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ORIGINAL ARTICLE

Laparoscopic Versus Open Repair for Treatment of Sliding Hiatus Hernia

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Abstract

Background: **When an abdominal organ (usually the stomach) protrudes through the diaphragm and the posterior mediastinum of the chest, this condition is known as a hiatal hernia. Acid in the back of the throat or heartburn are two signs of laryngopharyngeal reflux or gastroesophageal reflux disease. Dysphagia and chest discomfort are two other symptoms. Aspiration, anemia from a lack of iron, and hernia strangulation are all possible complications. Age and weight are the most prevalent contributors to risk. Major trauma, as well as particular surgeries, also increase the danger.**

Aim and objectives: **To compare the result of laparoscopic hiatal hernial repair with open repair as regard early post-operative recovery, short hospital stay, complications, recurrence rate, and the more cosmetic.**

Patients and methods: **Our research is a prospective, randomized trial. Forty individuals with hiatus hernias participated in the study. People were hospitalized at Al-Azhar University Hospital's surgical outpatient clinics.**

Result: **The overall satisfaction rate of cosmetic appearance was 100 % in group I and 40 % in group II. A statistically significant change was observed among groups in the overall cosmetic satisfaction rate (χ^2 test, $P = 0.000$).**

Conclusion: **Laparoscopic repair for treatment of sliding hiatus hernia was associated with significantly lower ICU time, hospital stay, oral intake, and postoperative complications than open repair. Patients' satisfaction was higher after laparoscopic surgery compared to open repair.**

Keywords: Hernia, Laparoscopic, Obesity, Open, Repair

1. Introduction

When an abdominal organ (usually the stomach) protrudes through the diaphragm and the posterior mediastinum of the chest, this condition is known as a hiatal hernia. Acid in the back of the throat or heartburn are two signs of laryngopharyngeal reflux or gastroesophageal reflux disease. Dysphagia and chest discomfort are two other symptoms. Aspiration, iron deficiency anemia, as well as hernia strangulation are all possible complications. Age and weight are the most prevalent contributors to risk. Major trauma and specific surgical procedures are other contributors to the risk. Sliding hernias, in which the stomach's main body travels upward, and paraesophageal hernias, in which an abdominal organ slips across the esophagus, are the two most common forms. Medical imaging or endoscopy could verify the diagnosis.[1,2]

Hiatal hernias are often referred to as the 'great mimic' due to their similar symptoms to those of other conditions. Dull pains in the chest, difficulty breathing (from the hernia's effect on the diaphragm), irregular heartbeat (from irritation of the vagus nerve), and discomfort from food 'balling up' in the lower esophagus before it reaches the stomach are all symptoms of a hiatal hernia.[1,3,4]

Hiatal hernias are more common in older people, affecting roughly 60 % of people 50 years old and up. Depending on the strength of the lower esophageal sphincter, as few as 9 % of these cases cause noticeable symptoms. In contrast to their high prevalence in urban centers, hiatal hernias are

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primarily seen in rural areas of Africa. A lack of dietary fiber and defecating while seated upright have both been suggested as potential risk factors.[1,5,6]

2. Patients and methods

Forty adult individuals presenting with hiatus hernias participated in this randomized prospective research. Al-Azhar University Hospitals admitted those people from its surgical outpatient clinics.

The cases were separated into two groups: group I: 20 patients were operated on by laparoscopic hiatus hernia repair. Group II: 20 patients were operated by open repair.

2.1. Inclusion criteria: patients included in this study had sliding hiatus hernia primary or recurrent

Exclusion criteria: patients with pervious other upper abdominal surgery, upper midline, and other abdominal incisions above the umbilicus were not included in the trial. Participants were also ruled out if they were deemed ineligible for postoperative follow-up due to factors like substance abuse or mental illness. Patients who were considered as unfit for general anesthesia or who had untreated risk factors such as chronic obstructive airway disease were also not included in this trial.

All the persons involved in the study were subjected to the following: clinical history, clinical examination, endoscopic examination, and routine investigations.

Operative technique: the hiatus hernias of 20 people were repaired laparoscopically, and the hernias of the other 20 were repaired openly.

