

COMPARISON BETWEEN LAPAROSCOPIC HIATAL HERNIA REPAIR WITH AND WITHOUT FUNDOPLICATION.

¹Abdelrahman Mohamed Amin Sarhan,² Muhammad Ali Baghdadi,³ Mohammed Mahmoud Mokhtar Mohammed and ⁴Anas Abdelhmed Yousef Abdelhmed*.

Department of General Surgery, Zagazig University hospitals, Zagazig, Egypt.

*Correspondence to: Anas Abdelhmed Yousef Abdelhmed

E-mail: anasabdelhmed@yahoo.com

Tel: 01065359115

ABSTRACT

Background: A hiatal hernia is a type of hernia in which abdominal organs (typically the stomach) slip through the diaphragm into the middle compartment of the chest. This may result in gastroesophageal reflux disease (GERD) or laryngopharyngeal reflux (LPR) with symptoms such as a taste of acid in the back of the mouth or heartburn. Other symptoms may include trouble swallowing and chest pains. This study aimed to compare laparoscopic HHR cruroplasty (the effect of hernia reduction and only repair of diaphragmatic crura) versus HHR with concomitant fundoplication in terms of relative frequency and severity of symptoms before laparoscopic antireflux surgery, and DeMeester scores (DMS), relative symptom improvement, patients' satisfaction, and complications after antireflux surgery. **Patients and methods:** This prospective randomized study was conducted in GIT unit of General Surgery Department, Faculty of Medicine, Zagazig University, on 18 patients with hiatal hernia underwent laparoscopic hiatal hernia repair divided into two equal groups; 1st group was laparoscopic hiatal hernia repair (HHR) without fundoplication and 2nd group was with Nissen Fundoplication (HHR – LNF). **Results:** we found that there was complete absence of hernia among HHE-LNF group (0.0 %) versus 2 patients (22.2 %) had persistent hernia after HHR group with no significance difference between both groups pre- and post-operatively. There was not a statistically significance difference between the two studied groups regarding success rate with 100.0% versus 77.8% among HHR_LNF and HHR respectively. **Conclusion:** that laparoscopic hiatal hernia repair with Nissen Fundoplication has better short-term outcome than without Nissen fundoplication.

Key words: hiatal hernia , gastroesophageal reflux disease , laryngopharyngeal reflux

INTRODUCTION

Hiatal hernia is a common disorder. It is characterized by a protrusion of any abdominal structure other than the esophagus into the thoracic cavity through a widening of the hiatus of the diaphragm⁽¹⁾.

Greater than 95% of hiatal hernias are Type I. Types II – IV hernias as a group are referred to as paraesophageal hernias (PEH), and are differentiated from Type I hernias by relative preservation of posterolateral phrenoesophageal attachments around the gastro-esophageal junction. Of the paraesophageal hernias, more than 90% are Type III, and the least common is Type II⁽²⁾.

The history of antireflux surgery over the last 48 years has shown that reduction of the hiatal hernia in conjunction with diaphragmatic crural approximation is at best a transient antireflux deterrent and that an additional procedure needs to be performed⁽³⁾.

Ultimately, a fundoplication is performed either through the chest (Belsey Mark IV) or abdomen involving varying degrees of encirclement of the distal esophagus by the fundoplication. Laparoscopic hiatal hernia repair (HHR) has been shown to provide good short- and long-term results in gastroesophageal reflux disease (GERD) **Astit et al.** ⁽⁴⁾ and may reduce the laparoscopic antireflux surgery complications⁽⁵⁾.

Fundoplication is also an important component of laparoscopic antireflux surgery performed for medication-refractory GERD⁽⁶⁾.

In addition, fundoplication is thought to support the anchoring of the cardia below the diaphragm, thereby reducing the risk of recurrence. For all these reasons, routine addition of fundoplication is commonly recommended⁽⁷⁾.

Even more important, there is a risk of fundoplication-related complications and side effects. The frequency of gas-bloating symptoms after fundoplication are reported to be up to 58%, and in about 20% of patients, new symptoms occur postoperatively. Therefore, intended improvement of GERD represents a trade-off against the risk of fundoplication related side effects⁽⁸⁾.

The question arises as to whether routine addition of a fundoplication is reasonable. Therefore, the aim of this study is to compare laparoscopic HHR (the effect of hernia reduction and only repair of diaphragmatic crura) with HHR with concomitant fundoplication in terms of relative frequency and severity of symptoms before laparoscopic antireflux surgery, and DeMeester scores (DMS), relative symptom improvement, patients' satisfaction and complications after antireflux surgery.

PATIENTS AND METHODS

This prospective randomized study was conducted in GIT unit of General Surgery Department, Faculty of Medicine, Zagazig University during the period from February to July 2021, included 18 patients with hiatal hernia underwent laparoscopic hiatal hernia repair divided into two equal groups; 1st group was laparoscopic hiatal hernia repair (HHR) without fundoplication and 2nd group was with Nissen Fundoplication (HHR – LNF)

Written informed consent was obtained from all patients and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University (International review board IRB #:7142-12-1-2021). The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Inclusion criteria: Age above 18 years. Residual symptoms while on medical therapy or Endoscopic esophagitis after at least three months of intensive acid suppression therapy, or both. Dependence on continuous medication and expenses. Pathological 24-h esophageal pH monitoring in symptomatic patients without preoperative endoscopic signs of erosive esophagitis.

Exclusion criteria: Pregnancy. Patient not fit for surgery. Patients with central nervous system diseases, connective tissue diseases. Patients with previous esophageal or gastric surgery. Presence of esophageal stricture, and shortened esophagus. Patients with Barrett's esophagus. Patients has paraesophageal hernia .

All patients were subjected to full history taking, routine clinical examination and laboratory investigations including complete blood count, tests for liver function, kidney function, random sugar and blood fluidity. Radiological evaluation, endoscopic evaluation and computed tomography if possible

Pre-operative assessment.

Preoperatively, the patients were investigated for the type of hiatal hernia with an upper-gastrointestinal endoscopy. The patients were screened for evidence of gastroesophageal reflux disease (GERD) as confirmed by upper-gastrointestinal endoscopy, by symptomatic voluminous reflux and by a positive proton pump inhibitor test in. If apparent, esophagitis were graded according to the Savary and Miller or Los Angeles classification⁽⁹⁾. Pathological 24-h esophageal pH monitoring in symptomatic patients without preoperative endoscopic signs of erosive esophagitis.

Operative technique

In laparoscopic hiatal hernia repair without fundoplication all procedures were performed as described by **Muller-Stich et al.**⁽¹⁰⁾ incision of the lesser omentum and the peritoneum at the hiatus, the hernia sac was completely removed. Bougie was used to identify the esophagus, a 32 Fr esophageal. After complete mobilization of the hernia and the distal esophagus, the hiatus was narrowed with two to three non-absorbable, multifilament sutures. Finally, an anterior cardiophrenicopexy was routinely added with 5-7 non-absorbable, monofilament sutures.

In laparoscopic hiatal hernia repair with fundoplication:

The surgical technique of laparoscopic surgical procedure was performed as described by **Zhang et al.**⁽¹¹⁾. The patient was sedated and placed in a reverse-trendelenburg position, with the lower extremities abducted. The operating surgeon was stand between the legs of the patient, with the first assistant on the left side of the patient and the second assistant on the right side of the surgeon.

A veress needle was inserted close to the rib cage, and a pneumoperitoneum was created. The primary 10-mm trocar was inserted at the upper edge of the navel. Four more trocars will be then inserted in the upper abdomen under direct visualization. The liver was retracted, and the esophageal hiatus was exposed. The stomach was repositioned, and A 3–4 cm of esophageal reposition was dissected intra-abdominally. The diaphragmatic crura was exposed, and sutured 2–3 times intermittently with non-absorbable sutures to reduce the esophageal hiatus. If 360-degree Nissen fundoplication is added. A full-circle valve was formed from the posterior and anterior aspects of the fundus and sutured together using three separate nonabsorbable 2–0 sutures.

Follow-up assessment

An objective follow-up (upper-gastrointestinal endoscopy) was done. All patients will receive a standardized questionnaire (symptomatic follow-up). All the questions were focused on the time before the operation as well as the state at the time of the survey. The questionnaire included questions on reflux symptoms, such as heartburn and regurgitation, as well as side effects, such as dysphagia and gas bloating. The patients could rate their symptoms as none = 0, mild = 1, moderate = 2 and severe = 3. Included questions on the surgical success and the patients' physical state. Finally, the patients was asked how satisfied they are with their surgical results and whether they would be willing to undergo the operation again.

