screening, 23 records were excluded due to lack of relevance.

Eleven reports were retrieved for full-text evaluation, of which four were excluded because they were not related to cholecystectomy in patients with SIT, consisted of non-clinical or purely anatomical descriptions, or lacked sufficient surgical data. Ultimately, seven studies met the eligibility criteria and were included in the final qualitative synthesis.

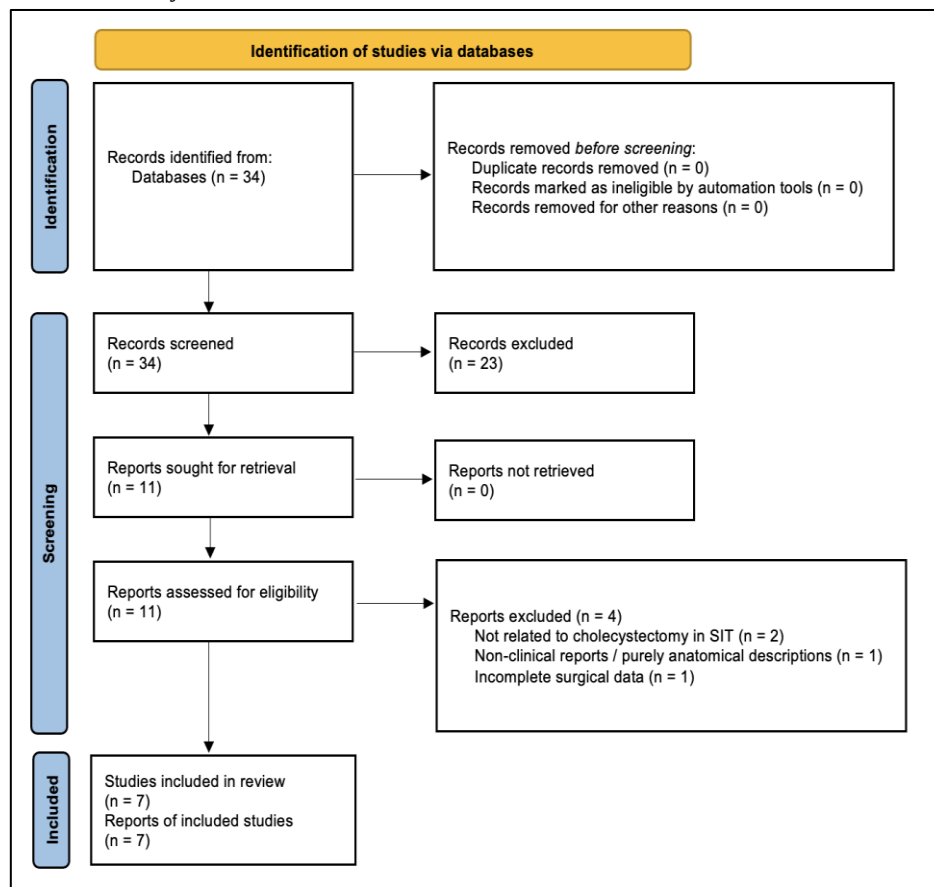


Figure 1: PRISMA flow diagram illustrating the identification, screening, eligibility, and inclusion of studies evaluating laparoscopic cholecystectomy in patients with SIT.

RESULTS

The literature search identified a limited number of studies describing laparoscopic cholecystectomy performed in patients with SIT, reflecting the rarity of this anatomical condition.⁹⁻¹⁵ The main characteristics of the studies included in this systematic review are summarized in Table 1. Most of the available evidence consists of isolated case reports and small case series published across different geographic regions, including Mexico, Egypt, Pakistan, India, Ecuador, and China.⁹⁻¹⁵

Despite variations in clinical presentation and operative strategy, the majority of patients presented with symptomatic gallbladder disease, most commonly cholelithiasis or acute cholecystitis. Across the included studies, laparoscopic cholecystectomy was successfully performed with appropriate technical adaptations to account for mirror-image anatomy, such as modified port placement or adjusted surgeon positioning. Overall, the reported outcomes were favorable, with most cases demonstrating uneventful postoperative recovery and no significant intraoperative or postoperative complications.

