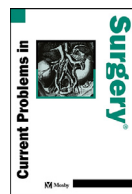




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ORIGINAL ARTICLE

Clinical results of Heller myotomy using the Eckardt scale over a 5-year period: A single-center retrospective cohort study [☆]



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Introduction

Achalasia is one of the most common primary esophageal motility disorders, with an approximate incidence of 1 per 100,000 people per year. Its presentation shows a bimodal distribution, with peaks in individuals under 30 years of age and again in those over 50. It affects people of all genders and ethnic groups without a clear preference. In countries such as Brazil, where Chagas disease is endemic, the prevalence rises to 840 per 100,000 people.^{1,2}

The clinical presentation is often nonspecific, although up to 95% of patients experience dysphagia, and a smaller percentage report symptoms such as heartburn (pyrosis), regurgitation, and chest pain.^{3,4} According to the literature, at least 3% of achalasia patients may develop esophageal cancer within 15 years of diagnosis.⁵

The gold standard for diagnosis is high-resolution esophageal manometry, which employs the Chicago Classification 4.0 to categorize patients based on integrated relaxation pressure (IRP) and esophageal peristalsis patterns. This allows more accurate diagnosis of achalasia subtypes and facilitates tailored treatment.^{2,6-8}

Treatment options include pharmacologic and endoscopic approaches such as pneumatic dilation and peroral endoscopic myotomy (POEM), as well as surgical interventions like Heller myotomy.^{1,2,9} Symptom improvement rates after myotomy range from 83% to 100% in global se-

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ries,^{10,11} although up to 9% of patients may experience gastroesophageal reflux symptoms, and 10%-5% may progress to megaesophagus.⁵

In 1992, Eckardt et al. introduced the “Eckardt score,” which evaluates clinical response by quantifying symptom frequency – dysphagia, weight loss, regurgitation, and retrosternal pain – on a scale from 0 to 3. Based on this, stages 0-I indicate clinical remission, while stages II-III suggest therapeutic failure. This score, with a sensitivity of 87.5% and specificity of 73.8%, remains widely used in clinical practice.¹² It’s important to note that symptom recurrence may reflect the natural history of achalasia rather than treatment failure.⁵

Although Heller myotomy is considered the gold standard for achalasia treatment worldwide, there is limited published data in the Latin American context, particularly in Colombia. Regional variations in clinical presentation, access to care, and surgical outcomes underscore the need for locally generated evidence.

For this reason, we conducted a retrospective study to evaluate the clinical outcomes of patients with achalasia who underwent Heller myotomy at a high-complexity referral center in Bogotá, Colombia, between 2018 and 2023, using the Eckardt score to assess treatment response.

Materials and methods

Study design

A single-center retrospective cohort study was conducted at Clínica Universitaria Colombia between January 1, 2018, and May 31, 2023. Patients older than 18 years with a clinical and paraclinical diagnosis of achalasia who underwent Heller myotomy according to the institutional management protocol were included. Patients with incomplete clinical records or with other disorders mimicking achalasia (eg, pseudoachalasia) were excluded.

The institutional protocol for achalasia management included standardized diagnostic evaluation with upper endoscopy, esophagogram, and high-resolution manometry (Chicago classification), followed by laparoscopic Heller myotomy with anterior fundoplication.

The research protocol was approved by the Institutional Research Commission and Ethics Committee and conducted in accordance with the Declaration of Helsinki (1989) and its subsequent amendments.

Parameters evaluated

Data were obtained by reviewing electronic medical records and complemented with a telephone survey to retrospectively apply the Eckardt scale for postoperative symptom assessment and recurrence.

The following parameters were evaluated:

- *Baseline data:* Age, sex, body mass index (BMI), comorbidities, previous endoscopic interventions (balloon dilation, botulinum toxin injection), type of achalasia according to the Chicago classification.
- *Perioperative variables:* Associated surgical procedures, operative time, intraoperative findings.
- *Postoperative outcomes:* Hospital stay, short-term complications (classified according to Clavien–Dindo), and need for reintervention.
- *Symptom assessment:* Postoperative Eckardt score (applied retrospectively via telephone survey). Clinical recurrence was defined as reappearance of symptoms (dysphagia, regurgitation, chest pain, or weight loss) with an Eckardt score ≥ 3 , regardless of endoscopic or imaging confirmation.

