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Laparoscopic Nissen Fundoplication in the Treatment of Esophageal Diseases: A Retrospective Study of 708 Cases

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Abstract

Background: A case of gastroesophageal reflux is a more common esophageal disease, with 20% of adults in the population. Surgery is formally indicated for patients who do not respond to therapy with proton pump inhibitors (PPIs) and patients with erosive disease on long-term use of PPIs. The laparoscopic Nissen fundoplication presents the best results of the open technique seen since there are fewer incidences of postoperative complications. **Objective**: To share a service experience on laparoscopic treatment of GERD through Nissen's fundoplication. **Method**: Retrospective observational study spanning 31 years, based on the medical records of 708 patients who underwent Nissen fundoplication in the general surgery department were applied. Stratified according to sex, age, main surgical indication, intraoperative complications, postoperative complications, conversions, reoperations and deaths. **Results**: There were 376 women, comprising 53.1% of the total and 332 men, representing 46.8%. The main pathologies responsible for the indication of fundoplication are heartburn and regurgitation in 530 patients (74.8%), followed by esophagitis in 151 patients (21.3%). Of the 530 patients with heartburn and regurgitation, 98% had hiatal hernia in the endoscopic evaluation. Main complications were pneumothorax (10% - 1.4%) and short vessel damage (10% - 1.4%). Four cases of conversion to laparotomic technique were added during the procedure (0.56%). There are 16 cases operated by clinical recurrent GERD (2.2%). **Conclusion**: A laparoscopic surgery at Nissen is a safe surgery, with good results. The correct surgical indication guarantees good results and low incidences of recurrences and post operative complications. The most frequent intraoperative complications do not imply an increase in morbidity and mortality. Late complications are uncommon and have the potential for seriousness.

Keywords

Fundoplication, Gastroesophageal Reflux Disease, Esophagitis

1. Introduction

Gastroesophageal Reflux Disease (GERD) is the most common esophageal disorder, affecting approximately 10% - 20% of the adult population in Western countries. It is classified as erosive or non-erosive depending on endoscopic findings of the esophageal mucous [1] [2].

The first fundoplication was performed in 1956 by Rudolf Nissen. It consisted of fixation of the anterior and posterior gastric walls to the distal 6 centimeters of the esophagus using four to five interrupted sutures passing through the anterior esophageal wall [3]-[5].

Since its introduction, fundoplication has undergone several technical modifications by surgeons, including total fundoplications and partial anterior and posterior fundoplications, among other variations [5]. In 1991, Bernard Dellemagne, in Belgium, described the first series of laparoscopic Nissen fundoplications, demonstrating that the technique was feasible and safe for patients [6].

Laparoscopic Nissen fundoplication provides long-term outcomes comparable to the open approach. However, the laparoscopic technique is associated with lower rates of incisional hernias and technical failures in valve construction, as anatomical structures are visualized and manipulated with greater precision. Additionally, the laparoscopic approach offers advantages such as reduced postoperative pain, faster return to daily activities, shorter hospital stay, reduced hospital costs, shorter length of hospitalization, and increased intraoperative safety [7] [8].

Surgical treatment is formally indicated for patients who do not respond to proton pump inhibitor (PPI) therapy and for patients with erosive disease requiring long-term PPI use [9]. Surgery is also indicated for patients who experience adverse effects from PPIs, young patients expected to require decades of medical therapy, and patients with GERD associated with hiatal hernia.

Before indicating surgery, GERD must be confirmed and investigated using complementary diagnostic tests in addition to history taking and physical examination. These include upper gastrointestinal endoscopy, barium esophagography, pH monitoring, and esophageal manometry [10]. It is known that some patients may experience symptomatic recurrence after surgery, which has led to discussions regarding appropriate surgical indications and improved preoperative patient evaluation [1] [11].

This study aims to present the experience with 708 laparoscopic Nissen fundoplications performed in patients treated at the General Surgery Service of Hospital São José do Avaí (HSJA), Itaperuna, RJ, Brazil, focusing on surgical indications, complications, conversions to open surgery, and reoperations.

2. Methods

This is a retrospective observational study based on electronic medical record data of patients who underwent laparoscopic Nissen fundoplication at HSJA between March 1993 and December 2024.