Statistical analysis :

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean \pm SD, the following tests were used to test differences for significance; difference and association of qualitative variable by Chi square test (X^2). Differences between quantitative independent multiple

by ANOVA, correlation by Pearson's correlation. P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS

Table (1): Comparison between the two studied groups regarding socio-demographic characteristics:

Variables	HHR No = 9	HHR Fundoplication No = 9	with	Test	P_Value
Age (years) Mean ± SD Range	46.2 ± 10.5 (30 – 60)	49.1 ± 9.7 (28 – 61)		M.W= 0.6	0.8
BMI (Kg/m²) Mean ± SD Range	24.1 ± 1.9 (20.2 – 27.1)	23.9 ± 1.8 (20.5 – 27.5)		M.W= 0.2	0.9
Sex Male (8) Female (10)	3 (33.3 %) 6 (66.7 %)	5 (55.6 %) 4 (44.4 %)		X ² = 0.9	0.3

Table 1; showed that there was no statistically significance difference between the two studied groups regarding age, sex and BMI.

Table (2): Comparing failure of reflux treatment among the two studied group:

Variables	HHR No = 9 (%)	HHR-LNF No = 9 (%)	P_Value
Moderate or Severe heart burn	3 (33.3 %)	1 (11.1 %)	0.2
Moderate or severe regurgitation	2 (22.2 %)	1 (11.1 %)	0.5
esophagitis at least grade B	1 (11.1 %)	0 (0.0 %)	0.3
Requirement of daily PPI III	1 (11.1 %)	0 (0.0 %)	0.3
Need for operation for GERD	0 (0.0 %)	0 (0.0 %)	1
Total No. of patients fulfilling at least two criteria	2 (22.2 %)	0 (0.0 %)	0.1

Table 2; showed that there was less failure of reflux treatment among HHR-LNF group than HHR but with no statistically significance difference between of reflux treatment.

Table (3): Long term post-operative complications among the two studied group:

Variables	HHR No = 9 (%)	HHR-LNF No = 9 (%)	P_Value
Dysphagia	1 (11.1 %)	2 (22.2 %)	0.5
Abdominal pain	3 (33.3 %)	1 (11.1 %)	0.2

Table 3; showed that there was no statistically significance difference between HHR and HHR-LNF groups regarding past-operative.

Table (4): Comparing modified visick score among the two studied group:

Modified visick score	HHR No = 9 (%)	HHR-LNF No = 9 (%)	P_Value
I (No symptoms)	5 (55.6 %)	7 (77.8 %)	0.3
II (Mild symptom	2 (22.2 %)	2 (22.2 %)	1
III significant symptom	2 (22.2 %)	0 (0.0 %)	0.1
IV symptom as bad or worsen	0 (0.0 %)	0 (0.0 %)	1

Table 4; showed that there was higher improvement on modified visick score among HHR- LNF than HHR (77.8 %) versus (55.6%) but this difference wasn't statistically significant.

Table (5): Comparing total patients outcomes among the two studied group:

Variables	HHR No = 9 (%)	HHR-LNF No = 9 (%)	P_Value
Surgical result			
- Excellent	- 5 (55.6 %)	- 7 (77.8 %)	0.3
- Good	- 4 (44.4 %)	- 2 (22.2 %)	
- Poor	0 (0.0 %)	0 (0.0 %)	
Physical state			
- Normalized	- 5 (55.6 %)	- 7 (77.8 %)	0.4
- Improved	- 3 (33.3 %)	- 2 (22.2 %)	
- Unsatisfied	- 1 (11.1 %)	0 (0.0 %)	
Patients satisfaction			
- Very satisfied	- 5 (55.6 %)	- 7 (77.8 %)	0.3
- Satisfied	- 2 (22.2 %)	- 2 (22.2 %)	
- Unsatisfied	- 2 (22.2 %)	0 (0.0 %)	

Table 5; showed that there was more excellent surgical results, higher normalized physical state and more very satisfied patients (77.8 %) versus (55.6 %) among HHR-LNF than HHR groups with no statistically significance difference.