Surgical technique

All procedures were performed laparoscopically with the patient in the supine French position. Standard trocar placement was used. A longitudinal myotomy of the distal esophagus and proximal stomach was performed, with an average length of approximately 7-8 cm on the esophageal side and 4cm on the gastric side. The chosen lengths were based on our institutional protocol, which follows current evidence derived from peroral endoscopic myotomy (POEM) procedures. POEM studies have demonstrated that extending the gastric myotomy to approximately 3-4 cm while maintaining 7-8 cm on the esophageal side optimizes division of the lower esophageal sphincter and improves postoperative functional outcomes without increasing gastroesophageal reflux. An anterior Dor fundoplication was routinely performed to minimize postoperative reflux. Crural repair was completed in selected cases when indicated. All procedures were performed by experienced general surgeons, with some cases involving surgeons in their learning curve under supervision.

Postoperative management

After surgery, all patients were managed according to our institutional postoperative protocol for antireflux and myotomy procedures. Patients were discharged within 24 hours and scheduled for follow-up visits at 15 and 30 days postoperatively. Each patient received written recommendations regarding diet, wound care, and activity.

The postoperative diet consisted of clear liquids on the day of surgery, followed by a liquid diet maintained until the first outpatient follow-up visit at 15 days. After medical evaluation, patients were instructed to progress to pureed foods for approximately 10 additional days, and then to a regular diet within 3-4 weeks, according to individual tolerance. Dietary recommendations included avoiding carbonated beverages, caffeine, alcohol, spicy foods, and foods at extreme temperatures. All medications were administered crushed or in liquid form during the early postoperative phase.

Early ambulation was encouraged on the day of surgery. Wound care consisted of removing dressings after 72 hours and washing the incisions with soap and water during showers. Routine upper gastrointestinal contrast studies (UGI) were not performed unless there was clinical suspicion of leakage, obstruction, or poor postoperative recovery. All patients received proton pump inhibitors and were advised to contact the surgical team in case of fever, persistent vomiting, dysphagia, or wound discharge.

Statistical analysis

Qualitative variables were summarized as absolute and relative frequencies. Quantitative variables were expressed as means with standard deviation or medians with interquartile ranges, depending on distribution. Associations between achalasia subtype and postoperative Eckardt score were analyzed. Data analysis was performed using R software, version 4.4.0.

Results

Baseline characteristics

A total of 58 patients diagnosed with achalasia underwent Heller myotomy at Clínica Universitaria Colombia between January 1, 2018, and May 31, 2023. Of these, 41 were women (70.7%) and 17 were men (29.3%), with a mean age of 44.2 years (range 18-79). At the time of surgery,

Table 1

Demographic and Clinical characteristics.

Variable	N = 58
<i>Demographic characteristics</i>	
Age in years (mean \pm SD)	44.7, (15.17)
Gender, n (%)	
Female	41 (71%)
Male	17 (29%)
Comorbidities, n (%)	16 (28%)
<i>Clinical characteristics</i>	
Body mass index, n (%)	
Underweight < 18.5kg	4 (6.9%)
Normal 18.5 to 24.9 kg	38 (66%)
Obesity > 30 kg	5 (8.6%)
Overweight 24.9 to 29.9 kg	11 (19%)
Complications, n (%)	
I	5 (8.6%)
II	1 (1.7%)
III a/b	1 (1.7%)
Intraoperative	3 (5.2%)
None	48 (83%)
Hospital stay, p50 (IQR)	1 (0.1)
Recurrence, n (%)	7 (12%)

SD, standard deviation; p50, median; IQR, interquartile range

11 patients (18.9%) were overweight and 5 (8.6%) were obese. Four patients (6.8%) were underweight (BMI < 18.5), while the remainder had a BMI within the normal range (18.5-24.9 kg/m²). Sixteen patients (27.6%) presented comorbidities, most commonly hypertension (6 cases) and hypothyroidism (5 cases).

According to the Chicago classification, 39 patients (67.2%) had type II achalasia, 15 (25.9%) had type I, and 4 (6.9%) had type III. Prior endoscopic treatment consisted of balloon dilation in 7 patients (12.1%); none received botulinum toxin injections. These data are summarized in [Table 1](#).