Patients underwent preoperative complementary examinations, with upper gastrointestinal endoscopy (UGE) being the primary diagnostic test. When suspicious areas of dysplasia, ulcerations, or polypoid lesions were identified in the esophageal mucous, biopsies were performed. pH monitoring and esophageal manometry were requested in cases of diagnostic uncertainty after clinical evaluation and UGE.

Regarding the surgical technique, patients were positioned supine, and pneumoperitoneum was established using a Veress needle at the level of the umbilical scar. A 10-mm umbilical trocar was introduced for the camera, along with a 10-mm trocar in the right hypochondrium, a 5-mm infraxiphoid trocar, and three 5-mm trocars along the left costal margin.

The procedure began with division of the hepatogastric and phrenoesophageal ligaments, followed by mobilization of the right and left diaphragmatic crura, exposing 5 - 6 cm of distal esophagus. The anterior and posterior vagus nerves were identified adjacent to the esophagus to avoid inadvertent injury. The esophagus was encircled and retracted anteriorly. Hiatal repair was performed by approximating the crura posterior to the esophagus using nonabsorbable sutures. The short gastric vessels were divided using a harmonic scalpel, and a 360-degree Nissen fundoplication measuring approximately 3 cm was constructed with nonabsorbable sutures involving the distal esophagus, with one suture anchoring the esophagus beneath the wrap.

A liquid test diet was initiated on the first postoperative day. According to tolerance, patients were discharged with a specific dietary regimen for weeks one through four.

Patients returned for postoperative follow-up at 15 and 30 days after surgery and were discharged from outpatient care if no gastroesophageal complaints were present. Patients were instructed to return to the surgeon if dysphagic symptoms developed.

Patients were stratified according to sex, age, primary surgical indication, intraoperative events, late postoperative complications, conversions from laparoscopic to open technique, reoperations, and mortality.

Inclusion criteria were patients of both sexes with a clinical diagnosis of GERD and/or confirmatory complementary examinations demonstrating hiatal hernia or lower esophageal sphincter dysfunction, body mass index (BMI) < 32 kg/m^2, presence of esophagitis, Barrett's esophagus, and poor symptom control with PPI therapy.

Exclusion criteria included BMI ≥ 32 kg/m^2, esophageal motility disorders, neoplasms altering esophagogastric anatomy, and patient refusal of surgical treatment.

All analyzed data were obtained from medical records. A total of 708 procedures were individually analyzed, including 376 women and 332 men.

3. Results

A total of 708 procedures were individually analyzed, including 376 women (53.1%) and 332 men (46.8%).

The main conditions leading to surgical indication were heartburn and/or regurgitation in 530 patients (74.8%), followed by endoscopically confirmed esophagitis in 151 patients (21.3%). Barrett's esophagus was the primary indication in 17 patients (2.4%).

Intraoperative events occurred in 4.2% of cases. The most frequent intraoperative events were pneumothorax (10 cases; 1.4%) and short gastric vessel bleeding (10 cases; 1.4%). Injury to the anterior vagus nerve and hepatic parenchymal injury occurred in three cases each (0.42%). Esophageal, gastric, and mesenteric injuries were reported in one case each (0.14%).

One postoperative death occurred due to major abdominal vascular injury during insertion of the first trocar, corresponding to an intraoperative lethality rate of 0.14%. Another death occurred due to postoperative septic complications. Overall mortality was 0.28%.

No patient required splenectomy. All bleeding during short gastric vessel division was successfully controlled using harmonic or bipolar energy devices. No cases of pneumothorax required chest tube drainage. No incisional hernias related to the laparoscopic procedure were reported.

Four conversions to open surgery occurred during the primary procedure (0.56%).

Sixteen patients underwent surgery for clinical recurrence of GERD (2.4%). In one patient, the fundoplication was dismantled and a Roux-en-Y gastric bypass was performed due to associated obesity and reflux symptoms.

Regarding postoperative complications, two cases of stenosis caused by hiatal suturing required reoperation. Five patients required urgent reoperation for abdominal or thoracic sepsis due to late complications of laparoscopic fundoplication.

One patient developed significant bleeding due to division of short gastric vessels using bipolar energy and subsequently developed a subphrenic and left paracolic abscess on postoperative day six. Another patient was admitted on postoperative day five with right-sided empyema. A 16-year-old male patient developed gastric body perforation into the left thoracic cavity on postoperative day 27.

During reoperations, nine intraoperative events were reported, with pneumothorax being the most frequent (five cases), predominantly left-sided. Two patients sustained hepatic injury, and two patients sustained splenic injury.

