

# Segmental Spinal Anaesthesia for Laparoscopic Cholecystectomy in Situs Inversus Patient: A Case Report

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## ABSTRACT

Situs inversus is a rare congenital anomaly and presents with transposition of abdominal and thoracic viscera to the opposite side, including the heart and gallbladder. Laparoscopic Cholecystectomy (LC) is the gold standard for chronic cholelithiasis and has been reported in patients with situs inversus under General Anaesthesia (GA). Segmental Spinal anaesthesia (SS) has been gaining popularity as a safe alternative to GA in high-risk patients and for LC as well. Present case is of a 48-year-old male with situs inversus, dextrocardia without any other cardiopulmonary anomaly, and short stature who was electively operated on under the SS for chronic cholelithiasis electively. The patient was aware of his congenital condition and preferred awake anaesthesia. After a multidisciplinary discussion involving surgery, cardiology and the anaesthesia team the patient was operated on with LC successfully under SS with isobaric levobupivacaine and fentanyl through T8-9 space. The intraoperative and postoperative periods were uneventful. Present case conclude that SS can provide considerable safety in well-investigated patients who pose a risk for GA due to various factors, such as altered anatomy, birth abnormalities associated with cardiac and pulmonary risk and difficult airways. This case report can be used as a reference for the preferred use of SS instead of GA in such cases.

**Keywords:** Dextrocardia, Isobaric, Levobupivacaine, Short stature

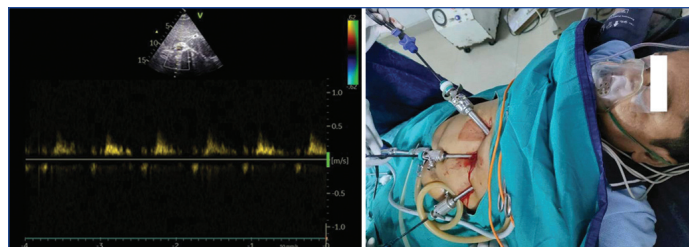
## CASE REPORT

A 48-year-old male who is short-statured, with a height of 90 cm and a body weight of 16 kg, presented for elective LC. The patient was diagnosed with situs inversus and dextrocardia during routine investigation for an unrelated ailment 22 years back, and he was aware of this condition. He had been a known hypertensive since last two years, with adequate blood pressure control on Tab Amlodipine 5 mg once daily, and had hypothyroidism since five years, managed with Tab Thyroxine 50 µg once daily. He presented with complaints of occasional epigastric pain, which increasing after meals and often radiating to the back. An ultrasound of abdomen showed a gallbladder on the left side of the abdomen with multiple stones and a spleen on the right side. The patient was planned for LC and consulted for a preanaesthetic check-up.

On physical examination, heart sounds were heard on the right side, and abdominal and respiratory systems were within normal limits. He was investigated with complete blood counts, liver function tests, kidney function tests, thyroid hormones assay, a chest X-ray, Electrocardiography (ECG), and echocardiography. The Echocardiography revealed dextrocardia with normal systolic and diastolic functions [Table/Fig-1]. A Computed Tomography (CT) abdomen was done to delineate the anatomy for surgery and confirmed the findings of transposition of thoracic and abdominal organs with no other major abnormality.

After the preoperative screening and multidisciplinary discussion with the surgeon, cardiologist and anaesthetist, the patient was scheduled for elective LC under SS anaesthesia. On the day of surgery, an eight-hours of NPO status was ascertained and Ringer's Lactate 10 mL/kg was infused with Inj. Ondansetron 0.1 mg/kg intravenously as premedication. SS was performed using a 27 G Quincke's needle, with 0.8 mL of isobaric Inj. Levobupivacaine and 5 µg of Fentanyl administered intrathecally after Confirmation of Free (CSF) flow at the T8-9 intervertebral space. The sensory level was assessed with the pinprick method, achieving an effect up to the T4 dermatome within five minutes. The Epidural Scaling Score of

Arm Movement (ESSAM) was assessed using the ESSAM score [1] and seen to be 0, indicating no motor loss in the upper limbs. The patient had intact toe movements before the start of the procedure, with slight flexion of both knee joints, implying that complete motor block had not been achieved in the lower limbs. Inj. Midazolam 1 mg IV was given before the start of the procedure, with intra-abdominal pressure kept at 12 mmHg. A Stryker 1688 system with a 30° scope was utilised for surgery. The laparoscopic ports were modified in accordance with the situs inversus [2] and the surgeon's convenience [Table/Fig-2]. The gallbladder was confirmed to be on the left side of the abdomen, with slight oedema. The surgery was completed successfully within 25 minutes of operative time. Intraoperatively, a single episode of hypotension of 85/55 mmHg with a heart rate of 62/min occurred three minutes of insufflation of CO<sub>2</sub>, which was managed by a single bolus of Inj. Mephentermine 3 mg IV. Mephentermine was preferred over Phenylephrine to avoid further reduction of heart rate. The patient was awake and following commands at the commencement of the procedure, with the ability to aid in shifting himself to the stretcher.



