



# Systematic Review of Laparoscopic versus Robotic Hiatal Hernia Repair

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## Abstract

To investigate, the results which contrasted robotic assisted hiatal hernia repair (RA-HHR) against laparoscopic hiatal hernia repair (LPHHR) we conducted a review. The results indicated feasibility and safety associated with the robotic method. The comparison of studies did not reveal variations in mortality and morbidity rate, conversion rate, ICU stay, 1-month mortality, and post-operative complications, quality of life between the RA-HHR cohort and LPHHR cohort.

**Edited by:** Ksenija Bogoeva-Kostovska

**Citation:** Coco D, Leanza S. Systematic Review of Laparoscopic versus Robotic Hiatal Hernia Repair. Open Access Maced J Med Sci. 2021 Apr 15; 9(F):186-188. https://doi.org/10.3889/oamjms.2021.5126

**Keywords:** Hiatal hernia; Robotic; Laparoscopic; Paraesophageal

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**Received:** 27-Jun-2020

**Revised:** 01-Apr-2021

**Accepted:** 05-Apr-2021

**Copyright:** © 2021 Danilo Coco, Silvana Leanza

**Funding:** This research did not receive any financial support

**Competing Interest:** The authors have declared that no competing interest exists

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## Introduction

Nowadays, elective surgical hiatal hernia (HH) repair has not standardized intraoperative techniques remaining with a considerable recurrence rate between 10% and 26% [1], [2]. International guidelines recommended laparoscopic paraesophageal hernia repair (LPHHR) as gold-standard technique. LPEHR is associated with a reduced rate of perioperative morbidity and shorter hospital stay compared with outcomes of the open approach. In the last few decades, the use of robotic assisted paraesophageal hernia repair (RA-HHR) has increased [3], [4], [5]. RA-HHR allows surgeons to operate more precisely compared to conventional laparoscopy due to the three-dimensional view and the enhanced manipulation of instruments [6], [7], [8], especially in challenging operations such as super-obese patients or during redo operations, proved out to have certain benefits when performed robotically, both for patients as well as for surgeons [9], [10], [11], [12], [13].

## Methods and Materials

### Study selection

A systematic literature search from the GOOGLE SCHOLAR, EMBASE, MEDLINE, and

PUBMED databases for studies published in the past 10 years (2010–2020) was conducted. Several terms were used in the search, including Hiatal hernia, robotic, laparoscopic, and paraesophageal

### Inclusion and exclusion criteria

#### Criteria for inclusion

1. Comparison of conventional LPHHR to RA-HHR
2. Studies featuring over 30 patients were taken into account
3. Mortality and morbidity rate, conversion rate, ICU stay, 1-month mortality, and postoperative complications, quality of life (QoL).

#### Criteria for exclusion

Non-comparative studies between LPHHR to RA-HHR, low-quality studies, reviews, case reports, and abstracts that could not be obtained from the research published were left out.

### Outcomes of interest

The following information was utilized for comparing patients on LPHHR to those undergoing RA-HHR: Mortality and morbidity rate, conversion

rate, ICU stay, 1-month mortality, and post-operative complications, QoL between the RA-HHR cohort and LPHHR cohort.

### Outcomes

Many studies demonstrated that LPHHR is an efficacious and safe therapeutic option for management of hiatal hernia, prevention of recurrence, and relief of symptomatic GERD. In a study of a total of 221 patients underwent LPHHR, only 8 patients (3.6%, 8/221) have had a documented anatomic hiatal hernia recurrence. About QoL the study demonstrated 86.6% of patients (149/172) were satisfied, and only 4.7% (8/172) were dissatisfied (23).

LPHHR leads to less post-operative pain than the open method. The tiny incisions of minimally-invasive surgery are unlikely to be compounded by wound infection and incisional hernias. There is reduction in post-operative respiratory complications [4]. Results from numerous studies are identical, with shorter stay in hospital and less morbidity arising from the minimally invasive method. The rates of recurrence are identical between LPHHR and RA-HHR [3], [12], [13]. Indeed, thanks to tiny incisions and decreased tissue trauma, patients that undergo robotic alongside other less invasive hernia repair surgeries return to normal duties more quickly, including particularly shorter stays in hospital. For instance, a study conducted by Carbonell *et al.* (2018) reported that robotic surgery patients that underwent hernia repair were discharged significantly sooner as opposed to those on open surgery [1], [14], [15].

A study by Chang *et al.* (2011) reviewed 12 scenarios of robotic and 12 scenarios for laparoscopic hernia surgical repairs, reported that robotic assisted surgery took longer compared to laparoscopic ones; this increased hospital expenses and presented further risks to the patient. The study concluded that robotic hernia repair was effective, safe, and feasible [2], [16], [17]. An observational study suggests technical feasibility for minimal-invasive robot-assisted redo surgery after open primary antireflux surgery. This study demonstrated a reduced number of conversions and shorter hospital stay with robotic surgery in REDO antireflux surgery 2.0 years after primary surgery based on single institute cohort of 75 patients who underwent either conventional laparoscopic or robot-assisted laparoscopic surgery for recurrent GERD or severe dysphagia between 2008 and 2013. The number of conversions was lower in the robot-assisted group compared to conventional laparoscopy (1/45 vs. 5/30,  $p = 0.035$ ) despite a higher proportion of patients with previous surgery by laparotomy (9/45 vs. 1/30,  $p = 0.038$ ). Complications rate were comparable [18], [19], [20], [21]. Soliman *et al.* performed a retrospective analysis of 293 consecutive patients who underwent elective hiatal hernia repair using either a laparoscopic ( $n = 151$ ) or a robotic ( $n = 142$ ) technique. They concluded that the hospital length of stay was significantly shorter ( $1.3 \pm 1.8$  vs.

$1.8 \pm 1.5$  days,  $p = 0.003$ ) and there were significantly lower rates of complications (6.3 vs. 19.2%,  $p = 0.001$ ) after robotic compared to LPHHR. There was no difference in readmission rate and mortality [22].

### Limitations

There are numerous limitations in the review. First, the review focused solely on English literature. Second, the selection and search of studies were conducted by two authors. Third, there was no balance in the studies concerning prosthetic meshes utilized, that is, non-absorbable, absorbable, and materials alongside configuration of repair. Fourth, the definition pertaining to the meaning of large hiatal hernia differed between studies. The main limitations are less number of manuscript that compare LPHHR and RA-HHR.

### Conclusion

Repair of hiatal hernias is associated with an elevated recurrence rate, a fact that has long driven modifications to surgical technique between 10% and 26% [2]. This review represented the sequence of RA-HHR to date and the results appear to be comparable to those attained by the traditional laparoscopic approach. RA-HHR constitutes a safe procedure with a learning curve of around 36 cases. With more experience, the complications, hospital, and operation time reduce without undermining the principles of surgery. Future studies with large patient cohorts alongside prospective RCTs are required to prove the durable nature of the procedure as opposed to the existing laparoscopic approach. In addition, several concerns should be addressed to ascertain the feasibility, safety, and clinical outcomes of RA-HHR and LPHHR for elective surgical treatments of large hiatal hernias in the future. The two techniques produce comparable results in terms of complications and reoperation rate save for reduced time for RA-HHR. RA-HHR allows surgeons to operate more precisely compared to conventional laparoscopy due to the three-dimensional view and the enhanced manipulation of instruments [13], [14], [15], [16], [17], [18], [19], [20], especially in challenging operations. Nevertheless, there is need for further studies to prove the efficacy and long-term safety of certain forms of RA-HHR before its routine implementation [23].

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