Overall, a total of 23 reoperations were performed (3.2%). Conversion to laparotomy during reoperation was required in one patient, corresponding to a conversion rate of 4.5% among reoperated cases (Table 1).

Table 1. Patient profile and surgical events.

Variable	N	%
Sex		
Male	332	46.8
Female	376	53.1
Total procedures	708	100
Surgical indication		
Heartburn and/or regurgitation	530	74.8
Esophagitis	151	21.3
Barrett's esophagus	17	2.4
Intraoperative events		
Pneumothorax	10	1.4
Bleeding from short gastric vessels	10	1.4
Anterior vagus nerve injury	3	0.42
Hepatic injury	3	0.42
Esophageal injury	1	0.14
Gastric injury	1	0.14
Mesenteric injury	1	0.14
Deaths		
Intraoperative	1	0.14
Late postoperative	1	0.14
Conversion to laparotomy	4	0.56
Reoperations	23	3.2
Conversion during reoperation	1	4.5†

†Percentage calculated among reoperated patients.

4. Discussion

Laparoscopic Nissen fundoplication is a safe procedure with low rates of complications and reoperations [12]. Total fundoplication was preferred over partial fundoplication. A meta-analysis by Tan *et al.* demonstrated a higher incidence of early postoperative complications in patients undergoing partial fundoplication [13]. Conversely, Nissen fundoplication is associated with a higher incidence of postoperative dysphagia. Another meta-analysis conducted by Broeders corroborated Tan's findings and showed that long-term outcomes of total and partial fundoplications are similar with respect to acid exposure, esophagitis, heartburn, need for dilation, reoperation, PPI use, and patient satisfaction [14].

A meta-analysis by Richter demonstrated the superiority of laparoscopic Nissen fundoplication over PPI therapy and incisionless transoral fundoplication in terms of physiological parameters involved in GERD, including increased lower esophageal sphincter tone and improved pH monitoring results [15].

Nissen fundoplication is considered the least invasive treatment with the best

outcomes for managing Barrett's esophagus dysplasia. Some authors report the possibility of complete regression with re-epithelialization of squamous epithelium in metaplastic areas, reduced progression to high-grade dysplasia or adenocarcinoma, and stabilization of genes involved in Barrett's esophagus progression. Ultimately, fundoplication alters the natural history of Barrett's esophagus [16] [17].

Regarding complications, intraoperative pneumothorax is the most frequent event, consistent with the literature. This study reported two deaths among 708 patients (0.28%), comparable to mortality rates reported in the literature ranging from 0% to 0.3% [12] [18] [19].

As in the primary procedure, pneumothorax remained the most frequent intraoperative event during reoperations. Gastric perforation is reported in the literature as the most common complication during reoperation. The incidence of intraoperative events during reoperation is higher than during the initial procedure, with nine events in 23 reoperations. Granderath *et al.* reported eight intraoperative events in 74 reoperations, noting improved outcomes when reoperations were performed early in patients with early failure [20].

Among reoperations in this series, one patient underwent four procedures. A 60-year-old woman initially underwent fundoplication and was reoperated 15 months later due to symptom recurrence and wrap migration. Hiatal repair and redo fundoplication with fixation to the anterolateral abdominal wall were performed. Ten days later, complete intrathoracic migration of the wrap occurred, leading to dismantling of the fundoplication. Six months later, a new Nissen fundoplication with mesh reinforcement was performed, with no further recurrence.

It is known that hiatal hernia recurrence is not solely related to surgical technique or patient profile. More than 90% of patients with recurrent hiatal hernia present ultrastructural abnormalities of hiatal muscle tissue on electron microscopy [21].

Certain patients are more prone to surgical failure, particularly those who do not respond to PPIs, obese patients, and those with atypical symptoms. These patients should be informed about the higher risk of surgical failure [22]. Conversely, patients who respond well to PPI therapy tend to have favorable outcomes after fundoplication [23].

Laparoscopic fundoplication in obese patients is controversial due to different reflux mechanisms. In such patients, Roux-en-Y gastric bypass is considered the procedure of choice, as it resolves GERD symptoms while promoting significant weight loss [24] [25].

The literature reports symptom recurrence rates ranging from 4.7% to 20.7% [26]-[30]. In this study, reoperation due to recurrence occurred in 2.5% of cases. This lower rate is attributed to strict preoperative patient selection and the fact that not all patients with symptom recurrence opted for reoperation. Additionally, routine postoperative endoscopy was not performed in asymptomatic patients, which may explain the lower observed incidence. A study by Gallyamov involving

2.678 patients reported a reoperation rate of 4.7%, comparable to the present study [27].

