

# Alinasser's Technique (Phrenoesophageal Ligament Reconstruction with Mesh) for Hiatal Hernia Repair: A Novel Approach

**Ali Nasser Alqahtani\***

Aseer Health Cluster, Aseer Central Hospital, Abha 61421, Saudi Arabia

**\*Corresponding author:** Ali Nasser Alqahtani, Aseer Health Cluster, Aseer Central Hospital, Abha 61421, Saudi Arabia

## ARTICLE INFO

**Received:** 📅 March 14, 2026

**Published:** 📅 March 30, 2026

**Citation:** Ali Nasser Alqahtani. Alinasser's Technique (Phrenoesophageal Ligament Reconstruction with Mesh) for Hiatal Hernia Repair: A Novel Approach. Biomed J Sci & Tech Res 65(1)-2026. BJSTR. MS.ID.010150.

## ABSTRACT

### Mini-Abstract

The study introduced the Alinasser technique for hiatal hernia repair by reconstructing the phrenoesophageal ligament using non-absorbable mesh. Applied in a 34-year-old male, it resulted in smooth recovery, normal diet tolerance, and no reflux or dysphagia. The method shows promise in reducing recurrence and postoperative complications.

### Abstract

Hiatal hernia (HH) occurs when a portion of the stomach protrudes into the mediastinum through a weakened esophageal hiatus. Standard laparoscopic treatment involving reduction of the herniated stomach, cruroplasty, and fundoplication provides symptom relief but carries a high recurrence rate of 12–42%, even with mesh reinforcement. The phrenoesophageal ligament (PEL) plays a key role in maintaining the anatomical relationship between the esophagus and diaphragm, allowing independent motion during swallowing and respiration. This case report introduces the Alinasser technique—Phrenoesophageal Ligament Reconstruction with Mesh—as a novel approach to hiatal hernia repair. In a 34-year-old male, who was complaining of GERD for more than 10 years and not responding to PPI, a non-absorbable mesh measuring approximately 2.0 × 10.0 cm was sutured to the esophagus just above the hiatus with four 2-0 Prolene stitches and fixed anteriorly to the diaphragm with four additional stitches, securing half the mesh to each structure. Postoperatively, the patient experienced a smooth recovery, tolerated oral fluids by the first day, and resumed a normal diet without reflux or dysphagia at six months follow-up. This outcome suggests that reconstructing the PEL using mesh may improve anatomical stability, reduce recurrence rates, and minimize postoperative complications such as dysphagia or mesh-related erosion. Further clinical evaluation in larger patient populations is required to validate this technique and determine its potential role as a preferred surgical option for durable hiatal hernia repair.

**Keywords:** Hiatal Hernia; Gastroesophageal Reflux Disease; Lower Esophageal Sphincter; Recurrence; Mesh-Related Erosion; Dysphagia; Case Report

### Highlights

- Alinasser technique for hiatal hernia
- Reconstructing the phrenoesophageal ligament
- Using non-absorbable mesh
- Reducing recurrence and Mesh erosion

**Abbreviations:** HH: Hiatal hernia; PEL: Phrenoesophageal Ligament; POH: Paraesophageal Hernia; HRM: High-Resolution Manometry

## Introduction

Hiatal hernia (HH) is a condition in which an organ, usually a portion of the stomach, extends into the lower mediastinum due to widening or weakness in the esophageal hiatus of the diaphragm. HHs can be categorized according to their anatomical characteristics into four types. Type I hiatus hernias are referred to as sliding hernia, type II is a paraesophageal hernia, type III is a mixed hernia, and Type IV hernias involve herniation of the stomach in conjunction with another abdominal organ, such as the spleen. Paraesophageal hiatal hernias (POH) include 5 to 10% of all hiatal hernias and generally manifest in older individuals with various comorbidities. A "Giant" paraesophageal hernia (POH) is characterized as encompassing all type 3 and 4 hernias, but the term is predominantly restricted to POHs occur when over 50% of the stomach is situated within the mediastinum [1-4]. The main presentation of sliding HH varies from asymptomatic to GERD symptoms. POH can cause a range of symptoms which may vary in severity, including chest pain, dyspnea, dysphagia, abdominal pain, nausea and vomiting, chest compression symptoms, anemia, weight loss, and choking. POH may induce obstructive symptoms as a result of stomach volvulus. A large POH may manifest initially with Borchardt's triad: intense epigastric pain, retching, and inability to pass nasogastric tube, necessitating immediate surgical intervention [4-6].