Short-term outcomes

All patients underwent Heller myotomy with anterior Dor fundoplication. The mean operative time was 103.6 minutes. Six patients (10.3%) experienced complications within the first 30 postoperative days. Five were Clavien–Dindo grade I (nausea, vomiting, atelectasis), and one patient suffered an esophageal perforation requiring intraoperative repair with suturing and stent placement. Two intraoperative gastric mucosal perforations were managed with gastrorrhaphy without further complications.

The mean length of hospital stay was 1.2 days. Twenty-six patients (44.8%) were discharged on the same day of surgery. One patient required a prolonged stay (> 10 days) due to esophageal perforation. Overall, 1.7% required reoperation. There were no deaths. Ten patients (17%) were readmitted: 3 underwent endoscopic dilation for early dysphagia, five were readmitted due to dysphagia related to poor eating habits (resolved with medical management), and 2 were readmitted for unrelated causes. Operative and postoperative outcomes are summarized in the text below.

Eckardt score and clinical recurrence

The mean postoperative total Eckardt score was 2.41 (\pm 1.79). According to symptom severity, 84.5% of patients were classified as stage I or II (34% and 50%, respectively), while 15.5% were

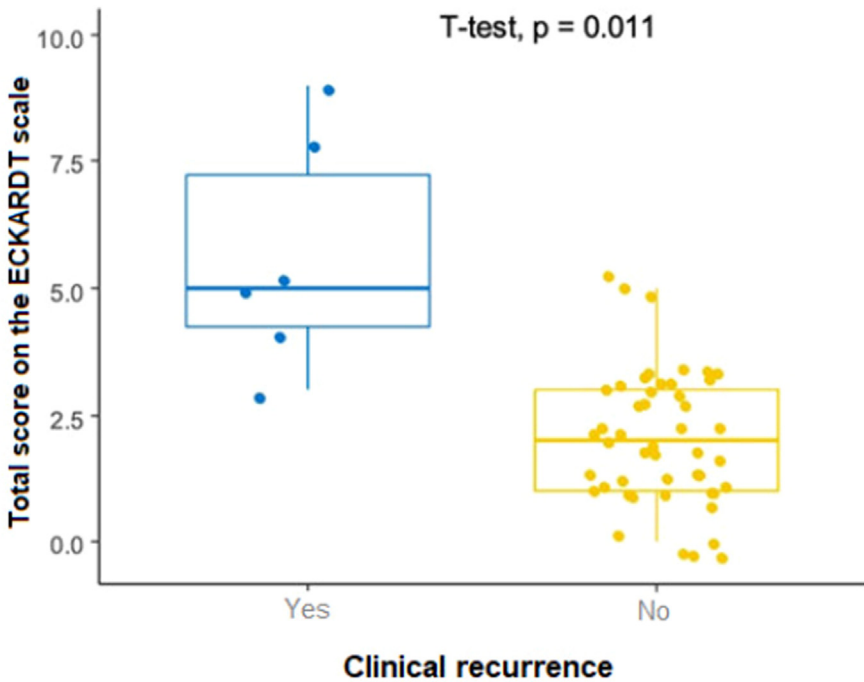


Fig. 1. Total Eckardt scale score according to clinical recurrence.

classified as stage III or IV (12.1% and 3.4%, respectively). The most frequent subscores were: weight loss 0 points (71%), dysphagia 2 points (74%), retrosternal pain 0 points (52%), and regurgitation 0 points (52%).

Nine patients (15.5%) had total Eckardt scores >4 , of whom 7 were classified as clinical recurrence (presence of daily symptoms or symptoms with every meal). Figure 1 illustrates the distribution of postoperative Eckardt scores and recurrence.

Of the recurrent cases, 3 received medical management with proton pump inhibitors and prokinetics, 3 underwent endoscopic dilation, and one is pending gastroenterology evaluation for peroral endoscopic myotomy (POEM).

Achalasia classification and postoperative Eckardt score

Among patients with type I achalasia, 20% had postoperative Eckardt stage III, most frequently with daily regurgitation (13.3%). In type II achalasia, 12.8% of patients were classified as stages II–III, most severely presenting with weight loss of 5–10 kg (15.4%). In type III achalasia, 25% were classified as stage III, most frequently presenting with dysphagia and weight loss (25%). Figure 2 shows the total and itemized Eckardt scores according to achalasia subtype.

