

## Evaluation of the Functional Outcome of Laparoscopic Heller Cardiomyotomy in Treatment of Patients with Achalasia of the Cardia

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### Abstract:

**Background:** Achalasia is an esophageal motor disorder characterized by increased lower esophageal sphincter (LES) pressure and diminished or absent peristalsis in the distal esophagus. This trial assessed the functional Outcome of laparoscopic Heller cardiomyotomy in treatment of patients with achalasia of the cardia using the Eckardt score. **Methods:** This prospective randomized trial included 30 patients with Achalasia of the cardia. These patients were managed at Banha and Mansoura University Hospitals by doing laparoscopic Heller cardiomyotomy. Follow-up was planned for 6 months for Eckardt score. **Results:** There was a statistically significant decrease in Eckardt score in all patients who done laparoscopic Heller cardiomyotomy ( $P < 0.001$ ) and 7% of patients (2 patients) had esophageal perforation and management done intraoperative with good improvement in the follow up. **Conclusions:** According to presented

evidence, laparoscopic myotomy with anti-reflux procedures is the optimal first-line treatment for achalasia with a satisfactory improvement in quality of life.

**Keywords:** Achalasia, Heller Cardiomyotomy, Quality of Life.

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### Introduction:

Esophageal achalasia is an unknown condition characterized by insufficient relaxation of the lower esophageal sphincter (LES) and absence of esophageal peristalsis (1).

Achalasia may be primary (idiopathic) or secondary. The etiology of esophageal

nerve fiber degeneration was discovered in secondary achalasia. The aberrant loss of inhibitory ganglion cells in the myenteric plexus is the cause of achalasia. Multiple studies have studied probable causes of sickness, including viral infection, other environmental factors, autoimmune

disease, and heredity. However, the precise pathophysiology of primary achalasia is yet unknown (2).

Frequently, a barium esophagram is followed by esophageal manometry, the "gold standard" diagnostic test for achalasia. Achalasia is characterized by a lack of peristalsis, sometimes elevated intraesophageal pressure due to food and saliva stasis, and inadequate relaxation of the lower esophageal sphincter (residual pressure >8–10 mmHg after swallowing (3).

The objective of decompression of LES pressure is to give long-term symptomatic relief for esophageal achalasia. Pharmaceutical therapy (such as nitrates and short-acting calcium antagonists), endoscopic pneumatic balloon dilation (PBD), endoscopic botulinum toxin injection, and laparoscopic or open esophagocardiomyotomy with antireflux surgery are currently viable treatments for gastroesophageal reflux disease (4).

First reported in 1914, surgical cardiomyotomy (Heller myotomy) is already one hundred years old. In the 1990s, it was resurrected through a minimally invasive approach (Laparoscopic Heller myotomy, LHM), and it has since become the gold standard for measuring the efficacy of treatments for achalasia and the preferred treatment (especially in young patients), with good

long-term results in approximately 90 percent of cases, according to the majority of published series. It is a straightforward, elegant, one-shot treatment with almost negligible mortality and minimal morbidity (5).

### **Hypothesis**

The efficacy of laparoscopic Heller cardiomyotomy in treatment of achalasia has motivated the authors to conduct this study.

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### **Materials and Methods:**

This prospective study was conducted at the General Surgery Department in Benha University Hospital and Mansoura university Hospital.

Enrollment of eligible patients was throughout the period December 2020 to March 2022. The study included 30 patients with achalasia of the cardia who underwent laparoscopic Heller cardiomyotomy and assessment of them postoperative according Eckardt score. The study was conducted after approval of ethical of research committee Banha University.

Informed written consent was obtained from all included patients. Inclusion criteria were: any patients with achalasia of the cardia fit for surgery. Exclusion criteria included patients undergo pneumatic dilatation, recurrent cases, associated with hiatus hernia, uncontrolled

co-morbidities as DM and HTN and Patients cannot accommodate pneumoperitoneum.

**Procedures:**

All patients were subjected to the following: All patients were subjected to the following: Preoperative assessment: Full clinical history: Regurgitation of undigested food, Dysphagia for solids and liquids, Respiratory complications (aspiration and nocturnal cough), heartburn, Chest pain, Weight loss. Full clinical examination: general and local abdominal examination. Investigations include routine preoperative laboratory investigations: CBC, kidney function tests, liver function tests, coagulation profile, serum electrolytes and viral markers. Routine preoperative radiological investigations: ECG, Echocardiography, plain chest X-ray, Esophageal manometry evaluating esophageal peristalsis and LES pressure, upper GIT endoscopy commenting on esophageal peristalsis, and Barium swallow showing “bird’s beak” appearance.