Laparoscopic reduction of the herniated stomach, in conjunction with cruroplasty with nonabsorbable sutures and either total or partial fundoplication, is presently the usual treatment for HH and has been demonstrated to be safe and effective when performed by skilled and experienced surgeon, providing effective symptom alleviation; however, it frequently entails a significant anatomical recurrence rate 12% to 42%. [2-4] To reduce recurrence rates, hiatoplasty utilizing synthetic mesh has been implemented, but the use of mesh remains debatable due to documented consequences, including esophageal erosion. Biological mesh has been suggested as a substitute; however, it incurs a higher cost and presents varied efficacy results [6-9]. The phrenoesophageal ligament (PEL) is a crucial structure that attaches the oesophagus to the diaphragm, allowing for independent movement during respiration and swallowing. The ligament provides flexibility and strength, maintaining the integrity of the esophageal hiatus while accommodating pressure changes during breathing and swallowing. It consists of two limbs. The upper limb attaches the oesophagus to the superior surface of the diaphragm, extending through the hiatus to insert into the oesophagus 2-3 cm above it. The Lower Limb is attached to the cardiac region of the stomach to the inferior surface of the diaphragm at the cardiac notch the stomach. Failure and weakness of the PEL can predispose to oesophageal HH and GERD symptoms. Understanding its anatomy is essential for the surgical management of hiatal hernia and GERD [10].

Uncertainty persists concerning the optimal approach for laparoscopic repair of hiatus hernias, as numerous studies present de-

batable results. Emerging techniques, such as Alinasser's technique (Phrenoesophageal Ligament Reconstruction with Mesh), aim to improve the long-term stability of the repair while minimizing post-operative adverse effects such as dysphagia and mesh erosion. Continued refinement of minimally invasive and patient-tailored surgical methods promises to enhance both the safety and durability of hiatal hernia management.

## Materials and Methods

### Case Description

A 34-year-old male (medically and surgically free) presented to the surgical clinic. The patient presented with signs and symptoms of GERD for more than 10 years. The patient did not improve with oral medication. The patient underwent endoscopy and high-resolution manometry (HRM). The results showed ineffective esophageal peristalsis and large hiatal hernia (EGJ morphology type III). The patient was counseled after being clinically diagnosed as GERD and Hiatal hernia. The patient was offered all the related information reading his condition. Both procedures (with and without mesh) was explained to the patient. Informed written consent was obtained prior to surgery. Preoperative antibiotics and anesthesia were administered intravenously.

### Surgical Technique

**Position:** The patient was placed in the French position, the surgeon stood between the legs, and the assistants stood on either side of the patient; steep reverse Trendelenburg positioning is often required.

### Port Placement

We used standard port placement for most foregut procedures performed. Pneumoperitoneum was established using a Veress needle placed at the Palmer's point in the left upper abdomen. A 10-mm optical trocar was inserted in the left subcostal position. Additional ports are placed under direct vision.

Camera port (10 mm) in the epigastric position (midway between the xiphoid process and umbilicus). Assistant (5 mm) port at the left anterior axillary line below the costal margin. The surgeon's left-hand port (5 mm) in the right upper quadrant at the midclavicular line.

1. The diaphragmatic hiatus was exposed by retraction of the left lateral segment of the liver (Figure 1).
2. Reduce the stomach and hiatal hernia sac by mobilizing the gastric fundus. Dissection begins with takedown of the short gastric vessels and proceeds toward the diaphragmatic hiatus to fully expose the left diaphragmatic crus.
3. Complete circumferential dissection of the hiatal hernia sac at the diaphragmatic hiatus level, It is often easy to gain entry into a proper plane immediately adjacent to the right crus.

The correct plane is bloodless and involves division of loose areolar attachments. The right crus was approached by dividing the pars flaccida and was dissected until the left crus was visualized. Therefore, it is important to preserve the integrity of the crura during the dissection phase.

4. The mediastinal dissection continues in a cranial direction to obtain enough intra-abdominal esophageal length (minimum 3-5 cm).
5. A non-absorbable mesh ( $\approx 2.0 \times 10.0$  cm) was sutured to the esophagus, just above the hiatus by four 2-0 prolene stitches. The continuity of the mesh was then fixed just below the hiatus anteriorly on the diaphragm, using four 2-0 prolene stitches. Approximately half of the mesh was fixed to the esophagus and the other half was fixed to the diaphragm (Figures 2-4).
6. Re-approximation of the diaphragmatic crura was performed posterior to the esophagus using interrupted 0 non-absorb-

able sutures. A calibration tube was used to determine the approximation limits.

