



# Laparoscopic Nissen fundoplication for gastroesophageal reflux disease in *situs inversus totalis*: a “self-solving puzzle” – a case report

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**Abstract:** We report a laparoscopic Nissen fundoplication for gastroesophageal reflux disease (GERD) in a patient with *situs inversus totalis* (SIT), focusing on the surgical anatomical challenge. GERD with SIT is a very rare condition, and because of its extremely low prevalence, it presents a once-in-a-lifetime challenge for the gastroesophageal surgeon. A laparoscopic approach with minimum modifications enabled us to perform surgery as in patients with normal anatomy. In this article we describe in detail how we adapted the surgical technique to the anatomic alteration, so it can be reproduced elsewhere. We share our experience and the challenges we encountered, with the objective to give insight to a surgeon confronting a similar scenario. This is the case of a 65-year-old female, with hiatal hernia, GERD symptoms, and chronic obstructive pulmonary disease (COPD) exacerbations, which required continuous treatment adjustment. After proper evaluation, we performed a hiatoplasty and laparoscopic floppy Nissen, with only surgical ports placement modifications. We found few difficulties during surgery and a swift and ergonomic dissection for the right-handed surgeon. The patient was discharged on the second day after tolerating oral feeds. After 6 months, the patient remains asymptomatic without further COPD exacerbations. To the best of our knowledge, we present which is possibly the first reported case of a laparoscopic Nissen fundoplication in SIT in Latin America.

**Keywords:** Case report; Nissen fundoplication; situs inversus; surgical technique; gastroesophageal reflux disease (GERD)

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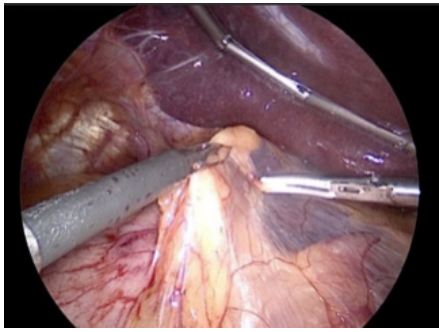
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## Introduction

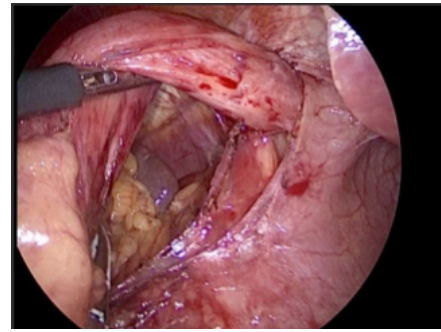
*Situs inversus totalis* (SIT) is a rare congenital condition present in 0.01% of the population (1), affecting equally males and females. It was first described in humans by Matthew Baillie in the 18th century (2). It is defined as the complete transposition of the thoracic and abdominal organs in the sagittal plane, associated with dextrocardia, generating a mirror-image positioning. Congenital cardiac

defects are present in 10% of cases, also primary ciliary dyskinesia or Kartagener's syndrome may be present in 20–25% of SIT (3). However, these patients are normally asymptomatic and have normal life expectancy. Diagnosis of SIT is often incidental through an imaging method. There is no clear relationship between SIT and gastroesophageal reflux disease (GERD) (4), though it does not seem to directly affect the incidence.

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**Figure 1** Section of the lesser omentum.



**Figure 2** Dissection of the abdominal esophagus.

As a rare condition, reports of surgery in patients with SIT are seldom found. The first and most frequently described is the laparoscopic cholecystectomy (5,6). Very few cases have been reported for laparoscopic fundoplication (7,8). Most of them describe the many technical difficulties encountered and how they were solved. Recently it has been published a report of a robotic procedure (9), in which the authors state that robotic surgery may overcome the limitations of laparoscopy.

In this case report we describe a laparoscopic Nissen fundoplication for GERD in a patient with SIT and how we adapted the traditional technique to the anatomic challenge.

We present the following article in accordance with the CARE reporting checklist (available at <http://dx.doi.org/10.21037/aoe-20-63>).

### Case presentation

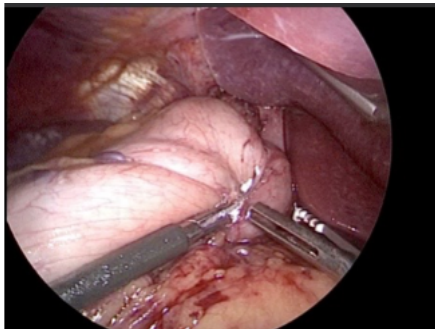
A 65-year-old female with SIT and chronic obstructive pulmonary disease (COPD) was diagnosed with GERD. She presented both esophageal and extraesophageal symptoms: heartburn, chest pain, cough, asthma, and acute COPD exacerbations. A complete evaluation was performed: a spirometry with moderate to severe airflow obstruction (FEV1 56% FVC 65% DLCO 46%), barium swallow that informs situs inversus, hiatal hernia and gastroesophageal reflux. An upper GI endoscopy with a 4 cm. hiatal hernia with no signs of esophagitis. Twenty-four-hour esophageal pH-impedance with 6.3% time in reflux, DeMeester score 20.5, 126 reflux events with 79% acid proximal reflux, concluding a pathological acidic reflux. High-resolution manometry describes a normal esophageal peristalsis, a 5.1 cm hiatal hernia and a normotensive lower esophageal sphincter. The thoracoabdominal CT scan confirms situs inversus totals, and hiatal hernia, without further findings.

The relationship between GERD and acute exacerbations of COPD due to microaspirations was established.

The patient had a previous conventional colorectal surgery for right colon cancer 6 years before. Laparoscopic floppy Nissen was performed by a team of two trained esophageal surgeons with a complete learning curve for the regular procedure, and a surgical resident. The patient was placed in French position, laparoscopic screen over the patient's left shoulder. The surgeon between the patient's legs, first assistant to the patient's right, and second assistant with the camera to the patient's left. Pneumoperitoneum induced with CO<sub>2</sub> with a Veress needle in the right hypochondrium. The camera port was placed 4 cm over and 2 cm to the right of the midline. After confirming SIT, we placed both surgeon's ports symmetrically in the right and left hypochondrium at the midclavicular line. A port for liver retraction in the left flank, and the first assistant port in the right flank. Adhesions from a previous surgery were taken down. Dissection began with the opening of the lesser omentum with an ultrasonic device (*Figure 1*). Then, we continued to the left crura, the abdominal and thoracic esophagus, and the short vessels. Both branches of the vagus nerve were identified and preserved (*Figure 2*). Hiatoplasty was done with two stitches of 2-0 polypropylene. Fundoplication was calibrated with intraoperative endoscopy. Closure of the 360° wrap fundoplication was done with two stitches of 2-0 silk (*Figure 3*). We had no intraoperative incidents, with minimal blood loss. The total operation time was 71 minutes. The patient was discharged on postoperative day 2, after ingestion of a liquid diet.

During the 6 months after surgery no symptoms of GERD have recurred, COPD is controlled, with no episodes of acute exacerbations thus far.

All procedures performed in studies involving human participants were in accordance with the ethical standards of



**Figure 3** 360° Fundoplication.

the institutional research committee and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this Case report and any accompanying images.

## Discussion

SIT may present a diagnostic challenge in a disease where organ location is crucial, such as in acute cholecystitis or appendicitis. This is not the case for GERD, where there is no difference in clinical presentation, and diagnosis arrives through the usual pathway.

In 2004, Hoang *et al.* reported the first laparoscopic Nissen in SIT for GERD, and very few cases have been reported in adults since then (7-10), all describing the difficulties related to performing the surgical technique in a mirror image configuration. We understand as a limitation having no experience in a case with the characteristics described.

For such, we found crucial a proper workup leading to surgery, having imaging studies that describe completely the anatomic abnormalities. For that purpose, we performed an upper GI endoscopy, CT scan, and eWsoptagogram. Usually, we perform all laparoscopic Nissen procedures in French position, with the surgeon between limbs. We decided to keep this arrangement with SIT since the hiatus, esophagus, and stomach are all midline structures, and this position creates the least spatial disorientation.

We switched the usual position for the assistants, first assistant at patient's right and second assistant to the left with the camera. During surgery, we placed all ports in a mirror image position. We found classical Nissen dissection to follow a more natural and ergonomic curve for the right-handed surgeon in SIT than in normal organ arrangement. Especially when dissecting from the lesser omentum towards the esophageal hiatus and

short vessels. During hiatoplasty, the stomach was pulled opposite to the surgeons right hand (instead of to the same side) making access to the crura more direct for suturing and reducing the potential risk of injuring the Vena Cava. When fundoplication was built, the 360° valve was oriented to 2–3 o'clock position, which was aligned to the surgeons' active hand where stitches were placed comfortably. The position mimics the usual 9–10 o'clock orientation of a regular case. Overall surgical time was average for a laparoscopic Nissen.

## Conclusions

In a patient with GERD and SIT, we were presented with a very unusual anatomical challenge. Studying the patient's anatomy beforehand was the first important step to decide the surgical strategy. In SIT the hiatus, esophagus, and stomach are close to the midline, making the mirror image less pronounced than in lateral organs. Moreover, for the right-handed surgeon in a laparoscopic Nissen, the dissection line follows the ergonomic hand curvature, and the hiatoplasty and fundoplication are oriented directly to the surgeon's dominant hand. These make it even more comfortable than regular cases for dissecting and suturing. For patients with SIT, we found that a laparoscopic approach is simple, safe, and feasible to achieve, so far, the standard results for the procedure.

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## Footnote

*Reporting Checklist:* The authors have completed the CARE reporting checklist. Available at <http://dx.doi.org/10.21037/aoe-20-63>

*Conflicts of Interest:* Both authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/aoe-20-63>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants

were in accordance with the ethical standards of the institutional research committee and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this Case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

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