

EFFICACY OF LAPROSCOPIC HELLER'S MYOTOMY IN THE TREATMENT OF ACHALASIA

TARAR JM^{1*}, NADEEM K² BHATTI S³

¹Department of Thoracic Surgery, Bakhtawar Amin Medical & Dental College & Hospital Multan, Pakistan

²Department of General Surgery, Armed Forces Hospital Alhada Taif Kingdom of Saudi Arabia

³Department of ENT, Bakhtawar Amin Medical & Dental College & Hospital Multan, Pakistan

*Correspondence author email address: drilyas123@yahoo.com

(Received, 17th June 2023, Revised 20th October 2023, Published 4th November 2023)

Abstract: In a retrospective study conducted from September 6, 2021, to September 6, 2022, at the Thoracic Surgery Department of Bakhtawar Amin Trust Hospital in Multan, the objective was to evaluate the impact of laparoscopic Heller's Myotomy on patients with achalasia. Additionally, the study sought to identify pre-operative factors that influence treatment outcomes. The methodology involved recording pre-operative patient data, including dysphagia scores, and conducting pre-operative manometry to diagnose achalasia. The diagnostic criteria included a non-relaxing lower esophageal sphincter (LES) and abnormal esophageal contractions. Post-operative changes in dysphagia scores (delta) were calculated, and a dysphagia score falling below a specified cutoff was considered an unsuccessful treatment outcome. The study's results revealed that the patients had an average age of 48.5 years, with a standard deviation of 1.6. After Heller myotomy, the average decrease in dysphagia scores was 7.2, with a standard deviation of 2.5. A change in score of ≥ 5 was indicative of successful treatment, leading to dysphagia relief in 69 out of 80 patients (86%). The sole pre-operative variable that significantly predicted successful dysphagia relief was the pre-operative LES pressure. The responder group displayed higher LES pressure than the non-responder group, with $41.5 \text{ mm Hg} \pm 12.1$ and $22.9 \text{ mm Hg} \pm 7.1$, respectively ($P = 0.001$). No significant correlation was observed between post-operative LES pressure and changes in dysphagia scores. In conclusion, Heller's myotomy demonstrated excellent efficacy in providing dysphagia relief for achalasia patients. Notably, a high pre-operative LES pressure was identified as a significant predictor of an excellent treatment outcome.

Keywords: Laparoscopic Heller's myotomy, achalasia, endoscopic dilation, lower esophageal sphincter pressure, dysphagia score, dysphagia relief

Introduction

Esophageal achalasia is the second most common esophageal disorder, following gastroesophageal reflux disease (GERD), the first (Gaber et al., 2022). Widely available strategies like the use of botulinum toxin injections, minimally invasive surgeries, and pneumatic dilation led to its management. Generally, these treatments focus on reducing the resting pressure of the lower esophageal sphincter (LES), which results in esophageal dysphagia. Though botulinum toxin or endoscopic dilation is effective for the short term, operative management is required in most achalasia patients for long-term relief (Schlottmann and Patti, 2018). There has been a dramatic improvement in the operative treatment of achalasia with advancement in laparoscopic Heller myotomy and thoracoscopic Heller myotomy, a minimally invasive surgery (Doubova et al., 2021; Nijhuis et al., 2020). Laparoscopic management of achalasia is now widely accepted and has become the first line of treatment for these patients (El Fiky et al., 2021). Studies have shown laparoscopic Heller myotomy superior to other primary therapies, such as pneumatic dilation of cardia (Martins et al., 2020). It is considered effective for treating non-advanced cases; however, its effectiveness in end-stage achalasia is controversial (Lee et al., 2019). Studies have documented its successful short-term results (Ramirez et al., 2018; Zaninotto et al., 2019). These studies reported that only 10%-30% of cases have persistent post-operative dysphagia; however, in these studies, pre-operative factors that have a role in the long-term effect of laparoscopic

esophageal myotomy were not evaluated. Thus, this study aims to assess the effects of laparoscopic Heller's myotomy and pre-operative factors affecting its outcome in achalasia patients.

