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Assessing the effectiveness of modified Heller myotomy combined with Dor fundoplication in surgical treatment of Achalasia

Abstract

Objectives: To assess how effective Heller myotomy is in the surgical treatment of achalasia. Methods: This retrospective study was conducted at a university hospital and a private clinic, involving 75 patients who underwent an extended myotomy combined with a modified Dor fundoplication between January 2017 and February 2025. Diagnosis was established using clinical, endoscopic, radiologic, and manometric criteria. Symptom evaluation and treatment success were measured using pre- and postoperative Eckardt scores. The Chicago Classification was used to grade the presence of megaesophagus, and the degree of megaesophagus was correlated with surgical outcomes. Results: The average postoperative Eckardt score was 0.52 points. Only one patient experienced a postoperative complication (atrial fibrillation), with no need for further intervention or appearance of GERD symptoms after surgery. Conclusion: This surgical technique proves to be a safe, effective, and practical option for relieving achalasia symptoms, while also lowering the risk of postoperative complications.

Keywords: achalasia, cardiomyotomy, megaesophagus, heller procedure, surgical technique

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Fernando Freire Lisboa,[1] Wenzel de Freitas,[2] Maria Clara de Oliveira Belarmino,[3] Gabriel Diniz Câmara Dantas,[3] Gabriel Carvalho de Oliveira Cruz[4]

[1]Associated Professor of the Department of Surgery, University Hospital of Federal University of Rio Grande do Norte, Brazil
[2]Senior Resident of Gastrointestinal Surgery, University Hospital of Federal University of Rio Grande do Norte, Brazil
[3]Faculty of Medicine, University Hospital of Federal University of Rio Grande do Norte, Brazil
[4]Fellowship of Surgery, University Hospital of Federal University of Rio Grande do Norte, Brazil

Correspondence: Fernando Freire Lisboa, Fellow of The International Society for Diseases of the Esophagus, Associate Professor of Department of Surgery, Universidade Federal do Rio Grande do Norte, Senator Salgado Filho Avenue, Natal, Rio Grande do Norte, Brazil

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Introduction

Achalasia is a chronic disorder affecting esophageal motility, marked by the absence of peristalsis and the inability of the lower esophageal sphincter (LES) to relax properly.[1] The exact cause is still unknown, but it is believed to result from selective damage to inhibitory neurons in the myenteric (Auerbach's) plexus, leading to the loss of esophageal peristalsis and Impaired relaxation of the lower esophageal sphincter (LES) in response to swallowing.[2] Clinically, this presents as gradually worsening difficulty swallowing, regurgitation, vomiting accompanied by chest pain, and can result in significant weight loss.[3]

The main goal in treating achalasia is to lower the pressure of the lower esophageal sphincter (LES). Among non-surgical options, three approaches stand out: medication therapy (long-acting nitrates, calcium channel blockers, and 5-phosphodiesterase inhibitors), endoscopic injection of botulinum toxin, and endoscopic pneumatic dilation. However, these non-surgical methods tend to be linked to side effects that are often hard to tolerate or to a high rate of symptom recurrence.[4] For this reason, they are recommended mainly for patients whose clinical condition does not allow for surgical treatment.[5]

Surgical approaches for treating achalasia have advanced significantly throughout the twentieth century. Today, the gold standard is laparoscopic myotomy paired with a fundoplication to help prevent reflux after the procedure.[6] However, there is still debate about which type of fundoplication is best.[7]

The purpose of this study is to prospectively assess the effectiveness of the extended myotomy technique combined with Dor fundoplication at a university hospital and a private center. This technique involves continuous suturing of the valve, which is important because it creates a longer fundoplication within the abdominal cavity, provides a tight seal over the exposed mucosa, and ensures the edges of the myotomy remain separated.

Case series and methods

A retrospective study was conducted from January 2017 to February 2025, involving patients treated for achalasia at Onofre Lopes University Hospital (Federal University of Rio Grande do Norte) and Casa de Saúde São Lucas, both located in Natal, Rio Grande do Norte, Brazil. Data was collected from 89 individuals who underwent Heller Laparoscopic Myotomy (HLM) surgery modified, but 17 patients were excluded for not meeting the inclusion criteria.

Inclusion criteria

a) Patients with clinically or manometrically confirmed achalasia

b) Patients with chagasic megaesophagus diagnosed with achalasia

c) Patients with idiopathic achalasia

Exclusion criteria

a) Patients without functional esophageal assessment

b) Patients without EGD

a) Patients with jackhammer esophagus or nutcracker esophagus

b) Patients with rosary bead esophagus

c) Patients with surgical contraindications

d) Patients under 18 years old

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Methods

The diagnosis of achalasia was based on clinical criteria, along with additional evaluations using Upper Digestive Endoscopy (EGD), Esophago-Gastro-Duodenal Series (SEED), and esophageal manometry, in accordance with established literature recommendations.[8] Chagasic etiology was determined in patients with positive IgG serology by the ELISA method.[6] The Chicago classification system was used to determine the severity of megaesophagus through SEED imaging (Figure 1).[9]

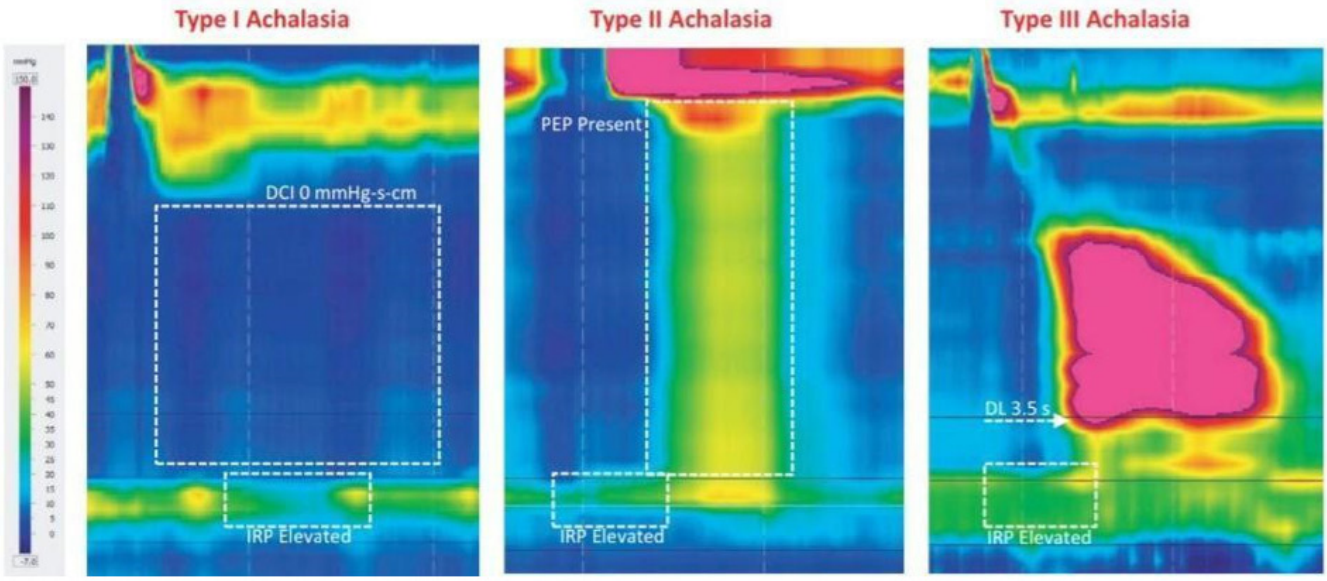

Figure 1 Representative swallows from high-resolution manometry (HRM) studies confirming type I, type II, and type III Achalasia.