Table 1: Reported cases of laparoscopic cholecystectomy in patients with SIT included in the present systematic review.

Authors	Years	Country	Study type	Clinical presentation	Surgical approach	Outcome
Flores et al ⁹	2026	México	Case report	Acute cholecystitis with left upper quadrant pain	Laparoscopic cholecystectomy with mirrored port placement	Uneventful recovery
Salama et al ¹⁰	2013	Egypt	Case report + literature review	Symptomatic cholelithiasis	Laparoscopic cholecystectomy	Successful surgery without complications
Ahmed et al ¹¹	2016	Pakistan	Retrospective case series (3 cases)	Cholelithiasis in SIT	Laparoscopic cholecystectomy with modified port placement	No intra- or postoperative complications
Alam et al ¹²	2017	India	Case report	Symptomatic gallstones	Laparoscopic cholecystectomy with technical modifications	Successful laparoscopic management
Takalkar et al ¹³	2018	India	Case report	Cholelithiasis with biliary pathology	Laparoscopic cholecystectomy + CBD exploration + choledochoduodenostomy	Uneventful recovery
Moyon et al ¹⁴	2020	Ecuador	Case report	Acute cholecystitis with choledocholithiasis	Laparoscopic cholecystectomy + ERCP for choledocholithiasis	Favorable postoperative outcome
He et al ¹⁵	2022	China	Case report	Symptomatic cholelithiasis	Laparoscopic cholecystectomy	Successful surgery

*Abbreviations: SIT: Situs inversus totalis, CBD: Common bile duct, ERCP: Endoscopic retrograde cholangiopancreatography.

Table 1 summarizes the principal characteristics of the studies included in this review, including study design, clinical presentation, surgical approach, and postoperative outcomes. The available literature is primarily composed of isolated case reports and small case series describing laparoscopic cholecystectomy performed in patients with SIT.

Clinical presentation and diagnostic considerations

The clinical diagnosis of gallbladder disease in patients with SIT can be particularly challenging due to the mirror-image transposition of thoracic and abdominal organs. As a result of this reversed anatomical orientation, symptoms may localize to the left upper quadrant rather than the typical right upper quadrant,

which can lead to diagnostic confusion or delayed recognition of biliary pathology. Several reports have described patients presenting with left-sided abdominal pain, nausea, and vomiting, clinical findings that may initially suggest alternative gastrointestinal, pancreatic, or even cardiac conditions rather than gallbladder disease.^{9,14} In some cases, the incidental identification of dextrocardia on chest radiography may provide an early clue to the presence of situs inversus and prompt further diagnostic evaluation.

Despite the atypical symptom localization, the underlying biliary pathology in patients with SIT is generally similar to that observed in the general population. Cholelithiasis and acute cholecystitis remain the most frequently reported conditions requiring surgical management.^{10-12,15}

However, more complex biliary presentations have also been described, including choledocholithiasis and obstructive jaundice, which may necessitate additional diagnostic procedures and therapeutic interventions such as endoscopic retrograde cholangiopancreatography or biliary exploration.^{13,14} Unusual anatomical configuration may therefore complicate the initial clinical assessment, particularly in emergency settings where atypical abdominal pain can obscure the underlying diagnosis and delay appropriate surgical referral. Imaging studies play a pivotal role in establishing correct diagnosis and identifying anatomical variant. Ultrasonography is typically 1st-line imaging modality and can reveal the presence of a left-sided gallbladder and signs of gallstones/gallbladder inflammation. When situs inversus is suspected, cross-sectional imaging such as computed tomography provides confirmation of mirror-image arrangement of thoracic and abdominal organs and offers valuable anatomical information for operative planning.^{9,14} In addition to confirming diagnosis, preoperative imaging allows surgeons to anticipate potential anatomical variations and prepare for technical adaptations required during laparoscopic surgery. Early recognition of SIT is therefore essential for appropriate operative preparation. Awareness of this rare anatomical variant enables surgeons to anticipate the ergonomic and technical challenges associated with laparoscopic cholecystectomy and to modify the operative strategy

accordingly. With adequate preoperative planning and careful intraoperative orientation, safe laparoscopic management can be achieved while minimizing the risk of bile duct injury and other operative complications.

