

A SIMPLE METHOD TO AVOID POST-OPERATIVE DYSPHAGIA AFTER LAPAROSCOPIC NISSEN FUNDOPLICATION

By

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ABSTRACT

Background: Nowadays, in most surgical centers, Nissen fundoplication is the “gold standard” procedure for treatment of pathologic gastroesophageal reflux disease.

Objectives: Comparing between fixation of fundal wrap to esophageal musculature and to the phrenoesophageal membrane, in laparoscopic Nissen fundoplication, as regard its effect on post-operative dysphagia.

Patients and Methods: From May 2013 to December 2015, laparoscopic Nissen fundoplication was done for 49 patients for treatment of gastroesophageal reflux disease and/or hiatal hernia at New Damietta University Hospital. These 49 patients were randomly divided into two groups; (A) 24 patients underwent fixation of the fundal wrap to the esophageal musculature, and (B) 25 patients underwent fixation of the fundal wrap to the remaining part of the phrenoesophageal membrane over the abdominal part of esophagus.

Results: Pre-operative dysphagia was present in 16 patients (66.7%) in group A {12 moderate and 4 mild}, and 15 patients (60%) in group B {11 moderate and 4 mild}. Post-operative dysphagia developed in 12 patients (50%) in group A {one severe and 11 moderate}, all of them got better gradually during the follow up period except one which needed dilation, and 5 patients (20%) in group B were moderate and gradually got better during the follow up period. Post-operatively, there was a recurrence of GERD in 5 patients (20.8%) of group A {3 patients with grade 1 improved spontaneously, one patient with grade 2 improved with PPI treatment, and one patient with grade 3 necessitated reoperation}. As regard group B, there was a recurrence of GERD in 3 patients (12%) {2 patients with grade 1 improved spontaneously, and one patient with grade 2 improved with PPI}. As regard recurrence of hiatal hernia, there was one (4.2%) recurrence in group A, and no one in group B.

Conclusion: Success of surgical treatment of gastro-esophageal reflux disease and hiatal hernia will be achieved with good patient selection, correct choice of surgical procedure, and good quality performance of operation. Fixation of the fundal wrap to the phrenoesophageal membrane is preferable and good alternative to its fixation to muscle fibers of lower part of esophagus, as it decreased post laparoscopic Nissen fundoplication dysphagia and recurrence.

Keywords: Gastroesophageal Reflux, Hiatal Hernia, Laparoscopic Nissen Fundoplication, dysphagia.

Abbreviations: GERD, gastroesophageal reflux disease.

INTRODUCTION

There are about 36% of healthy persons suffer from heartburn at least once a

month, and that 7% experience uncomplicated GERD and symptoms of heartburn as often as once a day. It has been estimated that approximately 2% of the

adult population suffers from complicated GERD, associated with macroscopic or histologic changes of the esophagus. The incidence of GERD increases after the age of 40, and it is not uncommon for patients experiencing symptoms to wait years before seeking medical advice (**Vakil et al., 2006**).

Hiatal hernia can be caused by one or more of three mechanisms: widening of the diaphragmatic hiatus; esophageal shortening causing the stomach to 'pull' through the hiatus; and increased intra-abdominal pressure causes a pressure effect forcing the stomach through the hiatus. Given that up to 80% of power athletes can be seen to have a hiatus hernia, this third cause may be significant (**Corinne and Roger, 2013**).

In 1937 in Istanbul, **Rudolf Nissen** performed a transpleural cardia resection and protected the anastomosis within a gastric fold, since then, the idea of fundoplication to prevent gastroesophageal reflux was born. The first fundoplication without resection was performed in 1955, with a short publication appearing in 1956 (**Nissen, 1956**). Initially, Nissen's technique consisted of invagination of the esophagus into a sleeve of the gastric wall obtained from the upper portion of the stomach (**Dallemagne et al., 1991**).

Donahue and Bombeck, 1977 introduced the total wrap which is the most commonly practiced nowadays. The technique consists of full mobilization of the gastroesophageal junction and posterior fundus with division of the upper short gastric vessels and a crural repair. Nowadays, Nissen fundoplication is the "gold standard" procedure in most surgical centers to treat pathologic gastroesophageal reflux. The laparoscopic

approach has shown excellent results in patients with non-complicated reflux esophagitis and has replaced completely the open approach (**Catarci et al., 2004**).

Current evidence revealed that laparoscopic fundoplication is more effective than medical therapy for the short- and medium-term treatment of gastroesophageal reflux disease (**Anvari et al., 2011**). There are side effects of Nissen fundoplication such as dysphagia, increased bloating and flatulence, and inability to belch or vomit may limit the success of antireflux surgery. Patients may also need redo surgery to improve symptom control, or return to use of long-term medical therapy following recurrent symptoms (**Lundell, 2007**).

PATIENTS AND METHODS

From May 2013 to December 2015, a total of 49 patients underwent laparoscopic Nissen fundoplication for gastroesophageal reflux disease and/or hiatal hernia at New Damietta University Hospital. Inclusion criteria were GERD, hiatal hernia, residual symptoms while on medical therapy and endoscopic esophagitis after at least three months of intensive acid suppression therapy.

These 49 patients were divided into two groups; **(A)** 24 patients underwent fixation of the fundal wrap to the esophageal musculature and **(B)** 25 patients underwent fixation of the fundal wrap to the remaining part of the phreno-esophageal membrane over the abdominal part of esophagus.

Diagnosis of gastroesophageal reflux disease and/or hiatal hernia was based on clinical features, upper gastrointestinal endoscopy and Barium meal in trendlenburg position. Laparoscopic floppy Nissen fundoplication was performed by the 5-

ports technique. All patients received prophylactic antibiotic and some obese patients had prophylactic anticoagulation and compressive elastic stockings.

The operation was performed under general anesthesia with endotracheal intubation and the patient placed in the lithotomy position. The surgeon stand between the legs of the patient with surgical assistant at his right and on his left, the scrub nurse, or another assistant. In thin patients the surgeon stands on the right side.

Pneumoperitoneum was established. Intra-peritoneal pressure of 14 mmHg was allowed. The table was maintained in a head-up position. The first trocar (optical port) 10 mm, placed in the supra-

umbilical midline, at the junction of the upper two-thirds and lower one-third between the umbilicus and the xyphoid process. Visual inspection of the entire peritoneal cavity was carried out. Under direct vision, four other 5 mm ports were inserted, two in the midclavicular lines above the level of optical port, one in the left anterior axillary line, and one in the sub-xyphoid area.

After retraction of the left lobe of the liver, the lesser omentum was divided, beginning dissection in the pars flacida (**Fig.1**) and then above the hepatic branch of the vagus nerve in the pars condensa. The phrenoesophageal membrane is then divided in a transverse direction (**Fig.2**).



Figure (1): Dissection of Pars flacida.

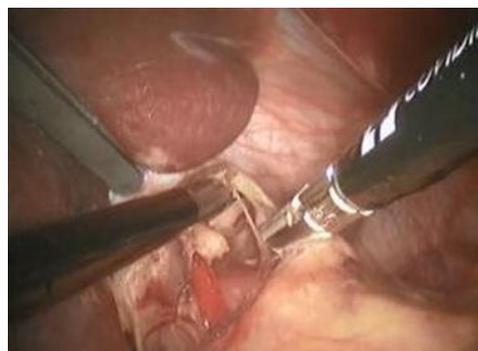


Figure (2): Dissection of phrenoesophageal membrane transversely.

Then, along the inner side of the right crus, the right esophageal wall was freed by dissecting the cleavage plane with vessel sealing device (**Fig.3**). The

cleavage plane between the left crus and the left aspect of the esophagus was freed (**Fig.4**).



Figure (3): Dissection of the cleavage plane between the right crus and esophagus.



Figure (4): Dissection of the cleavage between the left crus and the left aspect of esophagus.

Extending the dissection of the right diaphragmatic crus started the liberation of the posterior aspect of esophagus. A tap was passed posterior to the esophagus and held by the left sided assistant. The mediastinal dissection of the esophagus was completed and the esophagus now free from the pleura, the aorta and the crural muscles (**Fig.5**).

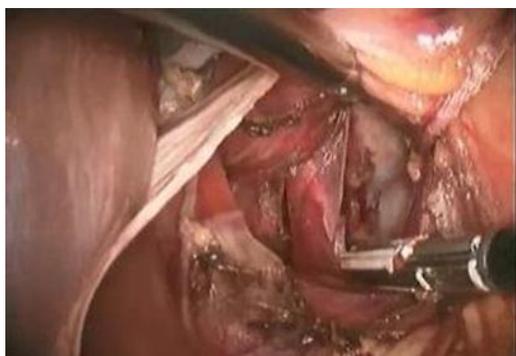


Figure (5): Clearance of posterior part of esophagus, the crura now ready for repair.

This dissection ends up when the left crus was reached after division of the gastro-phrenic ligament. The next step involved repair of the hiatal orifice; interrupted non-absorbable sutures were placed on the diaphragmatic crura (**Fig.7**). Calibration can be obtained with modeling the crural repair on the diameter of the esophagus, without traction on the GE junction, making the esophagus just kissing the crura.

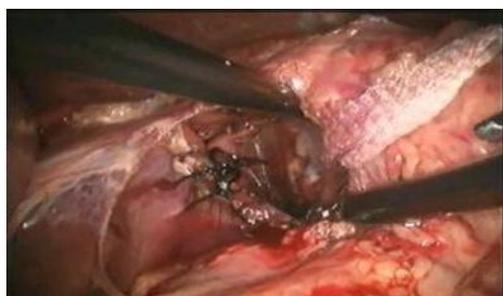


Figure (7): Crural repair.

This intramediastinal dissection must be extended to permit 3 to 4 cm of the lower esophagus to stay without traction in the abdomen, below the diaphragm. The following step was mobilization of the gastric fundus, this required division of the gastrosplenic ligament and the most cephalic short gastric vessels with vessel sealing device (**Fig.6**).



Figure (6): Division of the gastrosplenic ligament and the most cephalic short gastric vessels with vessel sealing device.

Then, creation of antireflux valve, an atraumatic forceps was passed behind the esophagus from right to left. It caught the posterior wall of the gastric fundus to the left of the esophagus and to pull it behind, forming the wrap. To calibrate the fundoplication, a large bore bougie can be passed down the cardia and shoe shine maneuver was done (**Fig.8**).



Figure (8): