

Research Article

Round Ligament (ligamentum teres) reinforcement in Laparoscopic Hiatus Hernia Repair



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Abstract

Background: A hiatal hernia is a condition involving herniation of abdominal contents into the mediastinum via the diaphragmatic hiatus. Anatomically, there is proximal displacement of the gastroesophageal junction causing the intrinsic sphincter to lie proximal to the esophageal hiatus, this is likely secondary to weakening or disruption of the phrenoesophageal ligament. **Aim of the work:** To explore feasibility, safety, and early outcomes of Round Ligament Flap as reinforcement of the standard crural repair in patients with hiatal hernia. **Methods:** This is a prospective clinical study that was done on 180 patients in Minia University Hospital in whom the round ligament flap should be used as a crural repair buttress. **Result:** the study included 180 cases of various degrees of hiatal hernia. Most of them were adults, endoscopically huge hiatus hernia and associated with esophagitis. The Round ligament was used in all of them to support crural repair. We recorded clinical improvement in 65% of the cases and follow up postoperative normal upper endoscopy in 66%. **Conclusion:** the use of the round ligament of the liver support hiatal hernia repair by using the patient own tissue, The round ligament support crural repair in addition it fills the posterior part to the esophagus leaving no place for anterior weakness. using the round ligament reinforcement is completely safe, useful and cost effective.

Keywords: round ligament; crura; ligamentum teres, repair; oesophagus.

Introduction

Primary hiatal hernias with a paraesophageal component are classified as type II, III, IV, and account for 10%–15% of all hiatal hernias^[1]. These conditions are more common in the elderly population, and the volume of the herniated viscera is generally associated with progressive enlargement of the hiatal defect, which increases with age^[2].

On the other side, secondary paraesophageal hiatal hernias develop after primary antireflux or bariatric surgery, or

after transhiatal or transthoracic esophagectomy^[3].

Surgical repair is necessary to alleviate symptoms of postprandial chest discomfort, epigastric pain, chest pain, and exertional dyspnea.

Incarceration and strangulation of the hernia contents can also lead to life-threatening complications and to the need for emergency surgery^[4].

Historically, the round ligament of the liver (or teres ligament) was first used in

the 1960s in Europe as a sling around the angle of His to enhance the anti-reflux barrier in patients with typical gastroesophageal reflux symptoms. laparoscopic technique was described in 1991.^[5]

Later on, a flap of vascularized teres ligament embedded in the peritoneal layer and in the properitoneal connective adipose tissue of the anterior abdominal wall was proposed as an adjunctive procedure for crural repair, especially in patients with large paraesophageal hernia^[6]

The Falciform ligament is an attachment arising at or near the umbilicus and continues onto the anterior aspect of the liver.

Within the lower edge of the falciform ligament is the ligamentum teres (round ligament), a remnant of the obliterated umbilical vein (ductus venosus)^[7].

Aim of this study

To explore feasibility, safety, and early outcomes of Round Ligament Flap as reinforcement of the standard crural repair in patients with paraesophageal hernia.

Patients and Methods

This prospective study was done on 180 patients in Minia University Hospital from October 2021 to October to May 2022 in whom crural repair should be attempted and the round ligament flap should be used only as crural repair buttress.

Our study included all patients aged above 15 years old (middle-aged are the main age category), both sexes, and primary and recurrent hiatus hernia. While patients excluded from the study were those with previous open abdominal exploration, small paraesophageal hernia, cirrhotic patients and patients with mechanical bowel obstruction.

All patients included in the study were subjected to full history especially symptoms severity and frequency, full laboratory investigations, upper GIT endoscopy, Computed tomography (CT) abdomen with oral contrast in Trendelenberg position, High-resolution

manometry (**HRM**) HRM identifies spatial dissociation of the intrinsic LES (smooth muscles of the lower oesophageal sphincter) and the diaphragmatic sphincter and 24-h pH measurement which is the best-established method for diagnosis of GERD (Gastro-intestinal reflux disease) associated with hiatus hernia with the use of pH-sensitive electrode as a nasopharyngeal catheter placed in the esophagus 5 cm above the proximal border of LES.