Methodology

A retrospective study was conducted in the Thoracic Surgery Department of Bakhtawar Amin Trust Hospital, Multan, from September 2021 to September 2022. Patients with achalasia were included in the study. Patients who were unavailable for follow-up were excluded. The study was conducted on a total of 80 patients who were selected through random sampling. Informed consent of the included patients was recorded. The Ethical Board of the hospital approved the study. For diagnosis of achalasia, all patients underwent pre-operative manometry. Patients were advised to stop taking pro-motility or anti-secretory drugs before the tests. The pull-through technique was used for esophageal manometry. The diagnosis was based on non-relaxing LES and esophageal contractions (Parsa and Vela, 2022). Demographic and pre-operative data of the patient, including dysphagia score, was recorded. Laparoscopic Heller myotomy was performed after exposing the anterior gastroesophageal junction, and the distal segment of the esophageal musculature was excised. It was extended to gastric cardia, and intraoperative endoscopy was done simultaneously to assess the myotomy's adequacy and limit. In the case of intraoperative perforation, Dor anterior hemi

fundoplication was added. Contrast swallow was performed in selected cases of post-operative fever, tachycardia, or chest pain; in other patients, a liquid diet was started the next morning.

Post-operative dysphagia score change(delta) was calculated (Abula et al., 2020). The score ranged from 0 to 10. It was calculated by combining the frequency and severity of dysphagia. The mean delta score of the whole sample was calculated, and a single standard deviation below it was selected and considered the cutoff for dichotomizing results of laparoscopic esophageal myotomy. A dysphagia score below the cutoff was considered

Results

The age of the patients ranged from 30 to 65 years. The duration of the hospital stay ranged from 1 to 3 days. All 80 patients were followed up, and dysphagia scores were obtained. The follow-up questionnaire was recorded at a mean of 43.2 months. Regarding the complications of the procedure, 6 (7.5%) intraoperative perforations were recorded, these perforations were repaired, and there were no sequelae. Post-operative pneumonia was reported in 1 (1.25%) case.

After Heller myotomy, the mean decrease in dysphagia score was 7.2 ± 2.5 . Change in score was ≥ 5 ; based on this, dysphagia relief was obtained in 69 (86%) (responder

unsuccessful. Follow-up data of all the patients was collected through a dysphagia score questionnaire. Patients who could not visit were contacted over the phone.

Statistical analysis was performed using SPSS version 13.0. For continuous variables, data was represented as mean and median, and categorical variables as frequency or percentage. Univariate regression analysis was used for analyzing correlations. Pre-operatively variables, like LES pressure, ASA class, disease duration, age, and sex, related to long-term relief were analyzed using Binary logistic regression analysis. P value < 0.05 was considered statistically significant.

group). 11 (13.7%) patients did not respond to the myotomy (non-responder group). The post-operative procedure was required in 4 patients; bougie dilation was done in 3 patients, pneumatic dilation in 1, Botox injections in 2, and esophagectomy in 1. Features of the responder and non-responder groups are compared in Table I. Pre-operative demographics, including clinical characteristics and medical history in both groups, were similar.

According to the Binary logistic regression model, higher pre-operative LES pressure independently predicted excellent response. The only independent pre-operative variable that predicted adequate dysphagia relief was pre-operative LES pressure. LES pressure was higher than the non-responder group in the responder group, 41.5 ± 12.1 vs. 22.9 ± 7.1 mm Hg ($P = .001$) (Figure 1).

Table I Pre-operative data of the subjects

	Responder (n=69)	Non-responder (n=11)	P value
Age (year)	48.5±16.5	47.1±17.2	.61
Sex (M:F)	45/24	4/7	.22
Disease duration (year)	2.6±3.2	2.8±2.1	.73
Botox injection (%)	16.5	19	.86
ASA classification	2.6±0.5	2.7±0.3	.38
Endoscopic dilation(%)	45.5	51	.87