7. If there is no space for mesh fixation on the diaphragm, the left hepatic triangular ligament will be released (Figure 5).
8. Toupét fundoplication was performed by positioning the fundus posterior to the esophagus. Three Interrupted 2-0 non-absorbable sutures were then used to anchor the stomach anterolaterally to the lower esophagus. The left gastric segment was then sutured to the esophagus anterolaterally, leaving a gap of 1.5 2 cm from the right gastric segment, completing a 270° wrap (Figure 6).
9. The wrap was then anchored to the hiatus using interrupted 2-0 non-absorbable sutures. Typically, four sutures are required to anchor the wrap to both the right and left crura as well as the anterior aspect of the diaphragmatic hiatus (Figure 5).



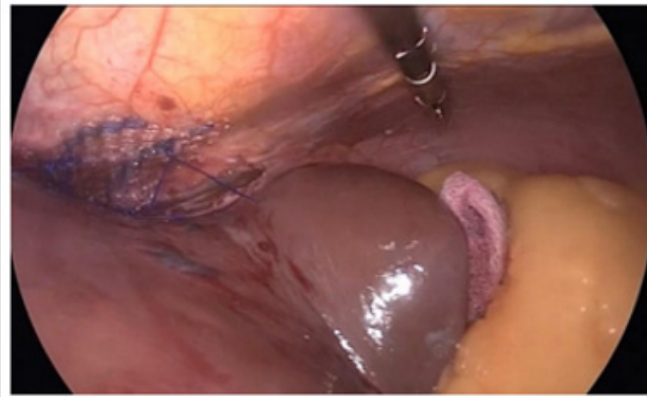
**Figure 1:** The diaphragmatic hiatus.



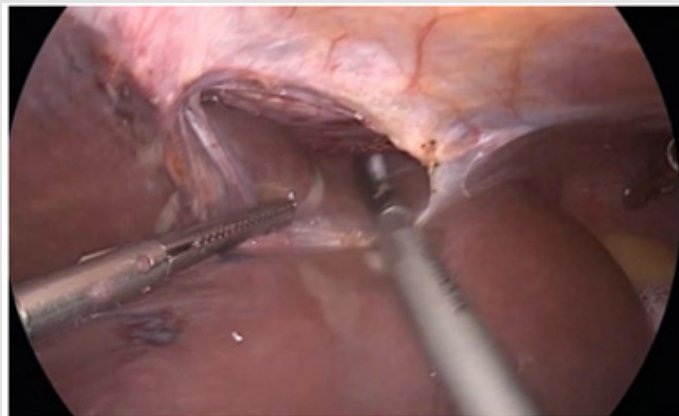
**Figure 2:** A non-absorbable mesh ( $\approx 2.0 \times 10.0$  cm) is sutured to the esophagus.



**Figure 3:** A non-absorbable mesh (≈2.0 x 10.0 cm) then sutured to the diaphragm.



**Figure 4:** A non-absorbable mesh (≈2.0 x 10.0 cm) is sutured to the diaphragm.



**Figure 5:** The release of the left hepatic triangular ligament.



**Figure 6:** The Toupét fundoplication

## Results

The patient recovered uneventfully postoperatively. The patient tolerated oral fluids without dysphagia. The patient was discharged on home day-one post operation with post-hiatal hernia instructions. At six months follow-up, the patient was fine and showed no reflux symptoms. In addition, the patient tolerated a normal diet without complications.