Surgical technique

The patient is placed in the lithotomy position. The surgeon stands between the patient's legs with the monitor directly ahead. The first assistant stands to the surgeon's right and the camera assistant to the surgeon's left. Pneumoperitoneum is established using a Veress needle inserted just near to the umbilicus. Once the usual security precautions have been performed using a 10 mL syringe, an incision is made to insert the first and most important port for the laparoscope. Ports are inserted intra-abdominal. The first port is inserted close to the midline at about two-thirds of the distance down between the xiphoid process and the umbilicus. The second port is placed just under the xiphoid process to introduce the liver retractor. The third port to be inserted at the right hypochondria region, for the grasping instruments in the surgeon's left hand. The fourth is the left lateral port used by the first assistant; this port is placed in line with the right lateral trocar, a few centimeters under the left costal margin. The fifth port is for the operating instruments in the surgeon's right hand and is placed midway between the camera port and the left lateral trocar.

Lysis of adhesions and dissection of the hiatal area, then obtaining adequate length of intra-abdominal oesophagus, Crural repair is done. Then Round ligament is dissected from anterior abdominal wall to buttress cruroplasty (**figure 1**). The round ligament is mobilized at the level of its attachment to the anterior abdominal wall starting just superior to the umbilicus and continuing superiorly, and anterior of the liver with harmonic scalpel dissection, and

then it is sutured to both diaphragmatic crura to buttress cruroplasty. It is sutured firstly to left diaphragmatic crus posterior to the diaphragm then to the right diaphragmatic crus. ligamentum teres is fatty tissue and covered by the peritoneum from both sides. The round ligament support crural repair in addition it fills the posterior part to the esophagus leaving no place for anterior weakness (**figure 2**). Fundoplication is then done. Complete fundal wrap (Nissen fundoplication) or partial fundal wrap either anterior (Dor) or

posterior (Toupet) after passage of transoral 54 fr bougie.

We evaluated duration of surgery, estimated blood loss, Intraoperative difficulties and technical feasibility. Postoperative, all patients were followed up as regards immediate postoperative data (recovery from anaesthesia, respiratory condition), early ambulation, allowance of fluids, response to postoperative treatment (anti-secretory drugs), observation of relief of symptoms, recurrence and post operative follow up upper GIT endoscopy.

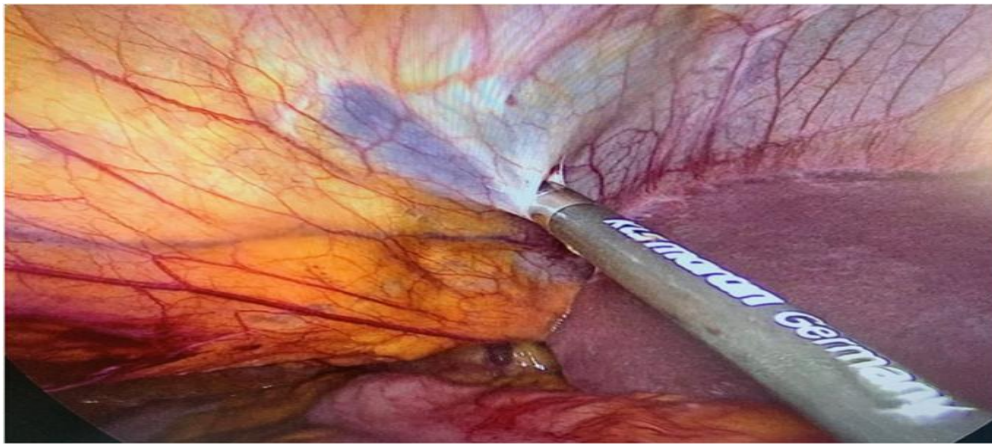


Figure (1) Dissection of the ligamentum teres from the ligamentum falciforme and the anterior abdominal wall using a harmonic device.