Technical considerations for laparoscopic cholecystectomy in SIT

The mirror-image anatomy observed in patients with SIT presents unique technical and ergonomic challenges

uring laparoscopic cholecystectomy. Because the gallbladder and hepatobiliary structures are located on the left side of the abdomen, surgeons must adapt their usual operative strategy to maintain adequate exposure and safe dissection of Calot's triangle. Several technical modifications have been described in the literature to address these challenges, including changes in surgeon positioning, mirrored trocar placement, and adjustments in instrument handling.

These adaptations are particularly important for right-handed surgeons, who may experience ergonomic difficulties when operating within a reversed anatomical orientation.

The principal technical considerations reported in the literature are summarized in Table 2.

Table 2: Technical adaptations reported for laparoscopic cholecystectomy in patients with SIT.

Technical aspects	Conventional technique	Adaptation in SIT	Supporting references
Surgeon position	Surgeon typically stands on the patient's left side	Surgeon positioned on the patient's right side to facilitate ergonomic instrument handling	10-12 and 15
Trocar placement	Right subcostal ports	Mirror-image trocar placement on the left side of the abdomen	9-12
Camera port	Umbilical or supraumbilical	Usually unchanged; provides central visualization	9-15
Instrument handling	Right hand performs dominant dissection	Adjusted hand positioning or crossed instruments to maintain dissection control	11,12 and 15
Exposure of Calot's triangle	Standard retraction of gallbladder fundus	Modified traction due to reversed anatomical orientation	9-13
Safety principles	Standard identification of cystic duct and artery	Same critical view of safety principle applied despite mirror anatomy	9-15

Proper operating room setup is an essential consideration when performing laparoscopic cholecystectomy in patients with SIT. Due to the mirror-image orientation of the abdominal organs, the gallbladder is located in the left upper quadrant rather than its typical right-sided position. As a result, several authors recommend modifying the standard operating room configuration in order to maintain adequate ergonomics and optimal visualization during the procedure.^{10-12,15}

In most reported cases, the surgeon stands on the patient's right side instead of the left, which corresponds to the mirrored location of the gallbladder. The assistant and camera operator are positioned accordingly to facilitate appropriate retraction and visualization of the operative field. This arrangement allows the surgical team to reproduce the familiar orientation used during conventional laparoscopic cholecystectomy while adapting to the reversed anatomical layout.^{10,12}

Patient positioning typically remains similar to that used in standard laparoscopic cholecystectomy, with the patient placed in a supine position and slight reverse Trendelenburg with left-side elevation to improve exposure of the gallbladder. These adjustments help optimize gravitational retraction of abdominal organs and facilitate safe dissection of Calot's triangle despite the mirrored anatomy.^{9,14}

Careful planning of the operating room configuration is therefore crucial before initiating the procedure. Adequate preparation allows the surgical team to anticipate ergonomic challenges associated with the reversed anatomy and helps maintain procedural efficiency and safety throughout the operation.

Trocar placement represents one of the most important technical adaptations when performing laparoscopic cholecystectomy in patients with SIT. Because the gallbladder is located in the left upper quadrant, the conventional right-sided subcostal port configuration must be mirrored to allow appropriate access to the hepatobiliary structures. In most reported cases, surgeons adopt a mirror-image port placement strategy that reproduces the standard laparoscopic cholecystectomy layout but on the opposite side of the abdomen.⁹⁻¹²

Typically, the camera port is inserted in the umbilical or supraumbilical position, similar to the conventional technique, allowing a central view of the abdominal cavity. Working ports are then placed in the left subcostal region along the midclavicular and anterior axillary lines, providing adequate access for dissection and retraction of the gallbladder. This mirrored configuration enables the surgeon to achieve proper exposure of Calot's triangle while maintaining familiar laparoscopic ergonomics.¹⁰⁻¹²

Several authors have emphasized that careful planning of trocar placement is essential to maintain safe operative angles and facilitate the identification of key anatomical landmarks. In particular, appropriate retraction of the gallbladder fundus and infundibulum is necessary to allow safe dissection and clear visualization of the cystic duct and cystic artery. These principles remain identical to those applied in conventional laparoscopic cholecystectomy despite the reversed anatomical orientation.^{11,15}