## Discussion

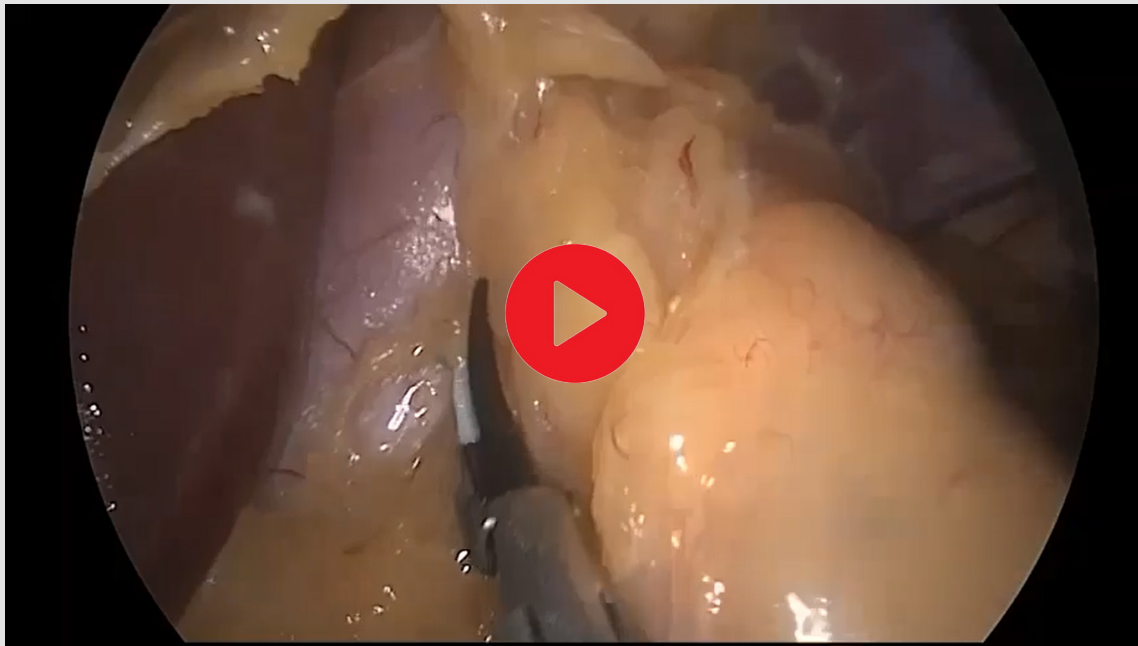
The high prevalence of hiatal hernia makes hiatal hernia repair with an antireflux procedure a common surgical intervention but faces major problems that carry a high recurrence rate, nearly equivalent with or without mesh in the long term [11]. The etiology of recurrence is multifactorial; however, several factors contribute to it. The esophageal hiatus consists of muscle fibers that move during respiration. Over time, the sutures placed during repair may cut through these fibers, allowing the hiatus to gradually enlarge under the pressure exerted by fundoplication, which may then slip through the hiatus. Furthermore, negative intrathoracic pressure during respiration, combined with positive intra-abdominal pressure, promotes upward migration of the wrap and facilitates recurrence. Additionally, during hiatal hernia repair, the phrenoesophageal ligament is usually divided, eliminating its important supportive role in maintaining the gastroesophageal junction within the abdomen. When mesh is used in the traditional manner for hiatal hernia repair (it is applied over hiatal cruroplasty), there are two main issues [12]:

1. The hiatus will expand anterior to the esophagus, causing a recurrence rate similar to that without mesh in the long term.
2. The mesh is perpendicular to the esophagus and moves with each respiration, causing friction between the mesh and esophagus, which can result in mesh erosion in 6-13% of patients.

In this patient, we used a new technique designed to decrease recurrence and avoid mesh-related complications. The phrenoesophageal ligament was reconstructed using a mesh that was fixed parallel to the esophagus, similar to mesh placement in anterior rectopexy. This orientation prevents friction during respiration, and theoretically eliminates the risk of erosion. The mesh covers only one-third to one-quarter of the esophageal circumference, further minimizing the risk of dysphagia and erosion. Additionally, the mesh was anchored to the central tendon of the diaphragm. This approach prevents suture pull-through, helps maintain the esophagus in its anatomical position, and maintains the gastroesophageal junction within the abdominal cavity. It also minimizes the pressure exerted by the wrap on the crura, thereby potentially reducing the risk of recurrence.

## Conclusion

Alinasser technique (Phrenoesophageal Ligament Reconstruction with mesh) is expected to significantly reduce recurrence rates and minimize significant postoperative dysphagia and mesh-related erosion in hiatal hernia repair. Further studies are required to validate these findings and establish this approach as a potential gold standard for hiatal hernia repair.



Video

## Acknowledgment

The author expresses his gratitude to the patient for volunteering in this study and recognizing his valuable contributions and insightful input.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Data Availability Statement

The pictures and video that support Alinasser's technique of this study are available by contacting the corresponding author via e-mail.

## Funding

This study received no external funding.

## Informed Consent Statement

Informed consent was obtained from the patient involved in the study.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2026.65.010150

Ali Nasser Alqahtani. Biomed J Sci & Tech Res



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