2.2. Preoperative preparation

The standard preanesthesia medical evaluation and tests are carried out. The pulmonary workup is given extra attention. Persons at high risk should undergo pulmonary function tests, particularly those with a history of asthma or aspiration pneumonia. The use of proton pump inhibitors, acid blockers, and antacids is maintained. Antibiotics must be given before surgery.

2.3. Laparoscopic hiatus hernia repair

2.3.1. Anesthesia

Endotracheal intubation, as well as general anesthesia, are employed. For gastric decompression, an orogastric tube is inserted.

2.3.2. Position

The patient lies on their back in the low lithotomy position or the split-leg position, with their arms out on arm boards or tucked into their sides. Thighs are slightly raised, yet legs are spread wide enough for the surgeon to work comfortably. Compression stockings, either of the elastic variety or the pneumatic sequential variety, are worn on the lower legs. At least 30° of head elevation is used to place a person in a reverse Trendelenburg position.

2.3.3. Operative preparation

Shaving occurs among the nipples and the pubic symphysis. Preparation of the skin is done regularly. Then, a time-out is performed.

2.3.4. Incision and exposure

The Veress needle procedure is used to enter the peritoneal cavity directly, allowing for insufflation to occur. The umbilical region is home to a camera port. The remaining ports are positioned as follows: 5 mm right subcostal anterior axillary line, 10 mm left subcostal anterior axillary line, and 5 mm left subcostal mid axillary line, all while using direct visualization. Then, a very steep reverse Trendelenburg position is adopted for the patient. The primary surgeon will use the subcostal ports on the right and left anterior axillary lines. The helper will use both the umbilical and the far-left subcostal camera ports. The visual investigation of the abdomen includes all four sections. A self-retaining liver retractor can be inserted subxiphoidly or through a right subcostal port to expose the esophageal hiatus. The surgical tools are introduced through subcostal apertures on the right and left sides.

Traction, in addition to exposure instrument is inserted through the left lateral subcostal port, as well the assistant guides the videoscope. When a patient has a hiatal hernia, the surgeon or assistant gently retract the gastroesophageal fat pad to help minimize the hernia. First, the lesser omentum's pars faccida is divided by ultrasonic dissection. This is a simple, easily accessible structure with few blood vessels in thin people.

In patients who are overweight, however, the gastrohepatic ligament contains a great deal of fatty stuff that must be carefully excised. Carefully gripping and elevating the cut hepatic edge of the ligament may improve exposure for the surgeon. Some patients may have an abnormal left hepatic artery in this area thus careful dissection is required. It is imperative that this vessel be discovered and kept safe. Careful dissection and division of the peritoneum above the left crus muscle exposes the crus

muscle bundle. To finish the anterior peritoneal dissection, the phrenoesophageal ligament is separated using the ultrasonic dissector. The peritoneum above the right crus muscle is accessed while pulling on the stomach's lesser curve. This cru is cleaned behind the scenes.

The posterior 'V' or fan-shaped union of the left and right crus will be visible, as would the hiatal deficiency behind the esophagus. During fundal mobilization, the surgeon uses an atraumatic clamp to retract the stomach anteriorly along with the right of the individual, thereby gaining access to the stomach's larger curvature. The spleen and lateral gastrosplenic ligament are retracted to the left side of the abdomen when the helper grasps the ligament. The gastrosplenic ligament region is readily seen. Selecting an appropriate area, a cut is made with a blunt instrument. To reduce the risk of heat harm, the ultrasonic dissector starts dividing the short gastric arteries sequentially ~1 cm from the stomach. The tip of the tissue the ultrasonic dissector holds must be readily visible so that the following short gastric artery is not partially transected.

Bleeding from a partially severed vessel is difficult to separate and manage, often necessitating conversion to an open abdominal operation. If the stomach is grabbed progressively along its posterior wall beneath the cut short gastrics, it is easier to see the reduced sac space in addition the course of the gastrosplenic ligament. Once it is established that the stomach can move freely, the floppy 360° wrap can be made. The esophagus travels behind the upper greater curve of the stomach. A 'shoeshine'-like side-to-side technique is carried out, with devices grasping the stomach in the suggested wrap locations. It is established that the stomach is flexible enough to allow for a loose wrap of several centimeters in width. Short gastric vessels along the lesser curvature of the stomach may be exposed by this procedure, indicating the need for further division of these veins.

An esophageal dilator of 56–60 Fr is passed by the anesthesiologist after the orogastric tube has been removed. To avoid undersizing the esophagus, the tapered tip of this dilator must be inserted into the stomach. In addition, both the right and left gastric wraps are evaluated for their ability to cover an area measuring between 2 and 3 cm deep into the abdomen. The wrap is constructed using three sutures, the first placed at the fundoplication's cephalic endpoint. A seromuscular partial-thickness component of the esophagus is incorporated into the middle area of each triple bite suture. To prevent the wrap from moving distally and unwrapping the gastric cardia, a final stitch secures it to the right crus or lateral esophageal wall. Using a Cruroplasty, two or three nonabsorbable interrupted Ethibond 2/0 sutures were used to close the diaphragmatic crus via a posterior route beyond the esophagus; these sutures were not pulled tightly to prevent the bloating syndrome.

2.4. Closure

One or two delayed absorbable 00 sutures are used to close the fascia around the 10–mm port locations. Absorbable subcuticular sutures are used to close the skin in a close approximation. Skin strips are adhered, and dry sterile dressings are applied.

2.5. Postoperative care

Nasogastric tube gastric decompression is frequently unnecessary. As tolerance improves, clear liquids are introduced, and the diet progresses to include soft, easily chewed foods. Dysphagia is a temporary condition that can be managed by modifying a patient's diet.

2.6. Open repair of hiatus hernia

2.6.1. Anesthesia

Endotracheal intubation, as well as general anesthesia, are used.

2.6.2. Positions

The patient lies supine on the table, with his or her feet positioned somewhat lower than his or her head for maximum comfort.

2.6.3. Operative preparation

Shaving occurs among the nipples and the symphysis. Antiseptic solutions are used to clean the skin of the sternum, the lower chest walls, and the entire abdomen.

2.6.4. Incision and exposure

Beginning at the level of the xiphoid along with continuing down the center of the body to the umbilicus, a large incision is made. The incision for an obese patient should go somewhat below the umbilicus as well as to the left. To better expose the esophagogastric junction, the xiphoid is surgically removed during elongation. The 00-silk transfixing suture stops the active bleeding at either xiphocostal angle.

The gallbladder, duodenal bulb, and esophageal hiatus size are all checked when the peritoneum is exposed and the abdomen is examined. Due to the

increased size of the hiatus or abdominal opening, some of the stomachs may be in the upper chest.

Good exposure to the esophageal hiatus edges is essential. When the relatively avascular triangular ligament of the left lobe of the liver is divided and rotated toward the midline, visibility is much enhanced. A big S-shaped retractor is used with a wet pad to pull the left lobe medially once it has been mobilized. The esophagus is moved with the right index finger after the peritoneum covering it is incised.

Only when gastric hypersecretion has been confirmed with operational, laboratory, roentgenographic, and clinical examinations, as well as duodenal deformity, has the vagus nerve divided in conjunction with a drainage surgery like a pyloroplasty. To expose the fundus for the 'wraparound' procedure, the upper section of the gastrohepatic ligament must be divided and ligated. An extended set of right-angle clamps seize the gastrohepatic ligament just above its attachment to the liver. To guarantee proper management of the left phrenic artery, the space among the clamps is partitioned and the contents of each are tied up with 00 silk. The vagus nerve's hepatic branch can fall under this category. Because of the damage caused by the hiatus hernia, the peritoneal cuff at the esophagogastric junction may have a lot of excess tissue. It is possible that further stitches will be needed to stop the bleeding here. Unless vagotomy is warranted due to a concomitant duodenal ulcer and excessive acid levels, such sutures must avoid the vagus nerves. Careful dissection is required when dividing the peritoneum to the left of the esophagogastric junction to protect the splenic capsule.

The stomach's funds are entirely reduced into the peritoneal cavity by maintaining downward traction using a rubber tissue (Penrose) drain around the esophagus. The hiatus can be seen by inserting a tiny S-shaped retractor behind the esophagus. To close the hiatus behind the esophagus, a cruroplasty is performed using long Babcock forceps to anchor two or three interrupted Ethibond 2/0 sutures. The esophageal hiatus is so small that a person's index finger can fit through it. A large esophageal dilator, typically among 56 and 60 Fr, can also be inserted to measure the aperture.

The success of the fundoplication hinges on how well the 'wraparound' operation is carried out. To mobilize the stomach fundus, four or five gastrosplenic (short gastric) veins must be ligated. Splenic damage can be avoided if this is done cautiously. Some doctors choose to use a transfixing stitch that also incorporates a piece of the gastric wall to ligate the vessel on the stomach side.

Silver clips may be used to ligate the vessels on the splenic side if the exposure is particularly challenging. The esophagus is dragged down with the use of a rubber tissue drain. Before the procedure, the esophageal lumen is dilated using a large gastric tube (Ewald) or the Maloney 56–60 Fr rubber esophageal dilator to avoid compressing the esophagus. To make sure the stomach has been adequately mobilized, the right hand is placed behind the fundus. The lower esophagus must have enough fundus released to be easily wrapped around. The right hand retains the stomach wall around the esophagus, while the left hand maintains downward traction on the esophagus with the rubber drain.

The esophageal, in addition to the stomach walls, is grasped with long Babcock forceps. Both sets of forceps feature traction that eliminates the need for the surgeon's hand to be in the incision. 00 silk interrupted sutures close the gap between the stomach's anterior and posterior walls. Several interrupted sutures along a 2–3-cm zone are usually sufficient. As a precaution against the 'wraparound' sliding upward, some surgeons choose to add a superficial bite in the esophageal wall in addition to the stomach wall in the uppermost suture. Many people also use an anchoring stitch to secure the gastric wrap to the crus. This stops the stomach from tunneling upwards and around the food pipe.

The esophagus's big dilator keeps it from getting too narrow. The surgeon is next inserts his index finger or thumb upward under the plicated stomach wall once the traction rubber drains as well as the esophageal dilator has been removed. There should be no unnecessary tightening, and the increased curvature of the fundus should not be prevented from being mobilized anymore. Finally, the esophageal region is examined to ensure the vagus nerves are unharmed. Temporary gastrostomy with fixation of the anterior gastric wall to the overlaying peritoneum may be performed if vagotomy is done. The nasogastric tube is reinserted once the dilator is taken out.

2.6.5. Closure

The abdominal wall is closed in the standard manner.

2.6.6. Postoperative care

The nasogastric Levin tube is removed within several days. Clear liquids are given in limited amounts, followed by a gradual return to a full diet.

2.7. Ethical consideration

The ethical committee of the Department of General Surgery at the Faculty of Medicine at Al-

Azhar University Hospitals granted their official permission for the study. It was confirmed that we have been given clearance from the Institutional Research. Approval by the ethical committee in the medical school (Institutional Research Board). All of the participants in the study were given detailed information regarding the objectives, procedures, and goals of the research before providing their written agreement to participate.

2.8. Data management and statistical analysis

SPSS 20 was used for data entry, processing, and analysis. Kruskal–Wallis, Wilcoxon's, χ^2, logistic regression analysis, and Spearman's correlation significance tests were utilized. The data were given, and appropriate analysis was carried out, in accordance with the type of data (parametric or nonparametric) that was received for each variable. *P* values with a disparity of less than 0.05 % were considered statistically significant. *P* value is often known as the degree of significance nonsignificant when *P* is greater than 0.05. *P* value under 0.05: significant. *P* value of 0.01 indicates that the result is highly significant.

3. Results

As shown in Table 1, no statistically significant alteration was found among groups about age distribution (χ^2 test, $P = 0.266$).

As demonstrated in Table 2, there were no significant alterations among the assessed patients according to BMI (Fig. 1).

As shown in Table 3, there was not observed to be a difference of statistical significance among groups regarding the American Society of Anesthesiologists (ASA) grading (χ^2 test, $P = 0.749$).

Table 4 demonstrated that there was not a significant distinction among the groups that were evaluated in terms of the surgical technique (Figs. 2 and 3).

As shown in Table 5, there were no statistically significant variations among the groups ICU admission rates (χ^2 test, $P = 0.185$). On the other hand, there was a variance that was statistically significant among groups regarding ICU admission time, time to oral intake, and length of time spent in the hospital (independent sample *t*-test, $P < 0.05$; Fig. 4).

