

Case Report

Anesthetic management of a patient with situs inversus posted for laparoscopic cholecystectomy

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ABSTRACT

Situs inversus totalis is a rare congenital visceral malrotation anomaly that results from disturbances in establishment of left-right asymmetry. It is an autosomal recessive condition, in which organs are transposed from their normal location to the opposite side of the body and the predicted incidence is one in 10,000 among the general population. In a patient with situs inversus totalis, not just the diagnosis of any acute abdomen pathology is difficult but equally challenging is the anesthetic management during the respective surgical procedure. We are reporting a patient who had situs inversus totalis and was operated for laparoscopic cholecystectomy under general anesthesia, and endotracheal tube as an airway conduit. Though the problems related to such patients are mainly of surgical feasibility, an anesthesiologist must be aware of the associated problems of both, situs inversus and the surgical procedures. The present case report lays an emphasis on the potential difficulties during anesthetic management and its various implications in a remote area in North East India with resource limitations. To the best of our knowledge, we report the first case from a remote area in North East India of a successful laparoscopic cholecystectomy in a patient with situs inversus totalis under general anesthesia which was uneventful.

Keywords: Cholecystectomy, General anesthesia, Laparoscopy, Situs inversus totalis

INTRODUCTION

Situs inversus totalis is one of the rare congenital disorders with incidence of 1:5000 to 1:20000.^{1,2} It is a morphological anomaly of the positioning of internal viscera where in there is a reversal of the usual handedness of the visceral topography. The reversal may be thoracic, abdominal or both. Situs inversus on its own is not pathological; however, it may be associated with cardio-respiratory, hepatic pancreaticobiliary, gastro intestinal, neurological, orthopedic and urological anomalies.^{3,4} The association of situs inversus totalis with syndromes such as Kartagener's syndrome, cardiac anomalies, spleen malformations and other such clinical entities makes the clinical scenario extremely challenging for the concerned anesthesiologist.⁵ The normal

development requires a 270 degree counter clockwise rotation that yields the normal anatomy. In situs inversus totalis, the 270-degree rotation is in the clockwise direction.⁶

The first case of situs inversus in humans was reported by Fabricius in 1600.⁷ This condition of abnormal visceral rotation was known in animals since the days of Aristotle.¹ The exact etiology is unclear; however, it is thought to be due to a single autosomal recessive gene of incomplete penetration. The male: female ratio is 1:1 and there is no racial predilection.⁸ It is important to be aware of presence of situs inversus to ensure the correct diagnosis and treatment of patients with acute abdomen. We are reporting a rare case of situs inversus totalis who underwent laparoscopic cholecystectomy under general

anesthesia with endotracheal tube as an airway conduit. The anesthetic considerations and implications associated with such anatomical abnormalities are discussed.

CASE REPORT

A 50-years-old female, weighing 50 kg, presented with a 6 months' history of intermittent left upper quadrant colicky pain, radiating to the left scapular region, which is aggravated by fatty food. No other symptoms were present and abdominal examination was unremarkable. On chest examination, apex beat was found on the right side of chest.

Ultrasonography abdomen for the evaluation of pain revealed situs inversus and X-ray chest revealed dextrocardia with fundal gas shadow on right side (Figure 1). Computed tomography (CT) abdomen revealed situs inversus totalis (Figure 2). Echocardiograph revealed normal cardiac parameters with ejection fraction of 77% and dextrocardia. ECG finding also revealed dextrocardia. On examination, the patient did not have any associated abnormalities. Airway examination revealed Mallampatti class II. Hemodynamic parameters were within normal limits. She was scheduled to undergo laparoscopic cholecystectomy.

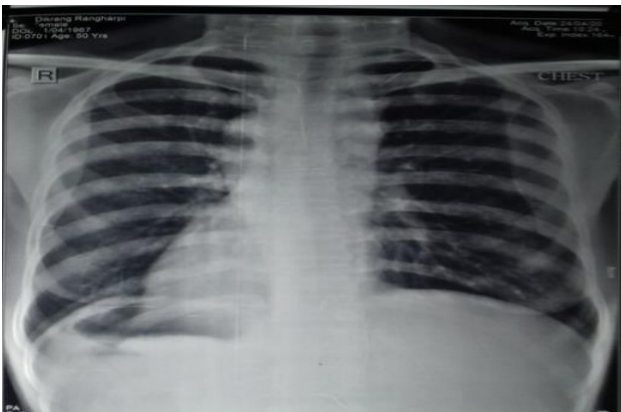


Figure 1: Chest X-ray of dextrocardia.

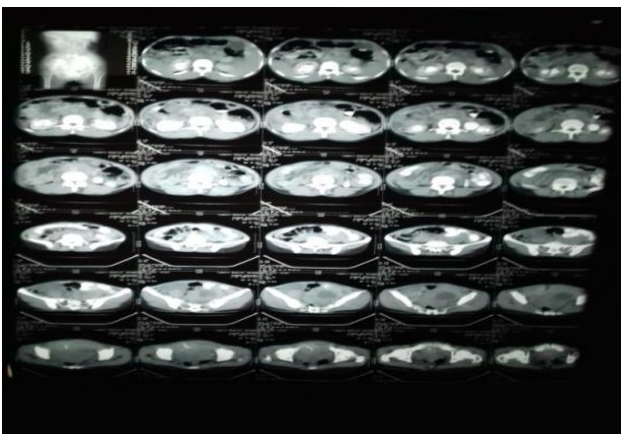


Figure 2: CT abdomen showing Situs inversus totalis.

In the preanesthetic area intravenous access was secured with 18G IV cannula. Inj Pantoprazole 40 mg and inj. Ondansetron 4 mg were given intravenously. In the operation room, ECG electrodes (mirror image of normal), NIBP and pulse oximeter were connected. ECG electrodes when placed in normal orientation showed upside down reading in lead II (Figure 3) and when placed in a mirror image showed normal reading in the same lead (Figure 4).



Figure 3: ECG showed upside down reading in lead II.



Figure 4: ECG in lead II when electrodes placed in a mirror image of normal.

Pre-medicated with inj. Midazolam 1 mg. Patient was induced with inj. Propofol 100 mg, inj. Fentanyl 100 mcg and 2% Sevoflurane. Neuromuscular blockade was achieved with inj. Vecuronium 6 mg. Endotracheal tube was inserted, placement confirmed with bilateral air entry on auscultation and ETCO₂ wave form. Respiratory rate-12/min and I: E = 1:2.

During laparoscopic surgery orientation and ergonomics were altered, surgeon stood on right side and video monitor was shifted to left side of patient. Total operating time was 95 min. Laparoscopic cholecystectomy was done to note the findings (Figure 5).

Anesthesia was maintained with O₂: N₂O=60:40, sevoflurane 0.6-1% and intermittent doses of inj. Vecuronium and Fentanyl. SpO₂ was ranging between 98-99%. ETCO₂ was ranging between 28-36 mmHg. At

the end of surgery, when the patient had respiratory attempts, residual neuromuscular blockade was reversed with Inj. Neostigmine 2.5 mg. and inj. Glycopyrrolates 0.4 mg. Perioperative period was uneventful and patient was discharged from hospital on fifth post-operative day.

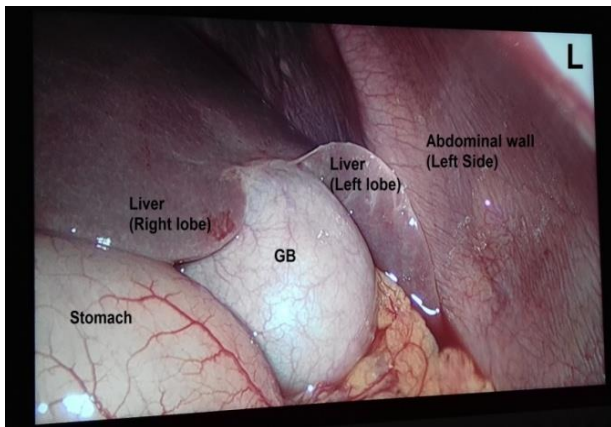


Figure 5: Reversed internal anatomy seen during laparoscopy.

