Images for Surgeons (Video)

Intra-Operative Twisted Gastric Sleeve: What Now?

Torção Intraoperatória do Sleeve Gástrico: E Agora?

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ABSTRACT

Laparoscopic sleeve gastrectomy (SG) is the most common bariatric surgery performed worldwide, valued for its effectiveness in weight loss and in comorbidity resolution. However, complications such as gastric twist (also known as gastric torsion or volvulus) may require conversion procedures, like the Roux-en-Y gastric bypass (RYGB).

We aimed to examine SG indications, the causes and risks of gastric twisting, and evidence supporting RYGB as a corrective strategy, supplemented by a surgical video.

The video demonstrates the intraoperative detection of a twist during leak testing and the subsequent conversion to RYGB.

Careful assessment during the methylene blue test may reveal functional obstruction, potentially preventing delayed complications.

Keywords: Gastrectomy/ adverse effects; Gastric Bypass/adverse effects; Methylene Blue; Obesity/surgery; Postoperative Complications

RESUMO

A gastrectomia vertical calibrada laparoscópica (SG) é o procedimento bariátrico mais frequentemente executado em todo o mundo, valorizado pela sua eficácia na perda de peso e na resolução de comorbilidades associadas. No entanto, complicações como a torção

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do tubo gástrico (também nomeada de torção gástrica ou volvo gástrico) podem necessitar de procedimentos de conversão, como o Bypass Gástrico em Y-de-Roux (RYGB).
Pretendemos avaliar as indicações para SG, as causas e os riscos da torção gástrica e a evidência que apoia o RYGB enquanto estratégia de correção, complementado por um vídeo cirúrgico.
O vídeo mostra a deteção intraoperatória de uma torção durante o teste para deteção de fugas e a subsequente conversão em RYGB. Uma avaliação cuidadosa durante o teste com azul-de-metileno pode revelar obstrução funcional, potencialmente prevenindo complicações mais tardias.

Palavras-chava: Azul de Metileno; Bypass Gástrico/efeitos adversos; Complicações Pós-Operatórias; Gastrectomia/efeitos adversos; Obesidade/cirurgia

Metabolic bariatric surgery (MBS) remains the most effective and durable treatment for severe obesity and is indicated in patients who have not achieved sustainable weight loss through non-surgical methods.[1-3]

Laparoscopic sleeve gastrectomy (SG) is the most widely performed MBS globally and, despite its established safety profile, carries a non-negligible risk of complications.[3,4] According to the International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO), the incidence of postoperative complications following SG is 2.12%, lower than that for RYGB at 3.02%.[5] Mortality rates for SG range from 0.18% to 0.27%, influenced by patient age, sex, comorbidities, and surgical center expertise.[5] Complications are classified as early (within 30 days postoperatively) or late (beyond 30 days). Early complications include staple-line leakage, bleeding, wound infection, and intra-thoracic pouch migration; late complications encompass gastric pouch stenosis and nutrient deficiencies.[6,7] Food intolerance, gastroesophageal reflux disease, and gastric fistulae are also reported.[8]

Gastric torsion (GT), a rare yet potentially catastrophic complication of SG, manifests as an axial rotation of the gastric tube, resulting in functional obstruction rather than mechanical stricture. This complication is often attributable to intraoperative technical errors and has an incidence that varies widely in different publications (1%–10%) due to diagnostic heterogeneity and under-reporting.[8] GT induces functional stenosis, impaired gastric emptying, elevated intragastric pressure, and diminished remnant stomach compliance.[3,9] It can significantly reduce the affected patient's quality of life, and predispose to malnutrition, gastroesophageal reflux disease and other complications. Early undiagnosed GT may progress to ischemia, necrosis, and leaks, incurring substantial morbidity, but GT can also be relatively asymptomatic and only manifest later, after several years.[3,5,10]

Intraoperative release of the greater curvature from the omentum enhances gastric mobility, predisposing to torsion. Additionally, postoperative sleeve scarring with adhesions can further promote kinking at the incisura angularis.[3] Two distinct forms of functional stenosis occur post-SG: localized twisting at the body-antrum junction, mimicking a sphincter-mechanism and impeding emptying; or spiral stapling winding around the stomach, eliciting uncoordinated contractions and ineffective voiding.[9,11,12]

While an ideal sleeve features a straight, symmetrical staple line, GT most commonly results from asymmetric forces applied during mobilization and stapling.[3,8] Principal risk factors are:

- Incomplete mobilization of the greater curvature/fundus, particularly inadequate dissection of the gastrophrenic ligament, which creates asymmetric tension during stapling[8,11,13];
- Unequal traction during stapling, notably excessive posterior-wall traction when positioning the first stapler, twisting the staple line[12];
- Mispositioning of the bougie, so that is misaligned with the pyloro-cardial axis, can induce angulation or rotation of the sleeve[8,9];
- Anatomical predispositions, including increased gastric tube mobility caused by the full release of the greater curvature from its supporting ligaments (gastrosplenic, gastrocolic, gastrohepatic), and laxity or elongation of gastric attachments, which make the sleeve more susceptible to twisting[13];
- Undiagnosed or untreated hiatal hernias, which may contribute to gastric displacement.[13]

Intraoperative methylene blue testing (MBT) is well established for detecting staple line leaks in SG.[14] While MBT reliably confirms staple line integrity, published evidence that it can help detect torsion was not found.