Image from the Esophageal Health Center at NYU Langone Health[3]

Data were collected using the Eckardt score before and after surgery in patients who underwent the studied technique. Postoperative score data were gathered during follow-up. The Eckardt symptom score is the most widely used grading system for assessing symptoms, clinical stages, and the effectiveness of achalasia treatment.[10] Each symptom—weight loss, dysphagia, chest pain, and regurgitation—is scored from 0 to 3 based on presence, intensity, and frequency (occasional, daily, or at every meal). The total score ranges from 0 to 12 points. Scores of 0-1 indicate clinical stage 0, a score of 2–3 indicates stage I, 4–6 points correspond to stage II, and 7–12 points to stage III. Successful therapy is defined by clinical outcomes in stages 0 and I, while stages II and III after treatment are considered therapeutic failures.[10] Postoperative Eckardt scores greater than 3 were classified as therapeutic failure.[8]

All patients were monitored in outpatient follow-up visits for clinical evaluation 15 days after surgery. Clinical and radiological assessment (SEED) was performed at 60 days, clinical and endoscopic evaluation (EDA) at 3 months post-op, and annual check-ups were scheduled from that point forward. After surgery, patients started with a strict liquid diet for the first week, moved to liquids and soft foods during the second and third weeks, and transitioned to a soft diet beginning in the fourth week post-op. Additionally, we tracked variables such as the recurrence or persistence of achalasia symptoms, the development of GERD symptoms, the need for additional procedures, and any complications.

Surgical technique

Under general anesthesia, the patient underwent closed pneumoperitoneum via a left paraumbilical approach (2 cm above). Following this, the first trocar was inserted for visualization and inspection of the cavity. Additional access ports were placed under direct view, along with a liver retractor. A size 22 French orogastric tube was also introduced.

The procedure began with opening the phreno-esophageal membrane, carefully preserving the gastrohepatic nerve. The diaphragmatic crura were identified and separated from the esophagus using blunt dissection, along with locating both the posterior and anterior vagus nerves. Dissection continued through the posterior mediastinum, isolating the esophagus for 6 to 7 cm from its junction. When the crura were found to be widened, they were approximated (Figure 2).

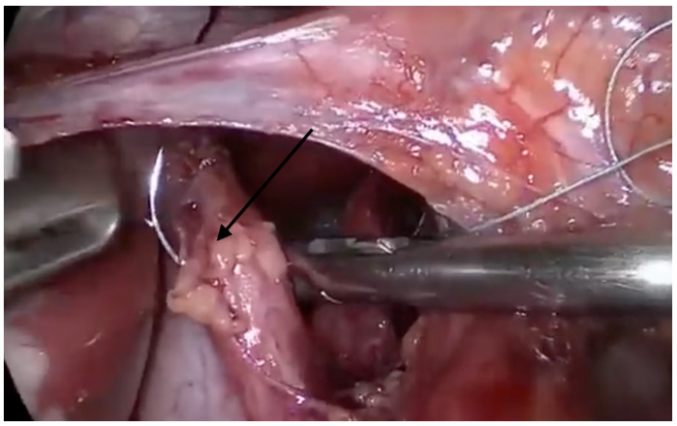

Figure 2 Crura closing (arrow).

Image from the author.

Next, the esophagogastric junction was carefully exposed and the fat pad was removed to clearly identify the junction. During this step,

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the anterior vagus nerve was isolated along the entire length of the separated esophagus (Figure 3). The short gastric vessels were divided starting from a midpoint along the greater curvature of the stomach.

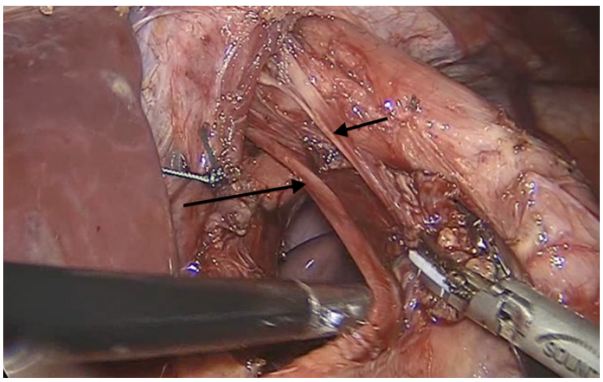

Figure 3 Anterior (short arrow) and posterior (long arrow) vagus nerve isolated.