**[Table/Fig-1]:** Echocardiography of the patient showing normal Aortic pulsation on right-side.

**[Table/Fig-2]:** The patient position and laparoscopic port placement. (Images from left to right)

## DISCUSSION

Situs inversus totalis is a rare autosomal recessive disorder characterised by transposition of thoraco-abdominal viscera, with a predicted incidence rate of 1 in 10,000 live births. Situs inversus may present with a spectrum of malformation, and depending on

the involvement of viscera, it may be graded as situs ambiguous, situs inversus partialis, or totalis [3].

Situs inversus totalis presents with transposition of all thoracic and abdominal viscera, including dextrocardia, i.e., a right-sided heart and a left-sided gallbladder. Dextrocardia may be further associated with Kartagener's Syndrome and Stratton-Parker Syndrome. Kartagener's syndrome is associated with renal dysplasia, biliary atresia, congenital heart disease, or pancreatic fibrosis, along with dextrocardia. Stratton-Parker syndrome is characterised by co-existing short stature with growth hormone deficiency, brachycamptodactyly, kidney hypoplasia, hypospadias, and anorectal and facial anomalies [4].

LC has been gold standard for cholelithiasis and has been reported in patients with situs inversus as well. Although LC is usually performed under GA, SS anaesthesia is gaining popularity in contemporary practice for the advantage of very selective and awake anaesthesia and early recovery. Authors present here a rare case report of a situs inversus patient operated under SS anaesthesia for LC. Authors believe this case report is the first reported case of SS anaesthesia for LC in a patient with dextrocardia.

SS anaesthesia is an innovative approach to the regional anaesthesia and subarachnoid block, where the dura is punctured far above the conventional approach of lumbar spinal anaesthesia. Various myelographic studies have proven that there is an increased distance between the spinal cord and posterior dura at the thoracic level [5-8]. Recently, Chandra R et al., published Magnetic Resonance Imaging (MRI) studies specific to the Indian population for thoracic spinal anaesthesia, and they also found an ample space between dura and cord at thoracic level [9]. The basic advantage of this approach is that it allows us to target the specific dermatomal level required for surgery with very low dose of local anaesthetic drugs, eventually achieving greater haemodynamic stability and patient satisfaction with fewer adverse effects. By targeting only the specific segments needed for surgery, both upper and lower extremities are spared from any block. Here patient was able to move from OT table to stretcher just after surgery and he went to pass urine by himself just after one hour of the surgery. The present case highlights the utility and safety of SS for altered anatomical configurations including the situs inversus. For the similar reasons, another case report by Deshpande JP and Jacob ME where they did fibroadenoma excision in situs inversus totalis patient under thoracic SS anaesthesia, and found that the haemodynamically patient remain stable there was early mobilisation, which is crucial in patients with dextrocardia, as mucociliary clearance may be hampered; early mobilisation provides better postoperative outcomes [10].

The first LC under thoracic spinal anaesthesia was done by Van Zundert AA et al., in a patient with severe lung disease [11]. The advantages of such anaesthesia include targeted specific dermatomal level block as needed for surgery, a very low dose of local anaesthetic drugs, greater haemodynamic stability, fewer adverse effects, and patient satisfaction with awake anaesthesia [11]. Paliwal N et al., in a comparative study of SS versus GA for LC involving 60 patients, concluded that SS is a better choice in patients, particularly those with respiratory co-morbidities, as it has a lower incidence of atelectasis and postoperative pneumonia [12]. Thoracic spinal anaesthesia is a safe and useful anaesthetic approach for LC without any neurological sequel in a study involving a 2,012 patients conducted earlier [13].

In earlier cases of situs inversus totalis, LC has been reported only under GA only. In a similar case of reported by Eapen S et al., in 2015, the patient with situs inversus had a normal stature [14]. In the present case, however, the patient had a short stature. GA in short-stature and situs inversus patients risk of accidental left bronchial intubation, as the left bronchus is in line with the trachea. There are

a lots of issues related to the length and fixation of the endotracheal tube. A prolonged recovery time after administration of depolarising muscle relaxants has been reported in such patients, and a preference to avoid succinylcholine and use of non depolarising muscle relaxant such as vecuronium [15]. An association with Kartagener's syndrome leads to decreased mucociliary clearance, making GA further unfavourable.