Discussion

This study evaluated the clinical outcomes of laparoscopic Heller myotomy with Dor fundoplication in patients with achalasia over a 5-year period at a single tertiary care center in Colombia. The main findings were: (1) the procedure was safe, with low complication and readmission

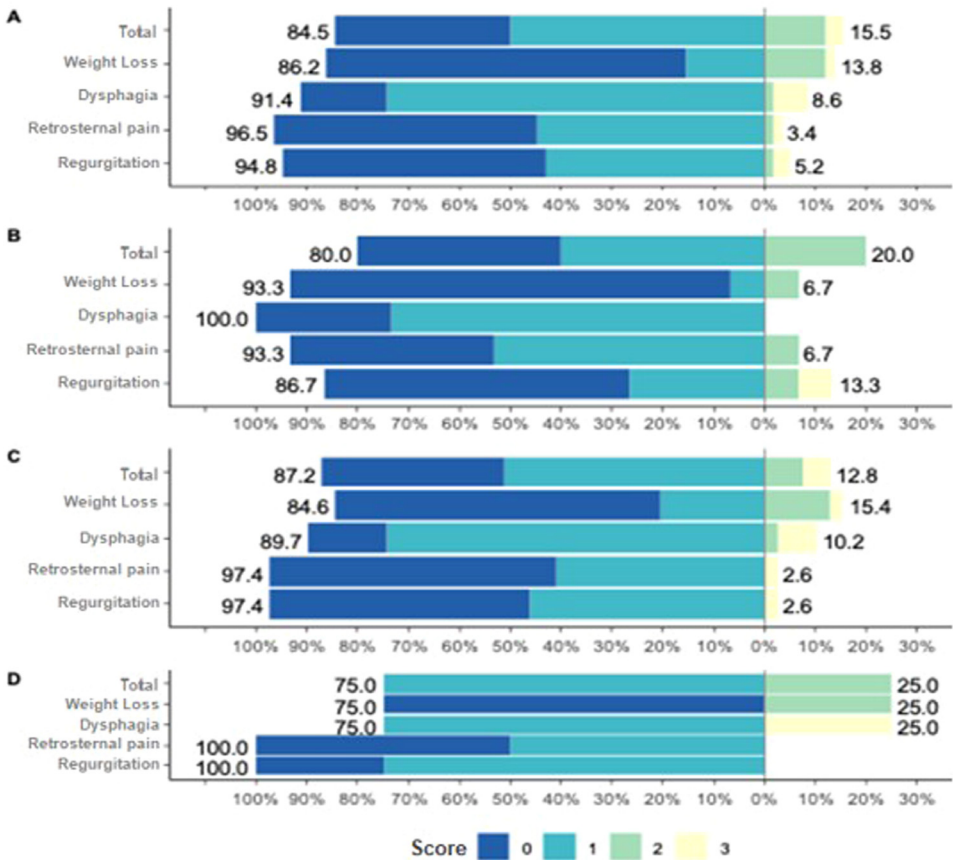


Fig. 2. Total Eckardt score and itemized breakdown for all patients according to the Chicago manometric classification. Total score (0: Stage 0; 1: Stage I; 2: Stage II; 3: Stage III). Weight loss (0: Never; 1: < 5 kg; 2: 5–10 kg; 3: > 10 kg). Dysphagia, retrosternal pain, and regurgitation (0: Never; 1: Occasional; 2: Daily; 3: With every meal). (A) All patients. (B) Manometric classification Type I achalasia patients. (C) Manometric classification Type II achalasia patients. (D) Manometric classification Type III achalasia patients.

rates, (2) no mortality occurred, (3) more than 80% of patients achieved symptom remission according to the Eckardt score, and (4) dysphagia remained the most frequent symptom both at baseline and in cases of recurrence.

Laparoscopic Heller myotomy combined with partial anterior fundoplication has been widely recognized as one of the most effective treatments for achalasia, with international success rates between 88% and 95%.¹³ Our results are consistent with this evidence. Only 3 patients presented intraoperative complications, which were managed during surgery, and no deaths occurred. The mean hospital stay was short, and almost half of the patients were discharged on the same day of the procedure.