Image from the author.

Myotomy was performed using the UltraCision® scalpel at the 12 o'clock position, extending 6 cm above and 3 cm below the junction (Figure 4). The modified anterior Dor fundoplication was constructed with two rows of sutures. The first row began by stitching the gastric fundus to the upper left lateral edge of the myotomy, securing the ipsilateral diaphragmatic pillar. Next, the gastric fundus was sutured at the junction to the lower angle of the myotomy opening. Then, a running suture was placed from the upper angle down to the lower angle of the myotomy using Ethibond® 2-0 thread (Figure 5).

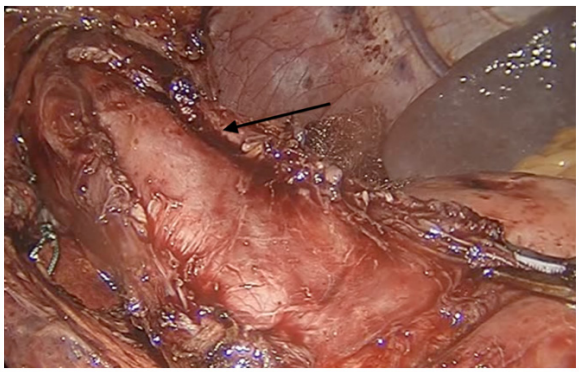

Figure 4 Long myotomy (arrow).

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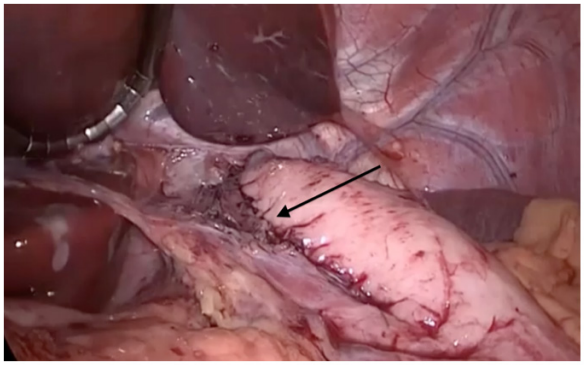

Figure 5 Running suture to finish the Modified Anterior Dor Fundoplicature (arrow).

Image from the author.

Next, the pneumoperitoneum was released and the trocars were removed. The entry sites were then closed with intradermal sutures using 3-0 (poliglecaprone 25) sutures, and the patient was then taken to the post-anesthesia recovery room.

Results

Out of the 72 patients studied, the majority were women, totaling 43 (59.7%). The average age at the time of surgery was 49.9 years. Primary achalasia was the most common type, accounting for 65 cases (90.2%), while Chagas-related achalasia was seen in 7 patients (9.8%). The most frequently observed comorbidity was systemic arterial hypertension (HAS), found in 17 cases (23.6%), followed by diabetes mellitus (DM) in 7 cases (9.7%) and depression in 4 cases (5.5%). Three patients (4.5%) had previously undergone myotomy, with an average interval of 4.5 years between surgeries (Figure 6).

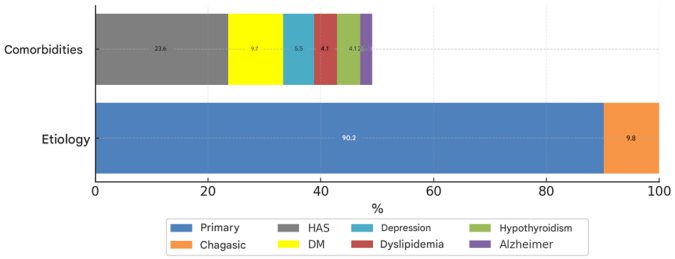

Figure 6 Percentage distribution of comorbidities and achalasia etiology.

Image from the author.