As shown in Table 6, the overall intraoperative complication rate was 25 % in group I and 15 % in group II. No statistically significant change was observed among groups in the overall intraoperative complication rate.

As shown in Table 7, the overall intraoperative complication rate was 20 % in group I and 55 % in

Table 1. Age distribution of patients.

	Group I ($N = 20$) [*n* (%)]	Group II ($N = 20$) [*n* (%)]	*P* value
Age (years)			0.266
Less than 50	12 (60)	7 (35)	
50–60	5 (25)	7 (35)	
More than 60	3 (15)	6 (30)	

Table 2. BMI distribution of patients.

	Group I ($N = 20$) [*n* (%)]	Group II ($N = 20$) [*n* (%)]	*P* value
BMI (kg/m^2)			0.627
Overweight	3 (15)	4 (20)	
Class I obesity	6 (30)	9 (45)	
Class II obesity	7 (35)	5 (25)	
Class III obesity	4 (20)	2 (10)	

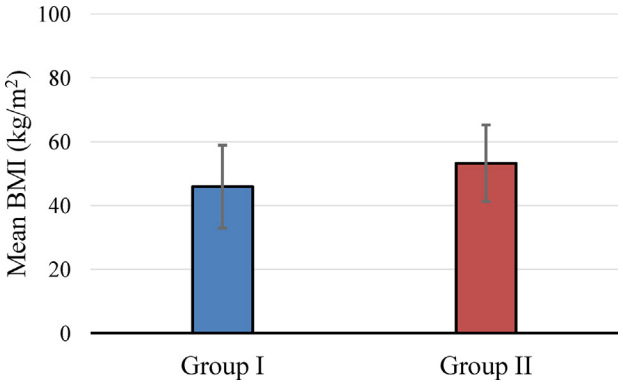

Fig. 1. BMI distribution.

Table 3. American Society of Anesthesiologists grading of patients.

	Group I ($N = 20$) [*n* (%)]	Group II ($N = 20$) [*n* (%)]	*P* value
ASA grading			0.749
Grade I	8 (40)	9 (45)	
Grade II	12 (60)	11 (55)	

ASA, American Society of Anesthesiologists.

Table 4. Re-do surgery for the studied patients.

	Group I ($N = 20$) [*n* (%)]	Group II ($N = 20$) [*n* (%)]	*P* value
Surgical procedure			0.677
Primary	17 (85)	16 (80)	
Revision	3 (15)	4 (20)	

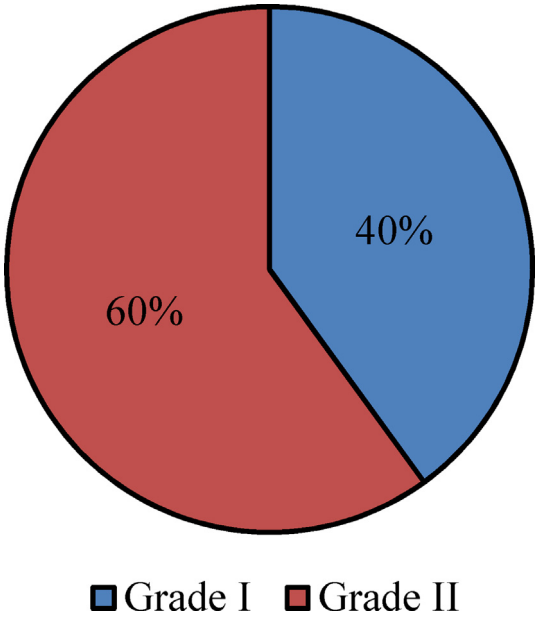

Fig. 2. ASA (group I). ASA, American society of anesthesiologists.