DISCUSSION

We found that there was no statistically significance difference between the two studied groups regarding age, sex, and BMI.

In contrast to our findings, Samuel conducted a study that revealed that higher body mass index above 30Kg/M2 has a negative association with silding hiatus hernia while the risk seems higher in women and those with BMI indicating overweight⁽¹²⁾.

Our findings cleared that there was statistically significant higher operative time among HHR-LNF group than HHR group while post-operative hospital stay and immediate post-operative complications weren't statistically significant different between both groups as there were 2 patients (22.2 %) versus one patient (11.1 %) among HHR- LNF and HHR respectively had transient subcutaneous emphysema in the neck which resolved completely within one to two weeks and only one patient (11.1 %) among HHE group had pleural effusion which absorbed within one week.

We also found that there was statistically highly significant improvement (decreased) of demeester score, number of reflux episodes, number of lasting 5 minutes reflux episodes and time of PH<4 and also statistically significant improvement on resting (LOS) pressure with more improvement among HHR_LNF. There was a highly statistically significant post-operative improvement on esophagitis on both groups with no difference between the two group pre nor post-operatively.

In the same line with us, Furnée and colleagues conducted a prospective study that showed that normalization of esophageal acid exposure was seen in 61% of patients who had a fundoplication. They also found that symptomatic outcome was successful in almost 90% of patients who underwent laparoscopic large sliding hiatal hernia repair⁽¹³⁾.

These results are in contrast to the outcome of surgery for gastroesophageal reflux disease carried out in patients with normal gastroesophageal anatomy, or type I hiatal hernias in the study of Draaisma and colleagues. In their studied patients, persistent abnormal acid exposure is reported in 4.1–12.5% of patients⁽¹⁴⁾.

There was no statistically significance difference between the two studied groups regarding success rate with 100.0% versus 77.8% among HHR_LNF and HHR respectively.

On the other side, the results of Furnée and colleagues revealed a success percentage of ninety percent of patients who underwent laparoscopic large sliding hiatal hernia repair, regardless of the addition or omission of an antireflux fundoplication⁽¹³⁾.

This study showed that there was also less failure of reflux treatment among HHR-LNF group than HHR but with no statistically significance difference was found between them. There was no statistically significance difference between HHR and HHR-LNF groups regarding post-operative. There was higher improvement on modified visick score among HHR-LNF than HHR (77.8 %) versus (55.6%) but this difference wasn't statistically significant. There was more excellent surgical results, higher normalized physical state, and more very satisfied patients (77.8 %) versus (55.6 %) among HHR-LNF than HHR groups with no statistically significance difference.

Apparently, in patients with a large sliding hiatal hernia, other mechanisms contribute to gastroesophageal reflux. The more prominent anatomical disturbances that require more extensive dissection, thereby destroying anatomical structures which contribute to the natural antireflux mechanism, like the phrenoesophageal membrane and preaortic fascia, have previously been reported as the possible cause⁽¹⁵⁾.

However, these structures are also dissected during an antireflux fundoplication primarily performed for gastroesophageal reflux disease. Compared to primary antireflux surgery, more extensive dissection of the esophageal and gastric wall is required during large sliding hiatal hernia repair. This may impair the intrinsic antireflux barrier at the gastroesophageal junction and explain the less favorable objective outcome in these patients⁽¹⁶⁾.

In addition, Aly and colleagues found that the suboptimal anatomical status after laparoscopic hiatal hernia repair (i.e., recurrent hiatal herniation) was present in a substantial number of patients (19%), as was reported previously. This may also contribute to the less than expected functional outcome after large sliding hiatal hernia repair⁽¹⁷⁾.

Conclusion:

We concluded that laparoscopic hiatal hernia repair with Nissen Fundoplication has better short-term outcome than without Nissen fundoplication. This concept may share in reducing the postoperative complications and improve the surgical outcome.

We recommended the implementation of the laparoscopic hiatal hernia repair with Nissen fundoplication rather than without Nissen fundoplication. In addition, further studies must be done to analyze the clinical outcomes in patients postoperatively.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Conflicting Interest (If present, give more details): No Conflict of Interest

No financial disclosure

-Acknowledgements

Not applicable

Declarations

-Ethics approval and consent to participate

Written informed consent was obtained from all patients and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University (International review board IRB #:7142-12-1-2021). The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

-Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

REFERENCES

1- Felix VN, Yogi I, Senday D et al. (2019). Post-operative giant hiatal hernia: A single center experience. *Medicine*, 98(23).