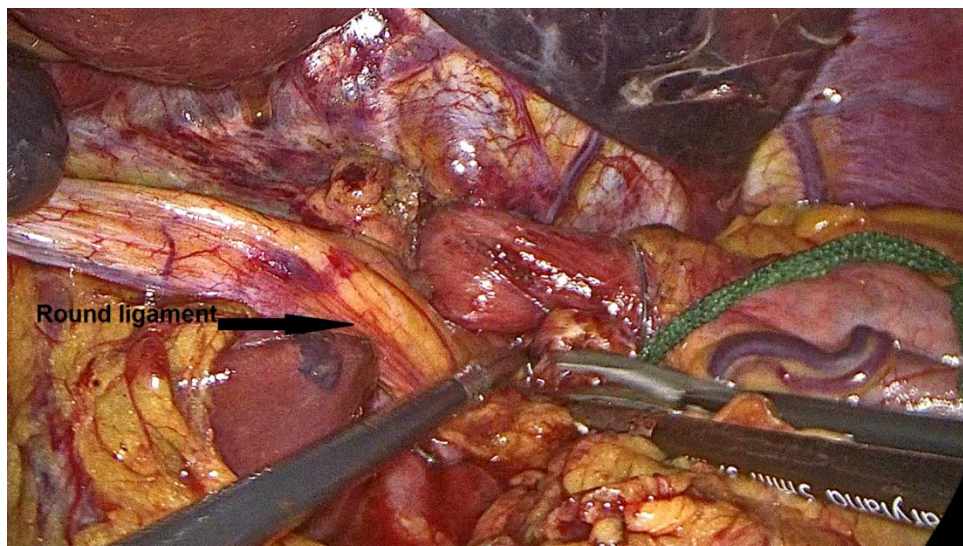


Figure (2) Round Ligament dissected from its origin to reinforce crural repair

Administrative considerations:

An Official permission was obtained from the ethical committee of Minia University Hospital. An official permission was obtained from the Institutional Research Approval from ethical committee in the faculty of medicine

Ethical consideration:

Informed consent was obtained from all participants after being informed about the aims and process of the study as well as applicable objectives. The study procedures were free from any harmful effects on the participants as well as the service provided.

The principal investigators have kept individual data as private information safely. There was no extra fee to be paid by the participants and the investigators covered all the costs in this regard.

Statistical Analysis

The collected data will be, tabulated, and statistically analyzed using SPSS program (Statistical Package for Social Sciences) software version 26.0, Microsoft Excel 2016.

Descriptive statistics were done for numerical parametric data as mean \pm SD (standard deviation) and minimum & maximum of the range and for numerical non parametric data as median and 1st & 3rd inter-quartile range, while they were done for categorical data as number and percentage. Independent t-test in cases of two independent groups with parametric data and Mann Whitney U in cases of two independent groups with non-parametric data were used. Chi square test for independent groups. Wilcoxon Rank test was used to assess the statistical significance of the difference of a non - parametric variable between related sample. The level of significance was taken at P value <0.05 is significant.

Results

This is a prospective clinical study that was done on 180 patients at laparoscopic unit at Minia University Hospital from October 2021 to October to May 2022 in whom complete crural repair was

attempted and the round ligament flap was used only as crural repair buttress.

Table (1) shows demographic characteristics among the studied cases. In addition to medical, surgical history and pre-operative symptoms.

The mean age was 45.3 \pm 2.2 years. The mean Body mass index was 27.3 \pm 2.7 kg/m². There were 40% males and 60% were females. There were 12.2 % diabetic, 11.67% hypertensive, 8.3% with cardiovascular diseases, 6.67% previous surgery. There were 9.7% of cases asymptomatic, 20.0% presented with Heartburn and regurgitation, 5% with Dysphagia only, 22.3% with Postprandial fullness and Intermittent epigastric pain and 43% of them had all these symptoms together.

Regarding endoscopic oesophagitis and reflux (GERD) associated with hiatus hernia according to Los Angeles classification (LA classes), there were 10 % have Grade A, 22.0% Grade B, 43% Grade C, 17% Grade D and 8% had no apparent endoscopic oesophagitis.

There were 90 % have Primary, 10.0% Recurrent. Regarding types of hiatal hernia according to upper GIT endoscopy (Hill classification): There were 13% have Grade 1, 10.0% Grade 2, 65% Grade 3, 12% Grade 4 (Table 2).

Table 3 showed the operative data and technique of operation among the studied cases. There were 60 % was in Group (1) crural repair + round ligament reinforcement + complete fundoplication, 40.0% Group (2) crural repair + round ligament reinforcement + partial fundoplication, 26% Partial anterior fundoplication (Dor fundoplication), 14% in Partial posterior fundoplication (Toupet fundoplication) Operative data among the studied cases. The mean Operative time was 109.5 \pm 11.2minutes, the mean Post-Operative hospital stay (days) was 5.2 \pm 0.8, the mean estimated mean blood loss (cc) 150 \pm 50, no cases were converted to open laparotomy.