The patient, being aware of his congenital condition and feeling anxious, preferred awake anaesthesia. Following a multidisciplinary discussion that involving the surgeon's expertise and our earlier experience with the safety of SS for LC, the patient was taken for surgery under SS anaesthesia. He remained haemodynamically stable and pain-free during the procedure. He did not report any discomfort, anxiety, or breathing difficulty, and was satisfied with the anaesthesia approach. Postoperatively, this patient did not have any shoulder pain or respiratory discomfort.

## CONCLUSION(S)

SS anaesthesia may provide considerable safety in well-investigated patients who pose a risk for GA due to various factors such as altered anatomy, birth abnormalities associated with cardiac and pulmonary risk, and difficult airways. Situs inversus with a short stature may pose anaesthetic challenges, such as risk of endobronchial intubation, decreased mucociliary clearance, and consideration for endotracheal tube fixation. SS anaesthesia may facilitates early mobilisation, quicker recovery from anaesthesia, and better mucociliary clearance comparison to GA in this situation. This case report may be used as a reference for such cases for the preferred use of SS instead of GA.

## REFERENCES

- [1] Abd Elrazek E, Scott NB, Vohra A. An Epidural Scoring Scale for Arm Movements (ESSAM) in patients receiving high thoracic epidural analgesia for coronary artery bypass grafting. *Anaesthesia*. 1999;54(11):1104-09.
- [2] Ali MS, Attash SM. Laparoscopic cholecystectomy in a patient with situs inversus totalis: Case report with review of literature. *BMJ Case Rep*. 2013;2013:bcr2013201231.
- [3] Bohun CM, Potts JE, Casey BM, Sandor GG. A population-based study of cardiac malformations and outcomes associated with dextrocardia. *Am J Cardiol*. 2007;100(2):305-09.
- [4] Mishra M, Kumar N, Jaiswal A, Verma AK, Kant S. Kartagener's syndrome: A case series. *Lung India*. 2012;29(4):366-69.
- [5] Imbelloni LE, Ferraz-Filho JR, Quirici MB, Cordeiro JA. Magnetic resonance imaging of the spinal column. *Br J Anaesth*. 2008;101(3):433-34.
- [6] Park JW, Bae SK, Huh J. Distance from Dura mater to spinal cord at the thoracic vertebral level: An introductory study on local subdural geometry for thoracic epidural block. *J Int Med Res*. 2016;44(4):950-56.
- [7] Wani T, Beltran R, Veneziano G, AlGhamdi F, Azzam H, Akhtar N, et al. Dura to spinal cord distance at different vertebral levels in children and its implications on epidural analgesia: A retrospective MRI-based study. *Paediatr Anaesth*. 2018;28(4):338-41.
- [8] Imbelloni LE, Quirici MB, Ferraz Filho JR, Cordeiro JA, Ganem EM. The anatomy of the thoracic spinal canal investigated with magnetic resonance imaging. *Anaesth Analg*. 2010;110(5):1494-95.
- [9] Chandra R, Misra G, Pokharia P, Singh PK. Study of thoracic spinal canal in Indian population with the 3.0 tesla magnetic resonance imaging: exploring the safety profile of thoracic spinal anaesthesia. *J Anaesth Clin Res*. 2024;15:1148.
- [10] Deshpande JP, Jacob ME. Fibroadenoma excision under thoracic segmental spinal anaesthesia in isolated situs inversus totalis: A case report. *Archives of Anaesthesia and Critical Care*. 2023;9(1):64-66.
- [11] Van Zundert AA, Stultiens G, Jakimowicz JJ, Peek D, van der Ham WG, Korsten HH, et al. Laparoscopic cholecystectomy under segmental thoracic spinal anaesthesia: A feasibility study. *Br J Anaesth*. 2007;98:682-86.
- [12] Paliwal N, Maurya N, Suthar OP, Janweja S. Segmental thoracic spinal anaesthesia versus general anaesthesia for breast cancer surgery: A prospective randomized-controlled open-label trial. *J Anaesthesiol Clin Pharmacol*. 2022;38(4):560-65.
- [13] Chandra R, Misra G, Datta G. Thoracic spinal anaesthesia for laparoscopic cholecystectomy: An observational feasibility study. *Cureus*. 2023;15(3):e36617.
- [14] Eapen S, Ahluwalia C, Chopra V, Kiran S. Anaesthetic management for laparoscopic cholecystectomy in patient with situs inversus totalis. *Indian J Anaesth*. 2015;59(1):57-58.
- [15] Bajwa SJ, Kulshrestha A, Kaur J, Gupta S, Singh A, Parmar SS. The challenging aspects and successful anaesthetic management in a case of situs inversus totalis. *Indian J Anaesth*. 2012;56(3):295-97.

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