Notwithstanding the lack of published evidence, the accompanying surgical video provides a compelling,

hypothesis-generating observation on the potential utility of MBT in intraoperative torsion detection. The video depicts a case where standard MBT revealed a functional torsion, not apparent on visual inspection alone, which resulted in a complete obstruction of the passage of the dye. This finding directly informed the decision to proceed with immediate conversion. The subsequent video segments detail the corrective approach: conversion to RYGB with resection of the distal gastric segment encompassing the point of torsion. The procedure concludes with a patent, unobstructed gastrojejunal anastomosis confirmed by repeat MBT. The post-operative course was otherwise uneventful.

Nevertheless, as it is usually a postoperative complication, the standard diagnostic tool for GT is an upper endoscopy which demonstrates GT via a clockwise rotation of the staple line, frequently resulting in marked narrowing at the incisura angularis.[3,11,12,15] Contrast studies (*e.g.* swallow series) or computed tomography (CT) imaging with three-dimensional reconstruction may show a spiral or "screw-thread" staple line and proximal gastric dilation.[16]

Endoscopic interventions also serve as first-line therapy in many series, with options including balloon dilation to relieve functional obstruction and/or placement of self-expanding stents if dilation fails.[8] These are less invasive and may achieve symptomatic relief.[17] However, success rates are variable, and patients with anatomical distortion or significant adhesion often require further therapy.[3,11,12,15]

Surgical management of gastric torsion is indicated when endoscopic measures fail or in severe anatomical distortion.

RYGB, often with partial gastrectomy of the stenotic or twisted portion, serves as an effective salvage procedure, yielding symptom resolution and restored oral intake.[4,18,19] Resection of the distal stomach is particularly indicated for severely affected areas exhibiting stenosis, ischemia, or fibrosis, to derotate the tube and prevent recurrence.[8,10,15]

Adhesion release followed by gastropexy offers a conservative alternative, promoting rapid symptom relief and low short-term recurrence rates.[15]

Tissue-preserving approaches are advocated to maintain gastric continuity, endocrine function, and physiological biliary-pancreatic outflows, while facilitating endoscopic evaluation of the upper gastrointestinal and biliary tracts, mitigating nutritional deficiencies (*e.g.*, iron and vitamin B12), and minimizing risks of dumping syndrome or diarrhea through avoidance of blind loops and narrow anastomoses. Tissue-preserving approaches also enhance reversibility and future convertibility.[8]

Preventive measures during SG, including minimal fixation via omentopexy, gastropexy, or suturing to adjacent structures, show emerging potential to reduce torsion incidence, but correct surgical technique with primary sleeve calibration over a straight bougie and avoiding spiral stapling are key.[12,15,20-23]

CONCLUSION

Laparoscopic sleeve gastrectomy remains a cornerstone of bariatric surgery, offering durable weight loss and significant comorbidity resolution. However, it carries a rare but serious risk of gastric torsion, largely related to intraoperative technical factors and postoperative anatomical alterations. This complication can present early or late in the post-operative course, and lead to substantial morbidity if unrecognized. Diagnosis relies primarily on endoscopy, supported by complementary imaging modalities. Endoscopic interventions, such as balloon dilation or stent placement, are considered first-line when technically feasible, whereas surgical revision, particularly conversion to Roux-en-Y gastric bypass with or without partial gastrectomy, represents the most reliable corrective strategy in refractory cases. Preventive measures include meticulous fundic mobilization, symmetric stapling over a correctly positioned bougie, and selective fixation techniques in high-risk anatomies. Because gastric torsion may be identified intraoperatively, patients should be counseled preoperatively regarding this possibility and the potential need for immediate conversion to an alternative procedure, such as Roux-en-Y gastric bypass. Further prospective studies are needed to validate preventive strategies, improve intraoperative detection methods, and refine revisional approaches. The present video illustrates that careful assessment during the methylene blue test (MBT) may reveal functional obstruction, potentially preventing delayed complications. Despite no published evidence of this that we could find, based on pathophysiologic plausibility and the anecdotal clinical evidence provided, MBT might be adapted to detect this complication intraoperatively. Any such application remains hypothetical and would require prospective validation.

KEY POINTS

- Gastric torsion results from asymmetric forces applied during mobilization and stapling
- Stapling too close to the lesser curvature creates an irregularity on the suture line
- Careful assessment during the methylene blue test may reveal functional obstruction, potentially preventing delayed complications

ETHICAL DISCLOSURES

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CONTRIBUTORSHIP STATEMENT

AV: Conceptualization, methodology, investigation, video editing, original draft writing, visualization.
AF: Investigation, resources, critical revision of the manuscript, patient follow-up.
AA: Supervision, project administration, mentorship, critical revision of intellectual content.
CT: Supervision, mentorship, validation, critical revision of intellectual content, patient follow-up.
RE and LC: Final manuscript reading and approval for submission.
All authors (AV, AF, AA, CT, RE, LC): Reviewed and edited the manuscript during its preparation.
All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work. The contributions comply with the ICMJE recommendations for authorship.

DECLARAÇÃO DE CONTRIBUIÇÃO

AV: Conceitualização, metodologia, investigação, edição de vídeo, redação do rascunho original, visualização.
AF: Investigação, recursos, revisão crítica do manuscrito, acompanhamento do paciente.
AA: Supervisão, administração do projeto, orientação, revisão crítica do conteúdo intelectual.
CT: Supervisão, orientação, validação, revisão crítica do conteúdo intelectual, acompanhamento do paciente.
RE e LC: Leitura final do manuscrito e aprovação para submissão.
Todos os autores (AV, AF, AA, CT, RE, LC): Reviram e editaram o manuscrito durante a sua preparação.
Todos os autores leram e aprovaram a versão final do manuscrito e concordam em ser responsáveis por todos os aspetos do trabalho. As contribuições estão em conformidade com as recomendações do ICMJE para autoria.

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