Regarding immediate postoperative complications among the studied cases

table 4 showed that, there were 2.7% with occasional vomiting, 2.2% mild dysphagia. 8.3% of patients had recurrence, 91.7% had successful outcome.

Table 5: showed the outcomes and the postoperative endoscopic evaluation after 6 months among the studied cases. There were 7.7% of patients had 30-day readmission, none of the cases had 30-day reoperation. There were 66% Ideally constructed fundoplication, 16% Tight fundoplication, 9.7% Loose fundoplication, 8.3% Recurrent hiatus hernia.

There were high significant differences between preoperative and postoperative as regard Symptoms present, heartburn, regurgitation, dysphagia and vomiting, Postprandial fullness and intermittent epigastric pain and Response to medical treatment (table 6)

This table shows that there was insignificant correlation between Outcome and Age or Post-Operative hospital stay (days).

Table (1): Demographic and basic characteristics among the studied cases.

Baseline data		
Age	45.3± 2.2	
Body mass index	27.3± 2.7	
Sex		
Male	72	40%
Female	108	60%
Medical and surgical history		
Diabetes mellitus	22	12.2%
Hypertension	21	11.67%
Cardiovascular diseases.	15	8.3%
Previous surgery	12	6.67%
Pre-operative symptoms		
Asymptomatic	18	9.7%
Heartburn, regurgitation, dysphagia and vomiting	77	43%
Heartburn and regurgitation	36	20%
Dysphagia only	9	5%

Table (2): primary or recurrent hiatus hernia + pre-operative endoscopic evaluation

primary or recurrent hiatus hernia	No	%
Primary	162	90.0%
Recurrent	18	10%
(Hill classification)		
Grade 1	24	13.0%
Grade 2	18	10%
Grade 3	117	65%
Grade 4	21	12%
endoscopic oesophagitis and reflux (GERD) associated with hiatus hernia		
Grade A esophagitis (one or more mucosal breaks less than 5 mm in length)	18	10%
Grade B (one or more mucosal breaks more than 5 mm in length)	40	22%
Grade C (one or more mucosal breaks that interconnect but encompass less than 75% of esophageal circumference)	78	43%
Grade D (one or more mucosal breaks that interconnect but encompass more than 75% of esophageal circumference)	30	17%
No apparent endoscopic oesophagitis	14	8%

Table (3): Operative data among the studied cases and technique of operation

Technique of operation	N	%
Group (1) crural repair + round ligament reinforcement + complete fundoplication	108	60.0%
Group (2) crural repair + round ligament reinforcement + partial fundoplication	72	40%
Partial anterior fundoplication (Dor fundoplication)	47	26%
Partial posterior fundoplication (Toupet fundoplication)	25	14%
Operative data among the studied cases		
Operative time (minutes)	Mean±SD	109.5±11.2
Estimated mean blood loss (cc)	Mean±SD	150 ± 50
Conversion to open laparotomy		0 (0%)
Post-Operative hospital stay (days)	Mean±SD	5.2 ± 0.8

Table (4): post-Operative complications among the studied cases

Post-Operative complications	N	%
Immediate post-Operative complications		
Occasional vomiting	5	2.7%
Mild dysphagia	4	2.2%
Post-operative recurrence		
Recurrence	15	8.3%
Success	165	91.7%

Table (5): outcomes and endoscopic evaluation among the studied cases

Outcomes	N	%
30-day readmission	14	7.7%
30-day reoperation	0	0%
Endoscopic evaluation		
Ideally constructed fundoplication	119	66.0%
Tight fundoplication	29	16.0%
Loose fundoplication	17	9.7%
Twisted fundoplication	0	0%
Disrupted fundoplication	0	0%
Recurrent hiatus hernia	15	8.3%

Table (6): Correlation between symptomatic outcomes and clinical data in the studied cases.