DISCUSSION

Situs inversus totalis is a rare congenital disorder with incidence of 0.01%.⁹ This phenomenon is considered to have a genetic predisposition which is autosomal recessive with the defect being localized on the long arm of chromosome 14.¹⁰

Early embryonic process of determination of normal body situs is complex and probably controlled by several genes.¹¹ The exact etiology is unclear; however, it is thought to be due to a single autosomal recessive gene of incomplete penetration. The male to female ratio is 1:1 and there is no racial predilection.^{12,13}

It is characterized by the transposition of the major thoracic organs and all the visceral organs of the abdomen to opposite side of normal position in the body. The stomach and the spleen are on the right, while the liver and gall bladder are located on the left. The normal development requires a 270-degree counter clockwise rotation which yields the normal anatomy but in situs inversus totalis, the 270-degree rotation is in the clockwise direction.⁶

In acute abdomen, it is important to be aware of the presence of situs inversus to ensure the correct diagnosis and treatment. Acute appendicitis causes left lower quadrant pain, whereas cholecystitis causes left upper quadrant pain in these patients. CT scanning is the preferred diagnostic modality as it shows the anatomical details. There is no evidence that situs inversus predisposes to cholelithiasis, but it may be a cause of diagnostic confusion. Delay in the diagnosis was due to the left upper abdominal pain and unknown situs inversus.¹⁴ In this case the patient presented with right

upper quadrant pain only and had no definite left upper quadrant pain.

It has been noted in 30% of previous reported cases of acute cholecystitis in patients with situs inversus that the pain was felt in the epigastrium alone and in 10% the pain was localized to the right upper quadrant.¹⁵ The proposed explanation for this is that the central nervous system may not share in the general transposition. Patients with situs inversus who are scheduled for laparoscopic cholecystectomy should be assessed pre-operatively for any potentially serious cardiac or respiratory abnormalities.

While there is no evidence to suggest that there is an increased risk of bile duct injuries in patients with situs inversus, the orientation and ergonomic challenges may result in an increased operative time.¹⁶ The procedure becomes difficult because of the fact that the anatomy is mirror image of that of routinely seen and most surgeons are right handed.

In situs inversus there are some special considerations which includes ECG electrodes and defibrillator pads that has to be placed on reverse side. Secondly there is association of situs inversus with other syndromes and diseases like Kartagener's syndrome, mucociliary dysfunction, airway anomalies, etc., which may predispose the patient to numerous varieties of airway difficulties and pulmonary infections that can have considerable implications during induction of anesthesia and intubation. Furthermore, it is associated with numerous cardiac anomalies like atrial septal defects, ventricular septal defects, transposition of great vessels, absent coronary sinus, double-outlet right ventricle, total pulmonary anomalous venous defect and pulmonary valve stenosis either singly or in combination.¹⁷

There has also been association with spinal deformities like split cord, spina bifida, meningocele, scoliosis, etc., so one has to evaluate the patient carefully if any surgery is planned under neuraxial anesthesia. In case of inversion of great vessels preference, should be given to left internal jugular vein for cannulation (to avoid thoracic duct and to ensure direct access to right atrium). The main stem intubation occurs often to the left.¹⁸ In case of thoracic surgery, the anatomy of the bronchi should be considered before selecting a double lumen tube. Insertion of a double-lumen tube will pose a lot of challenges, and the successful intubation and separation of lungs cannot be accomplished without the aid of fiberoptic bronchoscope.

The transposition of the thoracic viscera also alters the various anatomical landmarks, and one must be well acquainted with ultrasound-guided procedures if in case a need arises for invasive central venous cannulation and brachial plexus blockade. If situs inversus is present in Kartagener's syndrome it is invariably associated with mucociliary dysfunction. Primary ciliary dyskinesia is

present in 25% of the patients with situs inversus totalis with an increased probability of developing respiratory complications. Therefore, moist and filtered mixture of gases should be administered during mechanical ventilation. The role of bronchodilators, chest physiotherapy, postural drainage, antibiotics and incentive spirometry cannot be underestimated and is mandatory in optimizing the pulmonary status before any surgical procedure.

CONCLUSION

To conclude with meticulous planning and care, patients with Situs inversus totalis can be successfully managed. It needs modification in technique, proper planning and with cautious dissection; the procedure can be safely completed.

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