**Study operation:** laparoscopic Heller's cardiomyotomy was done to all patients.

Research Ethics Committee: MD 3.2.2020

**Procedure:** Patients were placed in a supine, split leg position. The patient was positioned in a steep reverse Trendelenburg position. Four operative

ports (two for the surgeon, one for the assistant, and one for the scope) were placed under direct vision after inflation of the abdomen with Veress needle, and liver retraction was then achieved by epigastric port retraction (S shaped). Mobilization of the fundus of the stomach: the first dissection began to the right of the esophageal hiatus.

The right anterior phrenoesophageal ligament and the peritoneum protecting the anterior abdominal esophagus are separated. The left phrenogastric ligaments are divided by cutting the short gastric arteries from the upper pole of the spleen to the exposed left crus of the diaphragm. We used a Harmonic or Ligature device for dissection.

Myotomy: Visibility and illumination must be ideal during the myotomy in order to prevent unintentional mucosal injury. On the esophagus, six centimeters of continuous myotomy were performed, and on the stomach, one centimeter. We began the myotomy one to two centimeters above the gastroesophageal junction. Myotomy was done longitudinally in the anterior esophageal axis using blunt dissection, an electric hook, scissors, or the harmonic – Ligasure device to expose a smooth, white, and bulging mucosal plane. The fundus was mobilized for Dor Fundoplication by severing the small stomach vessels and any fundal attachments. The fundus was

mobilized for Dor Fundoplication by severing the small stomach vessels and any fundal attachments. Following mobilization of the mediastinal esophagus, the gastroesophageal hiatus was closed posteriorly with interrupted sutures. Dor fundoplication was done at the end of procedure.

#### **Follow up**

All patients had follow-up visits after discharge to assess the results according to the Eckardt score (table 1) 1 month and 6 months post-operative.

#### **Outcomes**

The outcome was improvement in the Eckardt score.

#### **Statistical analysis**

Data were statistically analyzed using IBM SPSS statistics (Statistical Package for the Social Sciences) version 22.0, IBM Corp., Chicago, USA, 2013. For regularly distributed quantitative data, the minimum and maximum of the range and the mean standard deviation were computed, while numbers and percentages were computed for qualitative data. Using the Shapiro-Wilk test for normality testing and the independent t-test for two independent groups with normally distributed data, quantitative variables were evaluated. Using the Chi-square test for proportional changes and Fisher's Exact test for variables with small, predicted numbers, inferential analyses of qualitative data with

independent variables were performed. The significance level was found to be a P-value less than 0.05.

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#### **Results:**

The current study included 30 eligible patients who did laparoscopic Heller cardiomyotomy. Table 2 showed demographic data which revealed that age range from 30-50 years old (Mean  $\pm$  SD= 40.6). 53% of patients are female and also showed that 2 patients had DM, 3 patients had HTN, 1 patient had IHD, and 2 patients had a history of deep venous thrombosis.

Table 3 showed that 53% of patients are grade 2 with 16% grade 1. preoperative Lower Esophageal Sphincter Pressure (LESP) range (33-52) with mean of 42.2.

Table 4 showed that Operative mean time was 86 min with postoperative stay of 2 days. Regarding complications, 7% of patients had intra-operative bleeding, 7% had perforation, 3.4% had postoperative reflux esophagitis and 3.4% had postoperative wound infection. Table 5 showed descriptive pre Eckardt score and post Eckardt score of the studied patients which showed that pre Eckardt score of all 30 patients was range from 2 to 9 but the post Eckardt score was range from 0 to 3 which is the most important result in our study.

**Table 1:** The Eckardet score

Score	Weight loss (kg)	Dysphagia	Retrosternal Pain	Regurgitation
0	None	None	None	None
1	< 5	Occasional	Occasional	Occasional
2	5-10	Daily	Daily	Daily
3	> 10	Each meal	Each meal	Each meal

**Table 2:** Socio demographic and comorbidities data of the patients

		No.= 30
Age (years)		40.60 ± 9.24
Sex	Female	16 (53.0%)
	Male	14 (47.0%)
Diabetes mellitus		2 (7.0%)
Hypertension		3 (10.0%)
Ischemic heart disease		1 (4.0%)
History of deep venous thrombosis		2 (7.0%)
BMI		20.50 ± 3.24

BMI: body mass index, Data were expressed as mean ± Standard deviation (SD), frequency (percentage)

**Table 3:** Descriptive for type of achalasia, preoperative lower esophageal sphincter pressure

		No.= 30
Type of achalasia	Type I	9 (30.0%)
	Type II	16 (53.0%)
	Type III	5 (16.0%)
Pre LESP	Mean ± SD	42.20 ± 9.81
	Range	33 – 52

Data were expressed as mean ± Standard deviation (SD), frequency (percentage), \*: significant as P value < 0.05.