Symptomatic outcome in the study group	Preoperative	Postoperative	P value
Symptoms present	77.3 %	35 %	0.01
Heartburn, regurgitation, dysphagia and vomiting	30%	3%	0.001
Heartburn and regurgitation	20%	5%	0.005
Dysphagia and bloating	5%	23%	0.54
Postprandial fullness and intermittent epigastric pain	22.3%	4%	0.04
Response to medical treatment	45%	90%	0.02

Discussion

We have dealt in this study with variable cases and degrees of hiatus hernia with a safe technique hoping to provide a protective, safe way of hiatus hernia repair.

So, we have widened our scale including in our study all cases we encountered, that were indicated for hiatus hernia repair. We managed 180 cases with hiatus hernia including different grades and followed them up to 6 months to assess short term outcomes of round ligament flap as a crural buttress.

Regarding the age of the studied patients in our study the mean age was 35 years old which disagreed with ^[8] who mentioned that hiatus hernia is associated with old age due to increased laxity of phreno-oesophageal ligament with age.

But another attractive thing about the patient is that females formed about 60% of the cases and mean BMI was about 28. that is confirmed by studies showing that patients with BMI exceeding 25 are more likely to have hiatus hernia ^[9] this may be associated with high abdominal pressure and sedentary life.

Although hiatus hernia may be asymptomatic and accidentally diagnosed, 90% of the patients in our study were found to complain. this is contradicted with (Tsang T, et al.,) who reported that hiatus hernia is almost asymptomatic. This can be explained by GERD symptoms which were associated with many of the studied cases. commonest symptoms were heartburn and regurgitation (55% of patients).

Regurgitation is digested food and gastric secretions coming up from stomach to the oesophagus. This may be associated with dysphagia or it may be dysphagia alone in 5% of cases. the most common cause is oesophageal inflammation and damage.

Postprandial fullness and intermittent epigastric pain were in 22% of cases all these symptoms are secondary to GERD

which is a result for hiatus hernia and that occur oesophageal acid exposure exceeds normal frequency and time than in healthy individuals^[10].

Asymptomatic cases represented about 9.7% of total cases but they were associated with pathologic reflux or even Barrett oesophagus.

All cases of this study were evaluated by endoscopic grading of hiatus hernia (Hill classification).

Grade 1, the squamocolumnar junction (SCJ) is adherent to the shaft of the endoscope with no apparent defect. They were about 13% of the patients. Although there is no defect, these patients complained of reflux symptoms and were associated with endoscopic oesophagitis. Grade 2, in which there was effacement of angle of Hiss, were about 10% of the patients. Also most of them were associated with GERD. Grade 3, incomplete closure of EGJ around endoscope, they were most of the cases. Comprising about 65% of cases.

Grade 4, No EGJ adherence to endoscope at all, included 12% of cases.

It is to be mentioned that there was a bit difference between preoperative endoscopy and intraoperative finding by laparoscopy. Gastric insufflation induces transient LES relaxation so it can be misleading. That means that HILL grading is not a necessarily strong predictor^[11].

Apart from 8% of cases who have normal oesophageal mucosa, rest of cases had oesophageal complications of GERD such as (oesophagitis, ulcerations, peptic stricture or Barrett oesophagus) this is agreed with ^[12].

Oesophagitis was evident in most cases and was categorized according to LA classifications: 10% of the patients had grade A reflux esophagitis, 22% of them had grade B reflux esophagitis, the rest showed higher grade of erosive oesophagitis grade C, D 43% and 17% respectively. Conversely, non-erosive oesophagitis is difficult to diagnose by endoscopy and require biopsy^[13].

CT abdomen in trendelenberg position was performed preoperatively in most cases. It

was helpful in show size of hiatal defect and localize GEJ. Chest x-ray it may be pathognomonic to paraoesophageal hernia if it showed retrocardial air fluid level of the defect. 24 hour PH measurement is the gold standard test to diagnose hiatus hernia associated with GERD.

Laboratory investigations: CBC, Coagulation profile, RFT and LFT were done in all cases most patients did not have problems in their laboratory profile apart from mild degree of anemia if the case was complicated by previous attack of hematemesis. Or affected labs due to associated comorbidity.

All cases in our study underwent laparoscopic hiatus hernia repair with enforcement by the round ligament. After putting the patient in lithotomy position and creating pneumoperitoneum, ports are inserted for beginning of dissection.

Obtaining an adequate intraabdominal oesophageal length then crural repair was done in all cases.