Although the mirror-image technique is the most commonly described approach, minor variations in trocar positioning have been reported depending on surgeon preference and patient anatomy. Nevertheless, the fundamental goal remains unchanged: to achieve adequate exposure and safely obtain the critical view of safety during dissection of Calot's triangle, thereby minimizing the risk of bile duct injury.⁹⁻¹³

Laparoscopic cholecystectomy in patients with SIT may present significant ergonomic challenges, particularly for right-handed surgeons who are accustomed to operating

within the standard anatomical orientation. Because the hepatobiliary structures are located on the left side of the abdomen, the usual hand dominance used during dissection and retraction must often be modified. As a result, surgeons may need to perform critical steps of the procedure, including dissection of Calot's triangle, using their non-dominant hand or through altered instrument angles, which can initially reduce operative comfort and efficiency.¹⁰⁻¹²

Several reports have highlighted that this reversed configuration can create technical difficulty during the precise dissection of the cystic duct and cystic artery. Instrument crossing and altered triangulation may occur if trocar placement is not carefully planned. For this reason, some authors recommend adjusting the positions of the working ports or allowing the assistant to provide more active retraction of the gallbladder fundus in order to facilitate dissection by the primary surgeon.^{11,15}

Despite these ergonomic limitations, most published cases demonstrate that laparoscopic cholecystectomy can be performed safely once the surgeon adapts to the mirrored orientation of the operative field. Familiarity with laparoscopic techniques, careful instrument coordination, and adherence to established safety principles allow surgeons to overcome these challenges and maintain adequate precision during dissection.^{9,12} With appropriate preparation and awareness of the anatomical variation, the procedure can be completed successfully without increasing the risk of complications.

Intraoperative safety considerations

Despite the anatomical reversal associated with SIT, the fundamental principles of safe laparoscopic cholecystectomy remain unchanged. The most critical aspect of the procedure is the careful identification of anatomical landmarks within Calot's triangle and the achievement of the critical view of safety prior to clipping and dividing the cystic structures. Although the mirror-image orientation may initially create spatial disorientation for the operating surgeon, adherence to these established safety principles is essential to prevent bile duct injury and other intraoperative complications.⁹⁻¹²

Several reports emphasize that meticulous dissection and proper exposure of Calot's triangle are particularly important in patients with SIT. Adequate traction on the gallbladder fundus and infundibulum helps expose the hepatocystic triangle and facilitates identification of the cystic duct and cystic artery. Because the anatomical relationships appear reversed compared with the typical orientation, surgeons must maintain heightened awareness of the altered spatial relationships while proceeding with careful and methodical dissection.^{11,15}

Preoperative imaging and intraoperative orientation also play an important role in ensuring surgical safety. Cross-sectional imaging studies can provide valuable

information about the anatomical configuration of the hepatobiliary system and help surgeons anticipate the mirrored arrangement of structures before entering the operative field. This preoperative awareness allows the surgical team to plan trocar placement, surgeon positioning, and operative strategy more effectively.^{9,14}

Overall, when the principles of safe laparoscopic surgery are strictly followed, laparoscopic cholecystectomy in patients with SIT can be performed with outcomes comparable to those observed in patients with normal anatomical orientation. Careful dissection, proper exposure of Calot's triangle, and achievement of the critical view of safety remain the key factors for minimizing operative risk and ensuring favorable postoperative results.¹⁰⁻¹²

DISCUSSION

SIT represents a rare congenital anatomical variant characterized by a complete mirror-image transposition of thoracic and abdominal organs. Although this condition itself does not predispose individuals to biliary disease, it can significantly complicate the diagnosis and surgical management of gallbladder pathology due to the reversed anatomical orientation. In patients presenting with biliary symptoms, the atypical localization of pain—most frequently in the left upper quadrant—may lead to diagnostic confusion and delay appropriate treatment if the anatomical variant is not recognized early.^{9,14,15} For this reason, clinicians must maintain a high index of suspicion when evaluating abdominal pain that does not follow the expected anatomical distribution.