- 2- **Sihag S & Rattner DW (2016)**. Management of complicated and strangulated hiatal hernias. In *Acute care surgery handbook* (pp. 65-90). Springer, Cham.
- 3- **Fernando AM, Herbella Ana, Cristina C Amaral (2017)**. History of medical and surgical antireflux therapy, ACC, Amaral failed antireflux therapy springer; 172:638.
- 4- **Astit E, Lovece A, Bonavina L, Milito P, Sironi A, Bonitta G & Siboni S (2016)**. laparoscopic management of large hiatus hernia five-years cohort study and comparison of mesh-augmented versus standerized crura repair. *Surg; Endosc.* 27129562 (pp.35-44).
- 5- **Sasaki A, Obuchi T, Nakajima J, Kimura Y, Koeda K & Wakabayashi G (2010)**. Laparoscopic Heller myotomy with Dor fundoplication for achalasia: long-term outcomes and effect on chest pain. *Disease of the esophagus: official journal of the international Society For Disease of the esophagus*, 23(4), 284-289.
- 6- **Wilshire CL, Watson TJ (2013)**. Surgical management of gastroesophageal reflux disease. *Gastroenterology Clinics of North America*; 42:119–131.
- 7- **Müller-Stich BP, Achtstätter V, Diener MK et al. (2015)**. Repair of paraesophageal hiatal hernias—is a fundoplication needed? a randomized controlled pilot trial. *Journal of the American College of Surgeons*, 221(2), 602-610.
- 8- **Witteman BP, Conchillo JM, Rinsma NF et al. (2015)**. Randomized controlled trial of transoral incisionless fundoplication vs. proton pump inhibitors for treatment of gastroesophageal reflux disease. *American Journal of Gastroenterology*, 110(4), 531-542.
- 9- **Lundell LR, Dent J, Bennett JR et al. (1999)**: Endoscopic assessment of oesophagitis: clinical and functional correlates and further validation of the Los Angeles classification. *Gut*; 45:172–180.
- 10- **Muller-Stich BP, Linke GR, Borovicka J et al. (2008)**. Laparoscopic mesh-augmented hiatoplasty as a treatment of gastroesophageal reflux disease and hiatal hernias—preliminary clinical and functional results of a prospective case series. *Am J Surg*; 195:749–756.
- 11- **Zhang C, Wang ZG, Wu JM et al. (2012)**. A preliminary investigation of laparoscopic fundoplication treatment on gastroesophageal reflux disease-related respiratory symptoms. *Surg Laparosc Endosc Percutan Tech.* 22:406–409.
- 12- **Samuel DO & Nabe BR (2018)**. Hiatus Hernia and Body Mass Index (BMI): A Possible Correlation?. *American Journal of Medical Case Reports*, 6(4), 75-78.
- 13- **Furnée EJ, Draaisma WA, Gooszen HG, Hazebroek EJ, Smout AJ & Broeders IA (2011)**. Tailored or routine addition of an antireflux fundoplication in laparoscopic large hiatal hernia repair: a comparative cohort study. *World journal of surgery*, 35(1), 78-84.
- 14- **Draaisma WA, Rijnhart-de Jong HG, Broeders IA, Smout AJ, Furnee EJ & Gooszen HG (2006)**. Five-year subjective and objective results of laparoscopic and conventional Nissen fundoplication: a randomized trial. *Annals of surgery*, 244(1), 34.
- 15- **Roman S & Kahrilas PJ (2014)**. The diagnosis and management of hiatus hernia. *BMJ*, 349.
- 16- **Sfara A & Dumitrascu DL (2019)**. The management of hiatal hernia: an update on diagnosis and treatment. *Medicine and pharmacy reports*, 92(4), 321.
- 17- **Aly A, Munt J, Jamieson GG, Ludemann R, Devitt PG & Watson DI (2005)**. Laparoscopic repair of large hiatal hernias. *Journal of British Surgery*, 92(5), 648-653.