Regarding fundoplication, we have performed complete fundoplication in 60% of cases. Nissen fundoplication is the most common performed fundoplication (Hedberg, Kuchta et al., 2019) It augments LES function and recreate angle of Hiss. Partial fundoplication was performed in the rest of cases 40%. Anterior (Dor) fundoplication -180 degree wrap- was performed in 26% of cases by folding the fundus of the stomach over the anterior aspect of the oesophagus^[14]. Posterior (Toupet) partial fundoplication -270 degree wrap- was performed in 14% of cases by mobilizing part of the fundus posterior to the oesophagus to the right^[15].

Patients who underwent anterior fundoplication were found to complain of dysphagia and in need of more dose of antisecretory drugs than those who underwent posterior fundoplication. It was found in a study performed in 2010

compared Nissen fundoplication to Toupet fundoplication in patients with normal oesophageal motility that there was no difference in post-operative dysphagia. However, in patients with abnormal oesophageal motility, Nissen fundoplication was associated with higher rates of dysphagia^[16] But long term outcomes were in favor of Nissen fundoplication.

Lastly, there is no consensus regarding fundoplication which provides maximal control of reflux symptoms. Laparoscopic repair was done in all the cases with no need for conversion to open laparotomy in any case. This is due to availability of laparoscopic equipment and surgical experience and qualified surgical team.

Although major complications are rare in these cases, it must be mentioned that pneumothorax, gastric or oesophageal injuries and splenic injuries must be taken into consideration.

Mean blood loss in most cases was 100 to 200 cc blood and operative time of 110 minutes which is a bit longer than time consumed during classical repair (Eglington t, et al., 2006) due to dissection of round ligament then fixation of it.

After the operation, patients were admitted to the general surgical ward. they were given fluids in the evening of day 0.

Patients were discharged from hospital after 5 days or less after they were allowed clear fluids with no vomiting.

Commonest postoperative complaints included infrequent vomiting and dysphagia in 2.7% and 2,2% respectively. Vomiting may be due to oesophageal or gastric irritation or due to anaesthetic agents. Dysphagia is transient but it is related to cases who underwent 360-degree fundoplication due to postoperative edema and this was previously proved by^[17]

Symptomatic improvement in such cases was noticed especially on long-term follow-up. About 35% of patients still had postoperative complaints especially dysphagia and bloating. As regard Dysphagia, Vast majority of the cases

were transient and due to postoperative oedema. It is common for patients to experience mild dysphagia postoperative during first 2-4 weeks. Minor cases required readmission when they did not tolerate liquid swallowing .as regard Bloating, Fundoplication may lead to transient compression of vagus nerve so, patients become unable to blech. While eating or swallowing, areophagia may lead to gastric distension. This can lead to increased bloating and flatulence when patients are unable to release air from stomach. This incidence of postoperative dysphagia was lower than the described as it was reported that postoperative dysphagia was noticed in 70% of cases [18].

As regard Reflux Symptoms Regurgitation and heartburn were noticed in 3% of cases and it was not related to a certain type of fundoplication. However, it is reported in other studies that posterior fundoplication patients were able to obtain normal postoperative PH than those with anterior fundoplication [19].

However, none of the studied cases required re-exploration, 7.7% of patients - who developed severe postoperative dysphagia that they did not tolerate oral fluids- needed readmission. They only needed intravenous fluids, PPI and anti-edematous then for severe symptoms we needed to do upper endoscopy abut at least after 3 months.

Short term follows up of the studied cases and a 6 month follow up endoscopy was done to evaluate their conditions. Although it is known that recurrent hiatus hernia is the commonest cause of failure of anti-reflux surgery (Weber, Kanani et

al., 2019), short-term follow-up of the studied cases revealed recurrence in only 8% of the cases.

Upper endoscopy can evaluate the integrity of fundoplication and it was as follows:

Ideally constructed fundoplication: described by Jobe et al [20]. tight adherence to the scope, circumference of cardia less than 35mm, no cardiac dilatation and intra-abdominal location of the stomach. This is called (stacked coil appearance) this included 66% of cases.

Tight fundoplication: this may be concomitant with cases having persistent dysphagia, bloating or regurgitation. It may be either too long or too tight wrap or when no Bougie is introduced during fundop-lication. Distal oesophagus is tight and it may need oesophageal dilatation or re-operation. this was noticed in 16% of cases but none of them required re-operation

Loose fundoplication: Inadequate suture technique or insufficient mobilization of the stomach fundus may lead to loose fundoplication which was noticed in 9.7% of cases. The gastric mucosal folds are not adhered to the shaft of endoscope.