No cases of abdominal wall hernia were reported in this laparoscopic series, consistent with findings in the literature [8].

5. Conclusions

Laparoscopic Nissen fundoplication is a safe procedure with favorable outcomes. Appropriate surgical indication is essential to achieve good results and low rates of recurrence and postoperative complications. The most common intraoperative events do not increase morbidity or mortality. Late complications are uncommon but potentially severe.

In summary, the most clinically significant complications of hiatal hernia surgery include pulmonary events, leaks, perforation, bleeding, dysphagia, obstruction, recurrence, and wrap-related issues, with risk profiles influenced by patient factors and hernia characteristics [31]-[38].

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Katz, P.O., Gerson, L.B. and Vela, M.F. (2013) Guidelines for the Diagnosis and Management of Gastroesophageal Reflux Disease. *American Journal of Gastroenterology*, **108**, 308-328. https://doi.org/10.1038/ajg.2012.444

[2] Dent, J. (2005) Epidemiology of Gastro-Oesophageal Reflux Disease: A Systematic Review. *Gut*, **54**, 710-717. https://doi.org/10.1136/gut.2004.051821

[3] Liebermann-Meffer, S.H. (1999) Rudolf Nissen and the World Revolution of Fundoplication. Quality Medical Publishing Inc.

[4] Nissen, R. (1956) Gastropexy as the Lone Procedure in the Surgical Repair of Hiatus Hernia. *The American Journal of Surgery*, **92**, 389-392. https://doi.org/10.1016/s0002-9610(56)80111-6

[5] Stylopoulos, N. and Rattner, D.W. (2005) The History of Hiatal Hernia Surgery: From Bowditch to Laparoscopy. *Annals of Surgery*, **241**, 185-193. https://doi.org/10.1097/01.sla.0000149430.83220.7f

[6] Dallemagne, B., Weerts, J.M. and Jehaes, C. (1991) Laparoscopic Nissen Fundoplication. A Preliminary Report. *Surgical Laparoscopy & Endoscopy*, **1**, 138-143.

[7] Iwakiri, K., Kinoshita, Y., Habu, Y., Oshima, T., Manabe, N., Fujiwara, Y., *et al.* (2016) Evidence-Based Clinical Practice Guidelines for Gastroesophageal Reflux Disease 2015. *Journal of Gastroenterology*, **51**, 751-767. https://doi.org/10.1007/s00535-016-1227-8

[8] Salminen, P.T.P., Hiekkanen, H.I., Rantala, A.P.T. and Ovaska, J.T. (2007) Comparison of Long-Term Outcome of Laparoscopic and Conventional Nissen Fundoplication: A Prospective Randomized Study with an 11-Year Follow-Up. *Annals of Surgery*, **246**, 201-206. https://doi.org/10.1097/01.sla.0000263508.53334.af

[9] Spechler, S.J., Sharma, P., Souza, R.F., Inadomi, J.M. and Shaheen, N.J. (2011) American Gastroenterological Association Technical Review on the Management of Bar-

rett's Esophagus. *Gastroenterology*, **140**, e18-e52.
https://doi.org/10.1053/j.gastro.2011.01.031

[10] Jobe, B.A., Richter, J.E., Hoppo, T., Peters, J.H., Bell, R., Dengler, W.C., *et al*. (2013) Preoperative Diagnostic Workup before Antireflux Surgery: An Evidence and Experience-Based Consensus of the Esophageal Diagnostic Advisory Panel. *Journal of the American College of Surgeons*, **217**, 586-597.
https://doi.org/10.1016/j.jamcollsurg.2013.05.023

[11] Clarrett, D.M. and Hachem, C. (2018) Gastroesophageal Reflux Disease (GERD). *Missouri Medicine*, **115**, 214-218.