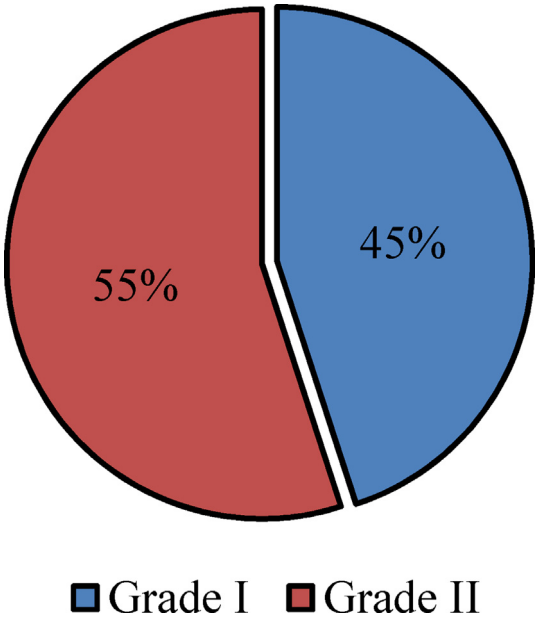

Fig. 3. ASA (group II). ASA, American society of anesthesiologists.

group II. A statistically significant variance was observed among groups in the overall postoperative complication rate (χ^2 test, $P = 0.022$).

As shown in Table 8, the overall satisfaction rate of cosmetic appearance was 100 % in group I and 40 % in group II. It has been found that there is a statistically significant distinction among the groups in the overall cosmetic satisfaction rate (χ^2 test, $P = 0.000$).

Table 5. Recovery outcomes.

	Group I ($N = 20$) [n (%)]	Group II ($N = 20$) [n (%)]	P value
ICU admission rate	5 (25)	9 (45)	0.185
ICU time (h)			0.006
Mean ± SD	9.6 ± 2.6	18 ± 5.2	
Range	6–12	12–24	
Oral intake (days)			0.000
Mean ± SD	1.8 ± 1.9	4.8 ± 2.5	
Range	1–5	1–8	
Hospital stay (days)			0.000
Mean ± SD	6.3 ± 4.7	12.9 ± 4.9	
Range	1–15	6–20	

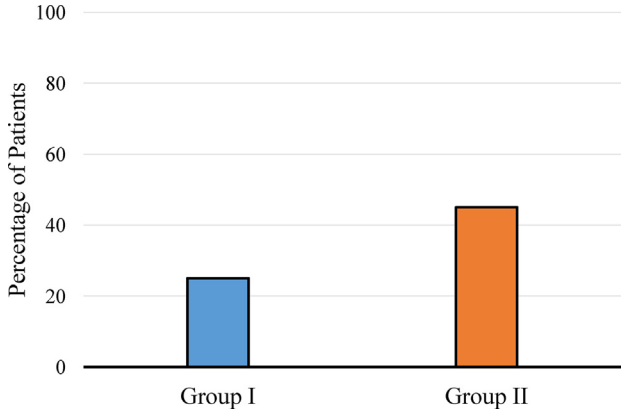

Fig. 4. ICU admission rate.

Table 6. Intraoperative complication.

	Group I ($N = 20$) [n (%)]	Group II ($N = 20$) [n (%)]	P value
Complications	5 (25)	3 (15)	0.429
Pneumothorax	2 (10)	0	
Pleural tear	1 (5)	0	
Serosa tear	0	1 (5)	
Gastrotomy	1 (5)	1 (5)	
Esophageal perforation	1 (5)	0	
Hypotension	0	1 (5)	

Table 7. Postoperative complications.

	Group I ($N = 20$) [n (%)]	Group II ($N = 20$) [n (%)]	P value
Complications	4 (20)	11 (55)	0.022
Wound infection	1 (5)	5 (25)	
Pneumonia	1 (5)	3 (15)	
Atelectasis	1 (5)	4 (20)	
MI	0	1 (5)	
Ileus	0	4 (20)	
Recurrence	1 (5)	1 (5)	
Death	0	0	

Table 8. Postoperative satisfaction (cosmesis).

	Group I ($N = 20$) [n (%)]	Group II ($N = 20$) [n (%)]	P value
Satisfaction			0.000
Very satisfied	8 (40)	0	
Satisfied	12 (60)	8 (40)	
Neutral	0	3 (15)	
Dissatisfied	0	8 (40)	
Very dissatisfied	0	1 (5)	

4. Discussion

In our current trial the mean age in group I was 45.9 ± 13 years, fluctuating from 31 to 70 years while in group II, the mean age was 53.2 ± 12 years, ranging between 30 and 70 years. Female participants made up a greater percentage of our analyzed sample. The mean period for follow-up in group I was 8.9 ± 2.2 months, extending between 6 and 12 months. In group II, the mean follow-up duration was 9 ± 2.1 months, ranging between 6 and 12 years. It was found that there was not a statistically significant disparity among the groups that were examined in accordance with age distribution, sex distribution, race distribution, BMI, and follow-up duration.