**Table 4:** Descriptive for operative time, post and intra operative complications

		No.= 30
Operative time		86.00 ± 23.00
Intra operative. Bleeding		2 (7.0%)
Perforation		2 (7.0%)
Post operative hospital stay		2 (2 – 3)
Post operative wound infection		1 (3.4%)
Post operative reflux esophagitis		1 (3.4%)

Data were expressed as mean ± Standard deviation (SD), frequency (percentage), Median (IQR).

**Table 5:** Descriptive for pre eckardt score and post eckardt score of the studied patients

	No.= 30
<b>Pre eckardt score</b>	5 (4 – 7)
<b>Post eckardt score</b>	1 (0 – 1)

Data were expressed as Median (IQR).



Figure 1: Position of the patient

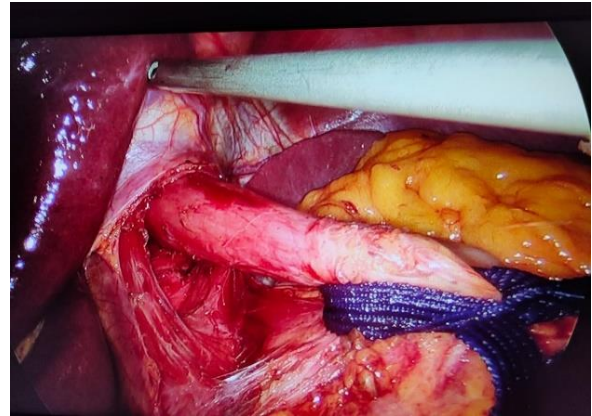


Figure 3: Mobilization of the mediastinal esophagus

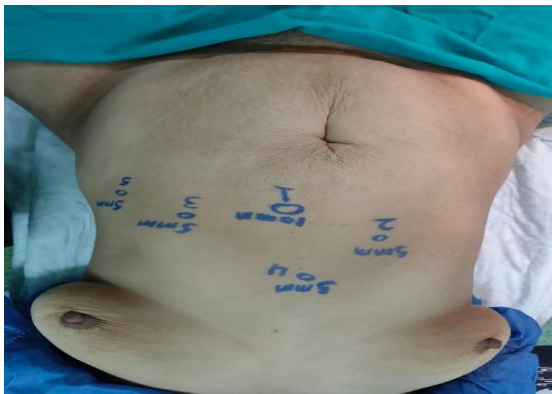


Figure 2: Sites of trochar



Figure 4: Myotomy

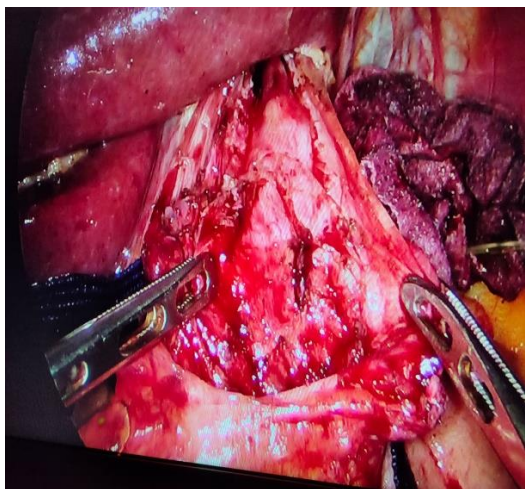


Figure 5: After complete the myotomy

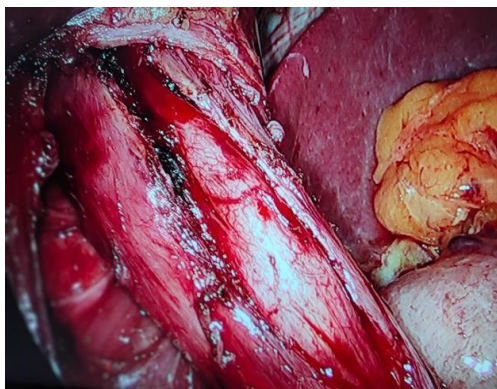


Figure 6: Bulging mucosal plane

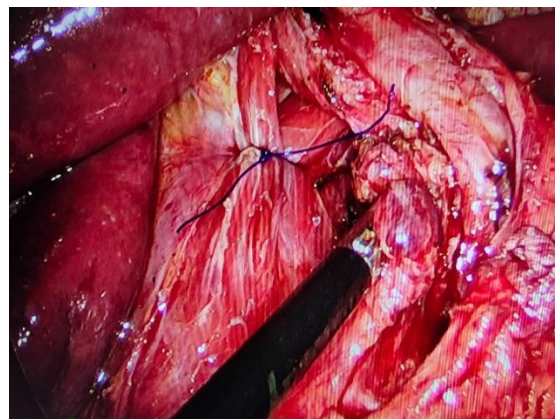


Figure 7: Repair of the hiatus

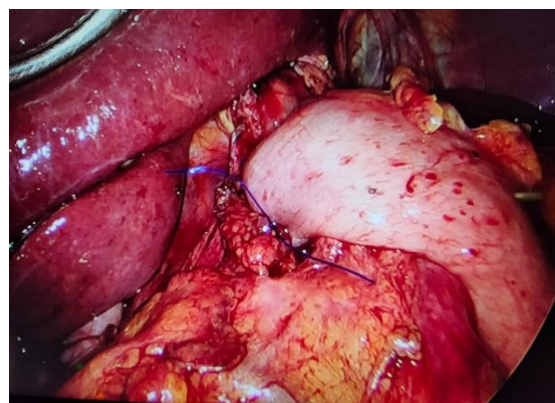


Figure 8: Dor Fundoplication

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## Discussion

Esophageal achalasia is a rare esophageal functional disorder characterized by disorganized or absent esophageal peristalsis and incomplete relaxation of the LES during swallowing as a result of destruction and loss of inhibitory myenteric ganglion cells in the esophageal Auerbach's plexus (4).

Botulinum toxin injection endoscopically, endoscopic balloon inflation, per-oral endoscopic myotomy, Laparoscopic Heller cardiomyotomy and fundoplication are

efficient achalasia therapies (6). The Heller–Dor method is based on two primary concepts: (1) easing the disrupted flow through the lower esophageal segment by means of Heller myotomy, and (2) fundoplication to avoid postoperative gastroesophageal reflux (7).

Due to its outstanding short-term success rates, laparoscopic myotomy plus anti-reflux treatments have been suggested as the most effective first therapy for achalasia (8).

We aimed in the current trial to assess the functional Outcome of laparoscopic Heller cardiomyotomy in treatment of patients with achalasia of the cardia using the Eckardt score. This is a prospective randomized study which was conducted at the General Surgery Department in Benha University Hospital and Mansoura University Hospital from December 2020 to March 2022 and performed on total 30 patients who were diagnosed with esophageal achalasia undergoing laparoscopic Heller's cardiomyotomy.

