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Case Report

Laparoscopic sleeve gastrectomy in a young female with Guillain-Barré syndrome and situs inversus totalis: a case report

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ABSTRACT

Laparoscopic sleeve gastrectomy (LSG) has emerged as a prominent bariatric surgery (BS) procedure due to its efficacy in weight reduction and improvement of associated co-morbidities. Although BS can be an underlying cause of Guillain-Barré syndrome (GBS), it's influence on those with a history of GBS remains uncertain. GBS is a rare autoimmune disorder characterized by symmetrical muscle weakness, and its coexistence with situs inversus totalis (SIT), a congenital condition involving mirrored organ placement, poses unique surgical challenges. We present a case of a 24-year-old female with a history of GBS and SIT seeking LSG for obesity management. Preoperative assessment involved multidisciplinary collaboration, and surgical adaptation was necessary due to anatomical anomalies. Trocar placement mirrored organ positions, facilitating successful surgery. Postoperative recovery was uneventful. At the one-year follow-up, she had a discernible improvement in the weakness that she expressed in her lower limbs. Obesity exacerbates GBS-related complications, necessitating careful consideration of surgical interventions. SIT presents technical challenges during laparoscopic procedures, demanding surgical expertise. Multidisciplinary assessment and surgical adaptation are crucial for optimizing outcomes. This case demonstrates the successful management of obesity in a patient with GBS and SIT through LSG, highlighting the importance of a comprehensive approach and surgical adaptation. LSG proves effective in promoting weight loss and improving mobility in such complex cases. Continued documentation of unique cases is essential for guiding future interventions in this challenging patient population.

Keywords: Obesity, Bariatric surgery, Sleeve gastrectomy, Guillain-Barré syndrome, Situs inversus totalis, Technique

INTRODUCTION

Laparoscopic sleeve gastrectomy (LSG) has garnered increasing favor as a standalone procedure over recent years. Since 2014, it has emerged as the fastest-growing bariatric surgery (BS) procedure.[1] Notably, its benefits extend beyond substantial weight loss outcomes to include significant improvements or remission of associated co-morbidities. In comparison with other bariatric procedures, LSG preserves gastrointestinal anatomy, thereby contributing to lower surgical morbidity and reduced occurrence of nutritional deficiencies.[2] While BS is recognized as a cause of Guillain-Barré syndrome (GBS), its impact on individual who have previously been diagnosed and treated for GBS remain unclear.[3,4]

GBS is an uncommon and potentially life-threatening immune-mediated peripheral nerve disorder typically characterized by progressive symmetrical ascending muscle weakness that may advance to paralysis.[5]

As a rare condition, the estimated annual incidence of GBS is reported to be up to two cases per 100,000 individuals.[6] In contrast to other autoimmune conditions, GBS tends to affect men more frequently than women, with a higher incidence observed in older age groups.[7]

Etiology is believed to stem from an autoimmune response triggered by a preceding infection, predominantly of bacterial or viral origin, affecting the respiratory or

gastrointestinal systems.[8] Recently, COVID-19 has also been identified as a potential trigger for GBS.[9]

The autoimmune response produces antibodies that cross-react with gangliosides found on nerve membranes, leading to nerve damage or functional blockade of nerve conduction, which manifests as the characteristic symptoms of GBS.[10]

The condition usually begins with tingling sensations in the limbs and progresses to muscle weakness. Disability reaches its peak within 2-4 weeks, resulting in eventual flaccid paralysis. Neuromuscular dysfunction presents as symmetrically ascending generalized paralysis, starting from the lower limbs to the upper limbs, along with autonomic disturbances that can lead to cardiac arrhythmias and fluctuations in blood pressure. Although weakness typically affects the limbs, it may also involve cranial nerves, affecting the diaphragm and pharyngeal muscles, potentially leading to respiratory failure and difficulty swallowing.[11] Comprehending the intricacies of GBS is essential for delivering comprehensive care, particularly when addressing concurrent health conditions.