[12] Csendes, A., Díaz, J.C., Burdiles, P. and Maluenda, F. (2016) Detalles técnicos y morbimortalidad de la fundoplicatura de nissen laparoscópica en 503 pacientes con reflujo gastroesofágico. *Revista Chilena de Cirugía*, **68**, 143-149.
https://doi.org/10.4067/s0718-40262016000200006

[13] Tan, G., Yang, Z. and Wang, Z. (2010) Meta-Analysis of Laparoscopic Total (Nissen) versus Posterior (Toupet) Fundoplication for Gastro-Oesophageal Reflux Disease Based on Randomized Clinical Trials. *ANZ Journal of Surgery*, **81**, 246-252.
https://doi.org/10.1111/j.1445-2197.2010.05481.x

[14] Broeders, J.A., Roks, D.J., Jamieson, G.G., Devitt, P.G., Baigrie, R.J. and Watson, D.I. (2012) Five-Year Outcome after Laparoscopic Anterior Partial versus Nissen Fundoplication. *Annals of Surgery*, **255**, 637-642.
https://doi.org/10.1097/sla.0b013e31824b31ad

[15] Richter, J.E., Kumar, A., Lipka, S., Miladinovic, B. and Velanovich, V. (2018) Efficacy of Laparoscopic Nissen Fundoplication vs Transoral Incisionless Fundoplication or Proton Pump Inhibitors in Patients with Gastroesophageal Reflux Disease: A Systematic Review and Network Meta-Analysis. *Gastroenterology*, **154**, 1298-1308.e7.
https://doi.org/10.1053/j.gastro.2017.12.021

[16] DeMeester, S.R. (2015) Barrett's Oesophagus: Treatment with Surgery. *Best Practice & Research Clinical Gastroenterology*, **29**, 211-217.
https://doi.org/10.1016/j.bpg.2014.12.004

[17] Peyre, C.G. and Watson, T.J. (2015) Surgical Management of Barrett's Esophagus. *Gastroenterology Clinics of North America*, **44**, 459-471.
https://doi.org/10.1016/j.gtc.2015.02.013

[18] Coelho, J.C.U., Wiederkehr, J.C., Campos, A.C.L., Andrigueto, P.C., Pinho, R.V. and Bonin, E.A. (1999) Complicações do tratamento laparoscópico da doença do refluxo gastroesofágico: Experiência com 600 casos. *Revista do Colégio Brasileiro de Cirurgiões*, **26**, 237-242. https://doi.org/10.1590/s0100-69911999000400008

[19] Lara, E.M. (2012) Avaliação do resultado precoce e tardio de pacientes operados por doença do refluxo gastroesofágico nesta instituição. HSPM-Producao, Sec. Munic. Saúde SP, Sec. Munic. Saúde SP. 27 p.

[20] Granderath, F., Kamolz, T., Schweiger, U. and Pointner, R. (2003) Laparoscopic Antireflux Surgery for Gastroesophageal Reflux Disease: Experience with 668 Laparoscopic Antireflux Procedures. *International Journal of Colorectal Disease*, **18**, 73-77.
https://doi.org/10.1007/s00384-002-0405-8

[21] Fei, L., del Genio, G., Rossetti, G., Sampaolo, S., Moccia, F., Trapani, V., *et al*. (2009) Hiatal Hernia Recurrence: Surgical Complication or Disease? Electron Microscope Findings of the Diaphragmatic Pillars. *Journal of Gastrointestinal Surgery*, **13**, 459-464. https://doi.org/10.1007/s11605-008-0741-2

[22] Morgenthal, C.B., Lin, E., Shane, M.D., Hunter, J.G. and Smith, C.D. (2007) Who Will Fail Laparoscopic Nissen Fundoplication? Preoperative Prediction of Long-

Term Outcomes. *Surgical Endoscopy*, **21**, 1978-1984. https://doi.org/10.1007/s00464-007-9490-7

[23] Park, J., Kim, B.J., Kim, J.G. and Chi, K. (2017) Factors Predicting Outcomes of Laparoscopic Nissen Fundoplication for Gastroesophageal Reflux Disease: Experience at a Single Institution in Korea. *Annals of Surgical Treatment and Research*, **92**, Article No. 184. https://doi.org/10.4174/astr.2017.92.4.184

[24] Madalosso, C.A.S., Gurski, R.R., Callegari-Jacques, S.M., Navarini, D., Mazzini, G. and Pereira, M.d.S. (2016) The Impact of Gastric Bypass on Gastroesophageal Reflux Disease in Morbidly Obese Patients. *Annals of Surgery*, **263**, 110-116. https://doi.org/10.1097/sla.0000000000001139

[25] Patti, M.G. (2016) An Evidence-Based Approach to the Treatment of Gastroesophageal Reflux Disease. *JAMA Surgery*, **151**, 73-78. https://doi.org/10.1001/jamasurg.2015.4233

[26] Dallemagne, B., Weerts, J.M., Jehaes, C. and Markiewicz, S. (1996) Causes of Failures of Laparoscopic Antireflux Operations. *Surgical Endoscopy*, **10**, 305-310. https://doi.org/10.1007/bf00187377

[27] Gallyamov, E.A., Lutsevich, O.E., Kubyshkin, V.A., Erin, S.A., Agapov, M.A., Presnov, K.S., *et al*. (2019) Redo Laparoscopic Surgery for Recurrent Gastroesophageal Reflux Disease and Hiatal Hernia. *Khirurgiya. Zhurnal im. N.I. Pirogova*, **2**, 26-31. https://doi.org/10.17116/hirurgia201902126

[28] Csendes, A., Orellana, O., Cuneo, N., Martínez, G. and Figueroa, M. (2019) Long-term (15-Year) Objective Evaluation of 150 Patients after Laparoscopic Nissen Fundoplication. *Surgery*, **166**, 886-894. https://doi.org/10.1016/j.surg.2019.04.024

[29] Price, M.R., Janik, J.S., Wayne, E.R., Janik, J.E., Martinez, L.A. and Burrington, J.D. (1997) Modified Nissen Fundoplication for Reduction of Fundoplication Failure. *Journal of Pediatric Surgery*, **32**, 324-327. https://doi.org/10.1016/s0022-3468(97)90203-7

[30] Anvari, M., Allen, C., Marshall, J., Armstrong, D., Goeree, R., Ungar, W., *et al*. (2011) A Randomized Controlled Trial of Laparoscopic Nissen Fundoplication versus Proton Pump Inhibitors for the Treatment of Patients with Chronic Gastroesophageal Reflux Disease (GERD): 3-Year Outcomes. *Surgical Endoscopy*, **25**, 2547-2554. https://doi.org/10.1007/s00464-011-1585-5

[31] Kumar, S.S., Rama, M., Koeneman, S., Tannouri, S., Tatarian, T. and Palazzo, F. (2024) Morbidity and Mortality Following Hiatal Hernia Repair in Geriatric Patients: A Multicenter Research Network Study. *Surgical Endoscopy*, **38**, 3999-4005. https://doi.org/10.1007/s00464-024-10956-y

[32] Ivy, M.L., Farivar, A.S., Baison, G.N., Griffin, C., Bograd, A.J., White, P.T., *et al*. (2024) Morbidity and Mortality after Antireflux and Hiatal Hernia Surgery across a Spectrum of Ages. *Journal of Gastrointestinal Surgery*, **28**, 1302-1308. https://doi.org/10.1016/j.gassur.2024.05.033

[33] Aaron, A.E., Amabile, A., Andolfi, C., *et al*. (2021) Gastrointestinal Surgical Emergencies Textbook. The American College of Surgeons.

[34] Ward, M.A., Hasan, S.S., Sanchez, C.E., Whitfield, E.P., Ogola, G.O. and Leeds, S.G. (2021) Complications Following Robotic Hiatal Hernia Repair Are Higher Compared to Laparoscopy. *Journal of Gastrointestinal Surgery*, **25**, 3049-3055. https://doi.org/10.1007/s11605-021-05005-1

[35] Latorre-Rodríguez, A.R., Rajan, A. and Mittal, S.K. (2024) Perioperative Morbidity after Primary Hiatal Hernia Repair Increases as Hernia Size Increases. *Diseases of the Esophagus*, **38**, doae117. https://doi.org/10.1093/dote/doae117

[36] Maret-Ouda, J., Wahlin, K., El-Serag, H.B. and Lagergren, J. (2017) Association between Laparoscopic Antireflux Surgery and Recurrence of Gastroesophageal Reflux. *JAMA*, **318**, 939-946. https://doi.org/10.1001/jama.2017.10981

[37] Yadlapati, R., Hungness, E.S. and Pandolfino, J.E. (2018) Complications of Antireflux Surgery. *American Journal of Gastroenterology*, **113**, 1137-1147. https://doi.org/10.1038/s41395-018-0115-7

[38] Su, C., Liu, W., Lian, D. and Wang, C. (2025) Postoperative Obstruction of Recurrent Esophageal Hiatal Hernia: A Case Report. *Medicine*, **104**, e41955. https://doi.org/10.1097/md.0000000000041955