During this study, 38 patients were assessed for eligibility and 30 patients were included in the study. Of all eligible patients, 6 patients were excluded from the study based on the inclusion criteria and 2 patients refused to participate in the study. The intraoperative bleeding occurred in 2 patients and this is better than the results of a study conducted in 2013 (8) who described that The intraoperative bleeding occurred in 3 patients and this result due to use of recent instruments in control of bleeding.

The intraoperative perforation in our study occur in 7% of the patients (2 patients) and managed by primary repair and follow up postoperative without any complication in comparison with a study conducted in 2011 (9) the Intra-operative mucosal perforation was identified in 5.8% patients (7 patients) . The post operative hospital

stay of the patients in our study is ranged from 2 to 5 days, this was supported by a study conducted in 2013 (10).

The Eckardt symptom score is the most common grading system for achalasia symptoms (weight loss, retrosternal pain, regurgitation, and dysphagia), phases, and therapeutic effectiveness. Clinical stage 0 refers to a symptom score of 0-1, clinical stage I corresponds to a symptom score of 2-3, clinical stage II corresponds to a symptom score of 4-6, and clinical stage III corresponds to a symptom score of >6. In phases 0 and I, the disease has remitted. In contrast, stages II and III indicate a failed treatment (11).

Our results revealed a highly significant difference between the preoperative and postoperative Eckardt scores among all patients in our study. These results were in concordance with the data reported by a study done in 2017 (4) which revealed that preoperative dysphagia improved in all patients postoperatively.

On the basis of postoperative questionnaires completed three months following surgery, Tsuboi et al. found no statistically significant variations in postoperative symptoms, with all patients reporting improvement in symptoms and excellent patient satisfaction (12).

Further trials with larger sample size are required to evaluate the effect of



laparoscopic Heller cardiomyotomy in treatment of achalasia.

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### Conclusions:

According to the current results, Laparoscopic Heller's cardiomyotomy achieved symptomatic improvement in all patients with Achalasia with least intraoperative and post operative complications.

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