The degree of megaesophagus was mainly distributed between grades II and III, with 26 cases (36.1%) and 24 cases (33.3%), respectively, totaling 69.4%. When advanced megaesophagus was defined as grades III and IV, the occurrence was 50%- the same as for early-stage megaesophagus (Table 1).

Table 1 Frequency of megaesophagus degree according to Chicago classification.

Megaesophagus degree	Number	Percentage
Degree I	10	13,9%
Degree II	26	36,1%
Degree III	24	33,3%
Degree IV	12	16,7%

Table from the author.

Dysphagia was the most common preoperative symptom, affecting 57 patients (79%), with 44 of them (61.1%) experiencing it during every meal. Weight loss was the second most reported symptom, seen in 42 patients (58.3%). Regurgitation was noted by 41 patients (56.9%), and retrosternal pain was reported by 15 patients (20.83%). The average preoperative Eckardt score was 5.98 points, with 23 patients (30.6%) in clinical stage 1, 29 patients (38.8%) in clinical stage 2, and 23 patients (30.6%) in clinical stage 3.

Patients were monitored for up to 45 months after surgery. Occasional symptoms were observed in 13 (17.33%) of the operated patients. The average postoperative score was 0.52 points, with 69 patients (92%) in clinical stage 0, 5 patients (6.67%) in stage 1, and 1 patient (1.33%) in stage 2. No reinterventions were needed, no GERD symptoms emerged, and the only complication reported was one patient who developed atrial fibrillation (AF) on the first postoperative day but responded well after heparin treatment (Figure 7).

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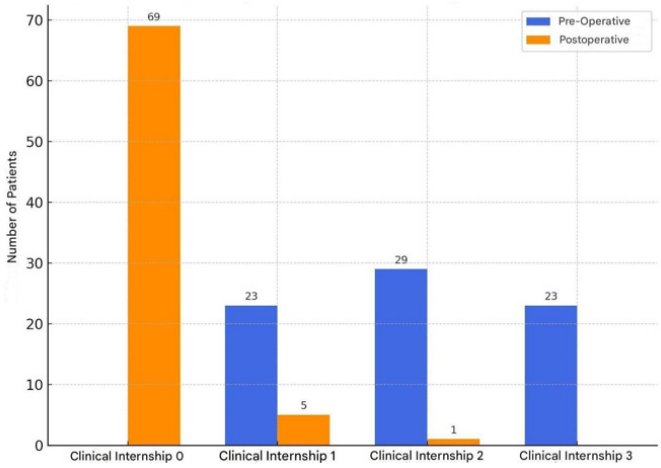

Figure 7 Clinical stage distribution of achalasia based on Eckardt classification before and after surgery.

Figure from the author.

Discussion

The clinical evaluation of patients with achalasia deserves special attention, as individuals respond differently to symptoms. Using the Eckardt score to quantify these symptoms makes it easier to understand and manage each case. The score is a reliable way to assess treatment success and is an essential tool for ongoing patient monitoring, especially since symptoms may often recur.[10] The most common signs and symptoms found in patients in this study are consistent with what has been reported in medical literature, with dysphagia appearing as the main symptom, most frequently accompanied by regurgitation and weight loss.[3]

Data regarding the etiology of achalasia aligns with international research, though it differs from certain Brazilian studies, which report a higher prevalence of Chagas-related cases.[1] In our sample, only 9.8% of patients tested positive for DC antibodies. Treatment for idiopathic or Chagas-related achalasia is comparable, with the primary goal being to lower LES pressure to help ease symptoms.[8] All patients in this study underwent surgical intervention, regardless of the cause of their achalasia.

The average age of the patients was 49.9 years, suggesting an earlier diagnosis compared to what's typically reported in the literature, which generally shows an average over 50 years old.[6] The gold standard for diagnosing achalasia is high-resolution manometry (HRM), which not only confirms the diagnosis but also categorizes the type of achalasia according to the Chicago classification.[9] In this study, patients did not undergo HRM due to its unavailability at the facility, so conventional manometry was used instead. While SEED isn't as sensitive as manometry, especially for detecting achalasia in its early stages, it remains valuable for ruling out structural abnormalities and identifying advanced megaesophagus.[11] The degree of megaesophagus was evenly distributed between early stages I and II (50%) and advanced stages III and IV (50%), with the majority of cases falling into the intermediate stages (II and III), which accounted for 69.4% of the sample.

Laparoscopic myotomy is the standard treatment for achalasia. Although various other therapies exist, their results are either equivalent to or less favorable than laparoscopic myotomy. The Heller technique, when paired with partial fundoplication, is considered a safe procedure, with a reported mortality rate of just 0.1%[7]. The most common complication from laparoscopic myotomy is perforation of the esophageal or gastric mucosa during surgery, but this is usually detected and repaired immediately during the operation, with no lasting effects. The overall complication rate for MLH is 6.3%.[5] In our study, the mortality rate was 0%, and the only complication observed was AF, which was quickly resolved with heparinization. None of the patients required further surgical intervention.

The laparoscopic technique boasts a success rate of about 90%.[11] In a study by Snyder et al., 86% of patients responded successfully out of a sample size of 134, with a follow-up period of 22 months.[12] Finley et al. reported lower success rates, despite a larger sample size. According to Finley, 69% of 261 patients were successfully treated and monitored for 36 months.[13] Rosemurgy et al. evaluated therapeutic success in a sample group of 505 patients. Among those monitored for up to 31 months, an 80% success rate was observed.[14] Occasional symptoms were reported by 13 patients (17.33%) after surgery, but these did not impact their overall quality of life. Only one patient experienced clinical stage 2 symptoms postoperatively. For the rest, the severity or frequency of symptoms was not high enough to score above 3 on the Eckardt Score, indicating a therapeutic success rate of 98.6%. Although this study followed patients for up to 45 months, the sample size remains limited (N=75).

There was no observed link between the type of megaesophagus and how the patient's symptoms were classified by the Eckardt score. Similarly, no connection was found between the severity of megaesophagus and the success of treatment, with positive outcomes even among patients with grade IV megaesophagus. This suggests that even those with advanced disease can benefit from MLH, keeping esophagectomy as a backup option if MLH doesn't work.[7] This finding contrasts with some studies that report less favorable results in advanced cases of megaesophagus.[15]

Iatrogenic gastroesophageal reflux after myotomy occurs due to disruption of the body's natural anti-reflux mechanisms. It's known that endoscopic myotomy procedures often lead to higher rates of postoperative reflux, since the esophageal muscle is cut without creating an anti-reflux barrier. In a multicenter study by Teitelbaum et al. involving patients who underwent POEM, changes in pH test results were noted in 57.8% and 37.5% of cases at one and two years of follow-up, respectively.[15] Schlottmann et al. compared various studies on reflux rates after laparoscopic myotomy versus POEM, showing rates from 0–13.3% for laparoscopic myotomy and 38.2–70% for POEM.[5] Chadalavada et al. reported abnormal acid exposure in 48.4% of patients after POEM, compared to 13.6% after MLH.[16]

This study found no reports of postoperative gastroesophageal reflux symptoms for up to 45 months, highlighting the effectiveness of this technique not only in treating dysphagia caused by achalasia, as well as the development of an effective anti-reflux mechanism.

Conclusion

Based on the clinical, radiological, and endoscopic data reviewed, the modified Laparoscopic Heller Myotomy (LHM) technique has proven to be a safe and effective approach for managing achalasia, delivering significant symptom improvement for patients with all degrees of megaesophagus included in this study. Clinical regression was noted both in early and advanced cases, demonstrating its usefulness at various stages of the disease. Additionally, the procedure was shown to not only alleviate achalasia symptoms, but also consistently serve as a preventative measure against gastroesophageal

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reflux, which is essential for enhancing quality of life and minimizing postoperative complications.

These findings highlight the technique as a reliable, safe, and long-lasting treatment option, firmly establishing its importance in surgical approaches for achalasia. It directly improves patient's functionality and overall well-being.

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None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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