Recurrent hiatus hernia: in 8.3% of cases there was herniated pouch of the stomach near fundoplication. This is anatomical deviation from the desired postoperative configuration. This is contradicted with (Rosemurgy AS, et al.,) who reported faliure of antireflux procedure due to recurrent hiatus hernia in 50% of cases.

Classification of failed fundoplication [21]. by Horgan et al.,

Type of failure	Description
Type Ia	Both GEJ and fundoplication herniated above the hiatus
Type Ib	GEJ above the hiatus and fundoplication at the hiatus
Type II	Herniated stomach/greater curvature with GEJ and fundoplication below the hiatus
Type III	Wrong part (body) of the stomach used for fundoplication

Other findings: twisted fundoplication, Cameron ulcer, Barrett oesophagus, or gastric volvulus. Twisted fundoplication may be due to improper mobilization of gastric fundus. As regard Measuring effectiveness of round ligament reinforcement in antireflux surgery, Evaluating the impact of antireflux surgery depend on scales assessing reflux symptom severity, such as heartburn, regurgitation, or pain, together with the endoscopic appearance of the oesophageal mucosa and patient's perception of overall success. Twenty-four-hour pH monitoring, although useful in selected subjects is generally not used to assess therapeutic response. Pope first discussed the relevance of quality of life in the assessment of antireflux surgery in 1992 [22]. Health related quality of life (HRQoL) can be defined as the functional effect of an illness and its therapy on an individual.

The model of strengthening of a hiatal repair has been formerly described by Varga et al., In their studies which included 26 patients, subsequent efficacious posterior hiatoplasty accomplished by two methods laparoscopically and open techniques, the round ligament was used to support the hiatal repair [23]. Their data confirmed the method to convey minimal morbidity (11%) and mortality (0%) with a radiologic repetition of 15% at an average of 3 years follow-up.

Conclusion

Laparoscopic anti-reflux surgery is mandatory for hiatal hernia and GERD. A major concern of anti-reflux surgery is its technique. Because of recurrence observed of many cases, reinforcement of the hiatal defect by many ways is studied and practiced in many cases. Regarding use of synthetic mesh, it is still questionable whether to use or not. Many complications of mesh repair have been recorded nevertheless.

As adhesions, migration, fibrosis or perforation. In our study we used the round ligament of the liver to support and reinforce crural repair. We believe that in this study the use of the round ligament of

the liver not only support hiatal hernia repair by using its own tissue, but also the ligamentum teres which is fatty tissue is covered by the peritoneum from both sides. The round ligament support crural repair in addition it fills the posterior part to the oesophagus leaving no place for anterior weakness.

There is still superiority of using patient's own tissue for hiatal repair than using mesh repair. On the other hand, we have recorded few cases of recurrence in the study compared to previous studies 8%. We have noticed that using the round ligament reinforcement is completely safe, useful and cost-effective with no need for additional instruments than usual instruments used in the classic repair.

Postoperative symptomatic improvement was clearly noticeable with 35% of the cases having mild postoperative reflux symptoms and dysphagia which is reduced by time and required nothing more than anti-secretory drugs postoperatively.

Recommendations

This study recommends that all symptomatic hiatal hernia that did not respond to medical anti-secretory drugs should be repaired. But repair of type 1 hiatus hernia or asymptomatic cases is not recommended. Laparoscopic anti-reflux surgery for GERD and type 1 hiatus hernia has excellent long-term results. Although type 2 and 3 hiatus hernia repair results are controversial either regarding the incidence of recurrence or postoperative persistent symptoms. That's why a safe and strong method for repair is needed. Mesh repair has many disadvantages and risks.

To avoid the complications of using foreign material and at the same time achieve a strong repair if hiatal hernia, we used in this study the patient's own ligament teres as a reinforcement for hiatal closure.

Consequently, we have observed decrease of incidence of recurrence as well as postoperative symptomatic improvement. We recommend using the round ligament as a buttress for crural repair especially in

type 2,3 hiatal hernia and in secondary or recurrent cases.

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