Our findings are consistent with Yun et al.,[7] who reported that patients aged 37–81 (median, 73). Ten of 14 symptomatic individuals had heartburn. Four had an operation on their abdomen before.

Concerning ASA grading in group I, eight (40 %) persons were categorized as ASA grade I, besides 12 (60 %) as grade II. In group II, nine (45 %) participants were classified as ASA grade I, while 11 (55 %) as grade II. No statistically significant alteration was found among the studied groups regarding the ASA grading.

When medicinal therapy fails to alleviate symptoms of gastroesophageal reflux disease or unpleasant dysphagia, a second operation to repair the sliding hiatus hernia may be required. The goal of surgery for a hernia is to reduce the size of the hernia and prevent it from coming back. Fundoplication is an effective method for accomplishing this in the general population.[8]

Concerning recovery outcomes in group I, five (25 %) patients were admitted to the ICU, whereas, in group II, nine (45 %) people were put in the ICU. The mean ICU admission time was 9.6 ± 2.6 h in group I and 18 ± 5.2 h in group II. The mean time to oral intake was 1.8 ± 1.9 days in group I and 4.8 ± 2.5 days in group II. The mean hospital stay was 6.3 ± 4.7 and 12.9 ± 4.9 days in groups I and II, respectively. No statistically significant change was found among the studied groups regarding ICU admission rates. However, a statistically significant alteration was found among the studied groups regarding ICU admission time, time to oral intake, and length of hospital stay ($P < 0.05$).

According to our results, Nguyen et al.[8] reported that there was a statistically significant alteration among laparoscopic repair and open repair groups regarding mean length of hospital stay as laparoscopic repair was linked with a shorter length of hospital stay (3.7 ± 4.6 vs. 8.3 ± 8.3 days, $P < 0.01$).

Moreover Soliman et al.[9] reported that stay duration (days), mean ± SD was 1.8 ± 1.5 days in the laparoscopic group.

Regarding intraoperative complications, the overall intraoperative complication rate was 25 % in group I and 15 % in group II. No statistically significant change was observed among the studied groups in the intraoperative complication rate. In group I, two (10 %) patients developed pneumothorax. One (5 %) patient had a pleural tear. One case of gastrotomy and one case of esophageal perforation were also reported. In group II, one case of serosa tear, one case of gastrotomy, and one case of hypotension were reported intraoperatively. The overall postoperative complication rate was 20 % in group I and 55 % in group II. A statistically significant variance was observed among the studied groups in the overall postoperative complication rate ($P = 0.022$). In group I, one (5 %) patient developed wound infection. One case of pneumonia and one case of atelectasis were also reported. In group II, five (25 %) patients developed wound infection, three (15 %) patients suffered from pneumonia. Four (20 %) patients developed atelectasis. Another four (20 %) patients had postoperative ileus. One case of myocardial infarction was reported. The recurrence rate was 5 % in both groups. No cases of death were reported.

Our results are consistent with those of other studies that compared laparoscopic to open paraesophageal hernia repair and found that the laparoscopic method was superior.

Our study is consistent with Nguyen et al.[8] reported that there was a statistically significant variance among laparoscopic repair and open repair groups regarding overall complications, showing a higher prevalence of complications in the open repair group ($P < 0.05$).

Patients who have undergone bariatric surgery and are now experiencing sliding hiatus hernia symptoms may not be candidates for fundoplication. Although weight reduction outcomes are

unaltered, patient satisfaction is increased and gastroesophageal reflux disease symptoms are alleviated with laparoscopic hill repair as a backup method for sliding hiatus hernia-related severe dysphagia.[10]

4.1. Conclusion

Sliding hiatus hernias can be treated with either open surgery or laparoscopic surgery. However the latter has been linked to fewer problems and shorter recovery times overall. Persons were more pleased with laparoscopic repair than with open surgery.

Conflicts of interest

There are no conflicts of interest.

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