Despite these diagnostic challenges, the underlying biliary pathology observed in patients with SIT is largely comparable to that seen in the general population. Cholelithiasis and acute cholecystitis remain the most commonly reported indications for surgical intervention, and the overall clinical course does not appear to differ significantly from that observed in patients with normal anatomical orientation.¹⁰⁻¹⁵ Imaging studies therefore play a central role in establishing the diagnosis and identifying the anatomical variation. Ultrasonography is typically the first-line modality for evaluating suspected gallbladder disease, while computed tomography or magnetic resonance imaging may provide additional anatomical clarification and facilitate operative planning.^{9,14}

From a surgical standpoint, laparoscopic cholecystectomy remains the gold standard treatment for symptomatic gallbladder disease and can be safely performed in patients with SIT when appropriate technical modifications are implemented. Several reports have demonstrated that the fundamental steps of the procedure remain unchanged despite the mirrored anatomy, including careful dissection of Calot's triangle and identification of the cystic duct and cystic artery prior to division.^{3,4,7} Nevertheless, the reversed anatomical configuration introduces important ergonomic

considerations that require adaptation by the operating surgeon.

One of the most frequently discussed challenges in the literature relates to the ergonomic difficulty experienced by right-handed surgeons when performing dissection within a reversed operative field. Because standard laparoscopic cholecystectomy is typically performed with the surgeon standing on the patient's left side and dissecting with the dominant right hand, the mirrored anatomy in situs inversus may require modification of surgeon positioning and trocar placement to maintain optimal instrument control.^{4,11,12} Various technical strategies have been described, including mirror-image port placement, altered surgeon positioning, and increased reliance on assistant retraction to improve visualization of the hepatocystic triangle.¹¹⁻¹³

Importantly, the available evidence suggests that these technical challenges do not translate into worse surgical outcomes when appropriate precautions are taken. Most published reports describe successful laparoscopic cholecystectomy with favorable postoperative recovery and no significant increase in complication rates.¹⁰⁻¹⁵ This observation supports the concept that SIT should not be considered a contraindication to laparoscopic cholecystectomy but rather a condition that requires careful preoperative planning and intraoperative adaptation.

In addition to conventional laparoscopic approaches, advances in minimally invasive surgery have further expanded the surgical options available for managing gallbladder disease in patients with anatomical variations. Several authors have reported the successful use of robotic-assisted cholecystectomy in situs inversus, highlighting potential advantages such as improved instrument articulation and enhanced three-dimensional visualization, which may help overcome some of the ergonomic limitations associated with mirror-image anatomy.¹⁶⁻¹⁸ Similarly, single-incision laparoscopic techniques have been described in selected cases, although their role remains limited and requires further evaluation.¹⁹

Nevertheless, the current body of evidence regarding laparoscopic cholecystectomy in SIT remains limited. Most available studies consist of isolated case reports or small case series, reflecting the rarity of the condition. Consequently, the literature lacks large prospective studies or standardized technical recommendations. Future multicenter studies and pooled analyses may help provide a more comprehensive understanding of optimal surgical strategies and potential outcome differences in this unique patient population.²⁰

Overall, the evidence suggests that with appropriate awareness of the anatomical variation, careful operative planning, and adherence to established principles of safe

laparoscopic surgery, laparoscopic cholecystectomy can be performed effectively and safely in patients with SIT.

CONCLUSION

SIT is a rare congenital anatomical variant that can complicate the diagnosis and surgical management of gallbladder disease due to the mirror-image orientation of abdominal organs. Nevertheless, the available evidence indicates that laparoscopic cholecystectomy can be performed safely and effectively in these patients when appropriate technical adaptations, such as mirrored trocar placement, modified surgeon positioning, and careful ergonomic adjustments, are implemented. Early recognition of the anatomical variation through appropriate imaging, combined with meticulous intraoperative dissection and strict adherence to the critical view of safety, is essential to minimize the risk of bile duct injury and other operative complications. Although most reported cases demonstrate favorable postoperative outcomes, the current evidence is largely limited to isolated case reports and small case series, highlighting the need for larger multicenter studies to better characterize optimal surgical strategies and outcomes in patients with SIT undergoing laparoscopic cholecystectomy.

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