The surgical technique used in our institution consisted of a careful anterior esophageal dissection, followed by a longitudinal myotomy of approximately 7–8 cm on the esophagus and 4 cm on the gastric side. An anterior Dor fundoplication was performed in all cases to minimize postoperative reflux. Evidence has shown improved outcomes when Heller myotomy is systematically combined with fundoplication.^{14,15}

Regarding symptom control, 84.5% of our patients achieved clinical remission (Eckardt I-II), while 15.5% remained symptomatic (Eckardt III-IV). Dysphagia was the predominant symptom in

both primary and recurrent cases. These results align with those reported by Milito et al., who identified dysphagia and regurgitation as the most common recurrent symptoms.¹⁶

Postoperative complications were infrequent (10.3%) and mostly minor (Clavien–Dindo grade I). Our rates are comparable to those described by Awaiz et al. in a systematic review and meta-analysis including 3745 patients, which reported a low frequency of severe complications after Heller myotomy.¹⁷ Similarly, Mineo et al. and Decker et al. demonstrated that Heller–Dor surgery provides durable symptom relief and improved quality of life,^{18,19} findings that are also reflected in our cohort.

An important aspect often overlooked in achalasia is the nutritional status of patients. Malnutrition increases the risk of postoperative complications, including esophageal leak. In our series, 6.8% of patients were underweight. Nutritional assessment and optimization should be considered preoperatively. Recent evidence from Petra et al. confirmed the diagnostic and prognostic value of malnutrition screening tools in surgical patients.²⁰

This study has several limitations. First, it was a retrospective cohort without a comparison group, which restricts causal inference. Second, it was conducted in a single center with a relatively small sample size, limiting generalizability. Third, no preoperative Eckardt scores were available, and the postoperative scale was applied retrospectively via telephone survey, which may have introduced recall bias. Finally, selection bias cannot be excluded.

Nevertheless, our study provides valuable strengths. It represents one of the first institutional reports on achalasia surgical outcomes in Colombia, adds regional data from a Latin American population, and presents a 5-year institutional experience with standardized surgical technique and follow-up.

Future research should focus on prospective comparative studies evaluating Heller myotomy versus alternative therapies such as POEM, pneumatic dilation, or botulinum toxin injection. Such studies could help tailor treatment strategies to patient-specific characteristics and optimize long-term outcomes.

Conclusion

Laparoscopic Heller myotomy combined with anterior partial fundoplication proved to be safe and effective, with low complication rates, no surgery-related mortality, and more than 80% of patients achieving clinical improvement according to the Eckardt score.

Although this study is limited by its retrospective single-center design and the absence of a comparison group, it provides valuable real-world evidence from a Latin American population, where reports on achalasia management remain scarce. These findings highlight the importance of standardized surgical management and serve as a reference point for other institutions in the region.

Future multicenter prospective studies are warranted to validate these results, compare surgical outcomes with alternative therapies such as POEM, pneumatic dilation, or botulinum toxin injection, and contribute to the development of personalized treatment strategies for achalasia.

Ethical considerations

The research protocol was approved by the Institutional Research Commission and Ethics Committee. The study complied with the Declaration of Helsinki (1975 and subsequent amendments) and Colombian regulations, including Resolution 008430 of 1993 and Resolution 2378 of 2008.

Disclosure

Dra Mayra Angelica Hernandez Peñuela, Dra Isabel Cristino Brito Rojas, Dra Gloria Stella Flores Dussan, Dr Jorge Isaac Vargas Rodriguez, Dr Raul Enrique Guevara Castro, Dr German Jimenez

Sanchez, Dra Liliana Maria Suarez Olarte, and Dra Diana Milena Munetones Buitrago disclose that this article has not been previously published and is not under consideration for publication elsewhere. The publication has been approved by all the authors.

Authors' contribution

Isabel Brito, Gloria Florez, and Mayra Hernandez contributed to the design, acquisition, analysis, and interpretation of data for the manuscript. Diana Munetones and Isabel Brito conducted data collection and clinical record review. Maria del Pilar Montilla served as the epidemiological advisor for the study. Gloria Florez, Mayra Hernandez, Jorge Vargas, Raul Guevara, Liliana Suarez, and German Jimenez contributed to the writing and critical review of the intellectual content. All authors contributed to and approved the final manuscript for publication.

Conflict of interest

The authors have no conflict of interest.

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