Barium Swallow findings in Achalasia Cardia



Laprosopic Heller's Myotomy

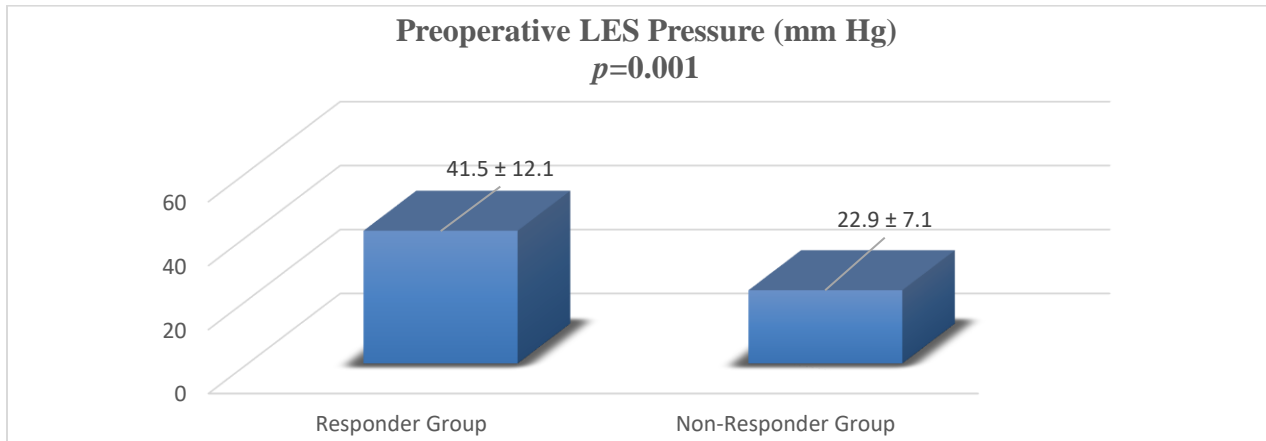


Figure 1: Preoperative LES Pressure between the Groups

Discussion

The findings of the current study show that laparoscopic esophageal myotomy provides durable relief from dysphagia symptoms and the long-term success of the procedure is predicted by high pre-operative LES pressure.

The results of our study show that myotomy resulted in dysphagia relief in 69 (86%). This was close to the results of a previous study, which reported the success rate of laparoscopic Heller myotomy to be 65% (Kamal et al., 2021). The only primary variable that predicted the procedure's success was pre-operative LES pressure. Subjects who had LES pressure greater than 34 mmHg were 20 times more likely to have complete dysphagia relief post-myotomy than those who had LES pressure less than 34 mmHg. This finding suggests that low pre-operative LES pressure is associated with less post-operative relief as there was relatively less decrease in obstruction to outflow. This finding also supported the finding that changes in dysphagia score significantly correlated with changes in LES pressure magnitude postoperatively. Another study confirmed this significant association (Samarakkody et al., 2022). Similarly, another study also found that the results of laparoscopic esophageal myotomy are affected by pre-operative LES pressure (Archerito et al., 2022). They reported that pre-operative resting LES pressure predicted long-term symptom relief from dysphagia. A study reported divergent findings that low pre-operative LES pressure did not affect laparoscopic Heller myotomy results (Andolfi and Fisichella, 2019). Another study reported that pneumatic dilation is effective in elderly patients with high basal LES pressure (Patti et al., 2022).

In the current study, other pre-operative variables were unrelated to dysphagia relief. No correlation between dysphagia relief and previous endoscopic dilation or Botox was found. Another study also reported that even after the low success of Botox or dilation therapy, Heller myotomy yielded excellent results (Weche et al., 2020). Different studies have shown that the myotomy procedure became increasingly difficult in patients who previously had no operative treatments (Costantini et al., 2019; Dantas, 2021). A study showed that previous non-operative treatment increases intraoperative perforation (Engwall-Gill et al.,

2022). ASA class, disease duration, age, and sex were not the predictors of the treatment outcome.

Our study recorded 6 (7.5%) intraoperative operative perforations. Another study reported intraoperative complications to be 9% (Kamal et al., 2021), which is close to our study. It is seen that Laparoscopic Heller myotomy is associated with low complications and achieves significant dysphagia relief in the majority of the study sample.

Conclusion

The study shows that laparoscopic esophageal myotomy is a durable procedure for the cure of dysphagia symptoms. High pre-operatively LES pressure is a predictor of excellent outcomes. This finding will help identify patients in whom esophageal myotomy will yield the best results

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate.

Approved by the department Concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

References

- Abula, A., Yushan, M., Ren, P., Abulaiti, A., Ma, C., and Yusufu, A. (2020). Reconstruction of soft tissue defects and bone loss in the tibia by flap transfer and bone transport by distraction osteogenesis: a case series and our experience. *Annals of Plastic Surgery* **84**, S202-S207.
- Andolfi, C., and Fisichella, P. (2019). Meta-analysis of clinical outcome after treatment for achalasia based on manometric subtypes. *Journal of British Surgery* **106**, 332-341.
- Archerito, M., Jamal, M. M., Perez, M. G., Kaur, H., Sundahl, A., and Moon, J. T. (2022). Esophageal Achalasia: From Laparoscopic to Robotic Heller Myotomy and Dor