In parallel, we encounter a unique case involving situs inversus totalis (SIT), an uncommon congenital condition characterized by the complete reversal of the thoracic and abdominal viscera.[12] It is a genetically determined anomaly, with an average incidence of 1 in 10,000, and a slightly higher occurrence among males.[13]

In SIT, the embryonic rotation of the mid-gut proceeds in the opposite direction to the usual clockwise rotation, leading to a mirror-image positioning of all solid organs within both the thorax and abdomen.[14]

Individuals with SIT typically lead uncomplicated lives and generally have a normal life expectancy unless there is an associated gastrointestinal or cardiac anomaly.[15]

It is frequently discovered incidentally during the assessment and investigation of other medical conditions. Nonetheless, the significance of this condition lies in the variances and technical challenges encountered during surgical interventions, particularly laparoscopic procedures, due to anatomical alterations and complexities in variations.[16]

This necessitates the surgeon's cognitive abilities and manual skills to perform surgical procedures accurately.[17] Hence, we underscore the significance of thorough preoperative evaluation and adaptability during surgery to achieve optimal outcomes, particularly in obese patients.

SIT can also be a component of Kartagener syndrome (KS), comprising bronchiectasis, chronic sinusitis, and SIT. The primary challenges associated with this syndrome stem from impaired ciliary movement, resulting in recurrent chest infections and infertility.[18]

Individuals with complex health profiles, characterized by the coexistence of multiple rare disorders, often face heightened risks associated with obesity-related comorbidities. These may include cardiovascular complications, respiratory compromise, and exacerbated musculoskeletal issues. Managing obesity becomes imperative not only for enhancing overall well-being but also for mitigating the potential exacerbation of existing health challenges.

The scarcity of documentation on the coexistence of GBS syndrome and SIT in the medical literature underscores the intricacies introduced by these rare conditions. This complexity significantly heightens the challenges associated with surgical decision-making, particularly in the context of bariatric procedures. Consequently, there is a pressing need for an approach that is both nuanced and evidence-based to navigate the intricacies of such unique medical scenarios.

In this case report, we present a detailed account of a young female patient with both GBS and SIT who successfully underwent laparoscopic sleeve gastrostomy. This report aims to contribute valuable insights into the management of obesity in patients with rare and challenging medical conditions, emphasizing the significance of multidisciplinary collaboration in delivering effective healthcare solutions.

CASE REPORT

We report the case of a 24-year-old Saudi female patient who has been diagnosed with GBS. The patient visited the bariatric surgery outpatient clinic (OPC) and expressed concerns about her weight increase over the last several years, with a BMI of 39.

Prior to her current presentation, she had been diagnosed and treated for GBS two years ago. During that time, she was admitted to the intensive care unit (ICU) with a history of tracheostomy and gradually improved until she was discharged with mild weakness in both lower limbs, she underwent periodic follow-up at the neurology OPC. The patient was educated about the various options for bariatric surgeries and expressed a preference for LSG.

A multidisciplinary approach involving a bariatric surgeon, neurologist, psychologist, and dietitian was implemented. The preoperative evaluation revealed normal findings for a range of laboratory tests, encompassing complete blood count, coagulation profile, liver profile, electrolytes, renal profile, lipid profile, vitamins, chemistry, and hormones.

Electrocardiography showed axis deviation (northwest axis) with P waves that were upright in the AVR lead and inverted in leads I and II (Figure 1).

Figure 2 of the chest X-ray showed the presence of dextrocardia. The barium meal test revealed a stomach

located on the right side, without any blockage of contrast material and with no reflux (Figure 3). The abdominal ultrasonography revealed fatty liver without the presence of cholelithiasis.

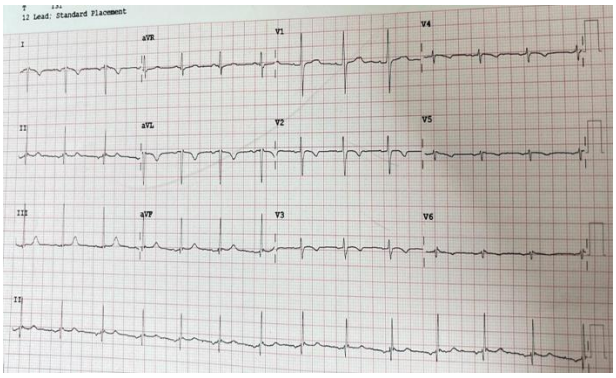

Figure 1: Electrocardiography revealed extreme axis deviation.

In order to examine the patient's capacity for surgery and identify any potential risks, she had preoperative assessment by personnel from the neurology, cardiology, endocrinology, pulmonology and anesthesia departments. Consensus was reached that she was suitable for surgery without any accompanying organic concerns.

Figure 2: X-ray revealed dextrocardia.

Figure 3: A barium meal test showed a right-sided stomach with no contrast obstruction and no reflux.

Operative technique

After rapid sequence induction (RSI) of anesthesia and intubation, the patient was positioned in the reverse Trendelenburg position with legs adducted. Skin preparation and draping were carried out according to the surgical protocol, and the procedure was performed using three abdominal trocars shown in Figure 4.

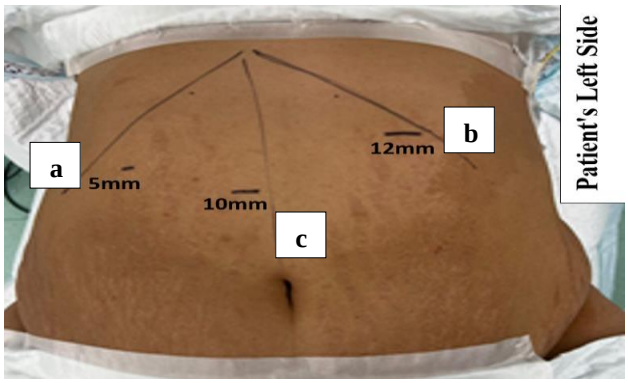

Figure 4: Modified Trocar positions (a) supraumbilical right midclavicular line, (b) supraumbilical left midclavicular line, and (c) supraumbilical right paramedian line.

Insufflation was achieved via a Veress needle inserted into the right Palmer's point and maintained at a pressure of 12 mmHg.

We strategically planned the insertion site of the trocars based on the mirror image of the anatomical locations of visceral organs. We accessed the abdomen using a 10 mm bladeless optic trocar (Johnson and Johnson, Ethicon, Cincinnati, OH, USA), positioned two centimeters above and to the right of the umbilicus. This allowed for the examination of the peritoneal cavity to identify any additional pathology associated with SIT. The exploration revealed a right-sided stomach and spleen, whereas the liver and gallbladder were located on the left side.

The monitor was positioned adjacent to the patient's right shoulder, with the surgeon and nursing assistant situated on the patient's left side, while the cameraman stood on the right side, creating a mirror image setup. A 12 mm bladeless trocar (Johnson and Johnson, Ethicon, and Cincinnati, OH, USA) was inserted into the left upper quadrant, and another 5 mm bladeless trocar was inserted into the right upper quadrant.

The LSG procedure commenced with the devascularization of the greater curvature, extending cephalad through the short gastric vessels until reaching the gastroesophageal junction (GEJ), exposing the right leaflet of the right crus and fully mobilizing the posterior aspect of the fundus. Subsequently, the first stapling was initiated approximately 2–4 cm from the pylorus following the introduction of a 36 French bougie.

The sleeve was created by sequentially firing the stapler, progressing towards the upper part of the fundus, approximately 1 cm away from the angle of His. Hemostasis was ensured, followed by the removal of a

portion of the stomach, and subsequent closure of the fascia and skin. The total duration of the surgery was 39 minutes. We adhered to the enhanced recovery after bariatric surgery (ERABS) protocols, with no insertion of drains or nasogastric tube.

The patient underwent successful extubation without any complications and was subsequently transferred to the recovery room for close monitoring. Neither surgical nor anesthetic complications arose during or after the operation. On the first day after the operation, a gastrografen upper gastrointestinal examination showed no signs of leakage or blockage as showed in Figure 5.

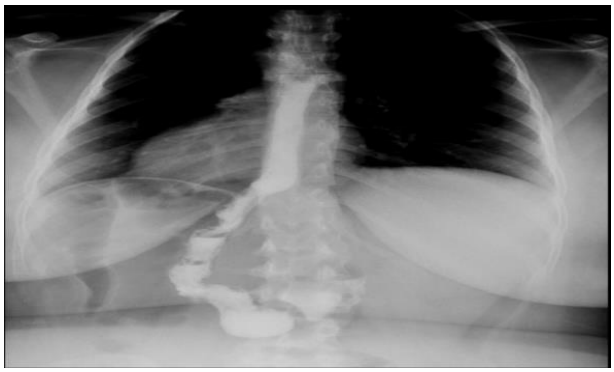

Figure 5: Gastrografen UGI study showed no leak or obstruction.

The patient made a successful recovery and was discharged home in an acceptable state on the day after the procedure.

The follow-up appointments at one and four weeks revealed a normal condition, with the patient demonstrating tolerance to oral intake, absence of pain, regular bowel movements, and normal results in examinations, and laboratory tests.

Subsequently, the patient underwent follow-up assessments at 3, 6, and 12 months, during which she expressed weight loss and reduction in her BMI to 24, with noticeable improvement in her lower limb weakness compared to preoperative period.

Written consent was obtained from the patient to allow for the discussion and publication of her case.

DISCUSSION

Bariatric surgery has become a secure and extremely efficient choice for individuals struggling with obesity, providing notable and lasting weight loss results as well as enhancements in co-existing conditions.[19] Advancements in understanding the mechanisms and distinctions among procedures have facilitated personalized treatment strategies.[20] However, the presence of GBS and SIT introduces unique considerations and potential challenges.

The presented case highlights the successful management of a young female patient with GBS and SIT undergoing LSG for obesity. This case underscores the complexities and challenges involved in managing obesity in individuals with rare and coexisting medical conditions.

Guillain-Barré syndrome and obesity

Obesity is widely recognized to gradually contribute to or exacerbate a wide range of related medical conditions. These conditions may encompass hypertension, type 2 diabetes mellitus, non-alcoholic fatty liver disease, dyslipidemia, cardiovascular disease, respiratory difficulties, reproductive concerns, psychological disorders, and increase the susceptibility to certain forms of cancer.[21]

These risks are further amplified in individuals with GBS, who already experience muscle weakness and potential respiratory compromise. In this context, managing obesity becomes crucial for improving overall health and well-being and alleviating the burden of existing health challenges.

GBS is a condition where the immune system attacks the peripheral nerve system, causing flaccid paralysis and acute demyelination. It is also marked by albumino-cytological separation in the cerebrospinal fluid (CSF).[22] Around 66% of patients encounter antecedent infections during a period of 6 weeks before the beginning of GBS.[23] However, GBS has also been linked to non-infectious factors like as trauma, immunization, autoimmune diseases, immunosuppression, and the injection of gangliosides.[24,25]

While the pathogenesis is associated mainly with infectious triggers, the relationship between obesity and GBS remains less explored. Convincing epidemiological evidence suggests a robust correlation between excess weight or obesity and immune system dysregulation and inflammation, potentially impacting the vulnerability to and progression of autoimmune disorders.[26]

Multiple studies have described the pathogenic changes that occur in adipose tissue with obesity. An important alteration occurs in the interruption of adipokine production. Adipokines have a vital role in connecting metabolism and the proper functioning of the immune system. However, when there is a disruption in their regulation due to obesity, it leads to persistent low-level inflammation and the development of illnesses.[27]

The coexistence of GBS and obesity presents a unique challenge as both conditions independently contribute to significant morbidity. Obesity-related complications, such as cardiovascular issues and respiratory compromise, add a layer of complexity to the management of GBS.

The neurological complications that occur after bariatric surgery are mostly caused by deficits in micronutrients

resulting from poor absorption after the procedure. GBS is a possible complication that can occur after bariatric surgery. It has been observed in several individuals who had improvement after receiving therapy with Intravenous Immunoglobulin (IVIg). Although the exact mechanism is not well comprehended, it is likely to entail immunological and inflammatory responses that result in damage to neurons. These findings are backed by data obtained from sural nerve biopsies, which show the presence of inflammatory cells in individuals who develop acute or subacute neuropathies or radiculoplexoneuropathies after undergoing bariatric surgery.[28]

Considering the previous facts, the decision to undergo BS in patients with GBS requires careful consideration, as surgical interventions may pose additional risks related to anaesthesia, immobility, and potential exacerbation of neurologic symptoms. The successful LSG treatment in this patient indicates that BS may be safely conducted in individuals with a history of GBS, provided that there is a comprehensive preoperative assessment and multidisciplinary collaboration.

Situs inversus totalis and bariatric surgery

SIT is an uncommon congenital disorder characterized by the entire transposition of thoraco-abdominal organs. In SIT, the first rotation of the midgut occurs in the opposite direction, leading to a symmetrical positioning of all internal organs in both the thorax and abdomen.[29] Poses anatomical challenges during surgical procedures, particularly laparoscopic approaches. An understanding of the mirror-image arrangement of organs is crucial to avoid technical difficulties and complications. The surgeon's cognitive and manual dexterity become paramount in adapting to altered anatomical landmarks, as demonstrated in the presented case.

Previous studies suggest that SIT might be linked with other syndromes, such as Kartagener syndrome (characterized by bronchiectasis, sinusitis, and situs inversus), which involves ciliary dysfunction and respiratory problems.[30] These additional complexities underscore the need for comprehensive preoperative evaluations.

Multidisciplinary approach

The success of the LSG in this complex case is attributed to a meticulous preoperative assessment and a multidisciplinary approach. The collaboration ensured a comprehensive understanding of the patient's overall health, addressing potential risks and optimizing the surgical plan. Such an approach is essential in managing patients with rare and challenging medical conditions with the following considerations taken in this case.

Meticulous preoperative assessment is essential to ensure patient safety and optimize surgical outcomes. In this instance, a comprehensive multidisciplinary approach was employed, encompassing a thorough assessment conducted by pertinent specialists such as a bariatric surgeon, psychologist, neurologist, dietitian, cardiologist, endocrinologist, anaesthetist, and respirologist. This approach guaranteed meticulous evaluation and adequately prepared the patient for the required interventions.

Technical considerations during LSG, SIT necessitates a mirrored approach to laparoscopic surgery due to the transposition of visceral organs. The surgeon's cognitive and manual dexterity become paramount in adapting to the altered anatomy and ensuring safe and precise LSG execution. In our specific case, meticulous trocar placement and strategic instrument maneuvering, guided by the mirrored image of the abdominal viscera, played a pivotal role in the successful completion of the procedure.

Close monitoring for potential complications related to GBS and SIT is essential in the postoperative period. Fortunately, our patient experienced an uneventful recovery with no GBS-related complications.

CONCLUSION

The successful LSG performed on a young female with both GBS and SIT underscores the significance of a comprehensive multidisciplinary approach. This achievement was made possible through meticulous preoperative assessment, surgical adaptation, and vigilant postoperative care. The complexity of addressing rare medical conditions alongside bariatric surgery highlights the need for a well-coordinated effort.

LSG emerges as a safe surgical technique for patients grappling with obesity, GBS, dextrocardia, and SIT. The key lies in conducting a thorough preoperative assessment and adhering to a carefully delineated operational plan. Notably, LSG proves efficacious in promoting weight reduction and enhancing mobility, particularly in cases where lower limb paralysis is associated with GBS.

A profound understanding of the body's structure is imperative for the procedure, necessitating the surgeon's expertise. As the field of bariatric surgery advances, continual documentation of unique cases becomes crucial. This documentation not only enriches our comprehension but also serves as a guide for future interventions in this challenging patient population.

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