- Fundoplication. *JLS: Journal of the Society of Laparoscopic & Robotic Surgeons* **26**.
- Costantini, M., Salvador, R., Capovilla, G., Vallese, L., Costantini, A., Nicoletti, L., Briscolini, D., Valmasoni, M., and Merigliano, S. (2019). A thousand and one laparoscopic Heller myotomies for esophageal achalasia: a 25-year experience at a single tertiary center. *Journal of Gastrointestinal Surgery* **23**, 23-35.
- Dantas, R. O. (2021). Management of esophageal dysphagia in chagas disease. *Dysphagia* **36**, 517-522.
- Dobova, M., Gowing, S., Robaidi, H., Gilbert, S., Maziak, D. E., Shamji, F. M., Sundaresan, R. S., Villeneuve, P. J., and Seely, A. J. (2021). Long-term Symptom Control After Laparoscopic Heller Myotomy and Dor Fundoplication for Achalasia. *The Annals of Thoracic Surgery* **111**, 1717-1723.
- El Fiky, K. A., El Akkad, H. A. R., Mohamed, M. M., Gerges, W. B., and Mikhail, F. H. W. (2021). Comparison between outcome after laparoscopic Heller's myotomy with Dor fundoplication in patients who had or had not undergone previous trials of endoscopic balloon dilatation for cardiac achalasia. *The Egyptian Journal of Surgery* **40**, 1215-1221.
- Engwall-Gill, A. J., Soleimani, T., and Engwall, S. S. (2022). Heller myotomy perforation: robotic visualization decreases perforation rate and revisional surgery is a perforation risk. *Journal of Robotic Surgery* **16**, 867-873.
- Gaber, C. E., Eluri, S., Cotton, C. C., Strassle, P. D., Farrell, T. M., Lund, J. L., and Dellon, E. S. (2022). Epidemiologic and economic burden of achalasia in the United States. *Clinical Gastroenterology and Hepatology* **20**, 342-352. e5.
- Kamal, F., Ismail, M. K., Khan, M. A., Lee-Smith, W., Sharaiha, R. Z., Sharma, S., McDonough, S., Tariq, R., Marella, H. K., and Khan, Z. (2021). Efficacy and safety of peroral endoscopic myotomy in the management of recurrent achalasia after failed Heller myotomy: a systematic review and meta-analysis. *Annals of gastroenterology* **34**, 155.
- Lee, Y., Brar, K., Doumouras, A. G., and Hong, D. (2019). Peroral endoscopic myotomy (POEM) for the treatment of pediatric achalasia: a systematic review and meta-analysis. *Surgical endoscopy* **33**, 1710-1720.
- Martins, R. K., Ribeiro, I. B., DE MOURA, D. T. H., Hathorn, K. E., Bernardo, W. M., and DE MOURA, E. G. H. (2020). Peroral (POEM) or surgical myotomy for the treatment of achalasia: a systematic review and meta-analysis. *Arquivos de gastroenterologia* **57**, 79-86.
- Nijhuis, R. A. O., Prins, L. I., Mostafavi, N., van Etten-Jamaludin, F. S., Smout, A. J., and Bredenoord, A. J. (2020). Factors associated with achalasia treatment outcomes: systematic review and meta-analysis. *Clinical Gastroenterology and Hepatology* **18**, 1442-1453.
- Parsa, N., and Vela, M. F. (2022). Current Diagnosis of Achalasia: Beyond Standard High-Resolution Manometry. *Foregut*, 26345161221143350.
- Patti, M. G., Schlottmann, F., and Herbella, F. A. (2022). Esophageal Achalasia: Evaluation and Treatment of Recurrent Symptoms. *World Journal of Surgery*, 1-6.
- Ramirez, M., Zubieta, C., Ciotola, F., Amenabar, A., Badaloni, A., Nachman, F., and Nieponice, A. (2018). Per oral endoscopic myotomy vs. laparoscopic Heller myotomy, does gastric extension length matter? *Surgical endoscopy* **32**, 282-288.
- Samarakkody, U., Weilert, F., Cama, J., and Adams, S. (2022). Lessons learned from early experience of per oral endoscopic myotomy in children. *Journal of Pediatric Surgery*.
- Schlottmann, F., and Patti, M. G. (2018). Esophageal achalasia: current diagnosis and treatment. *Expert Review of Gastroenterology & Hepatology* **12**, 711-721.
- Weche, M., Saad, A. R., Richter, J. E., Jacobs, J. J., and Velanovich, V. (2020). Revisional Procedures for recurrent symptoms after heller myotomy and per-oral endoscopic myotomy. *Journal of Laparoendoscopic & Advanced Surgical Techniques* **30**, 110-116.
- Zaninotto, G., Leusink, A., and Markar, S. R. (2019). Management of achalasia in 2019. *Current Opinion in Gastroenterology* **35**, 356-362.



Gastroenterology **35**, 356-362.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2023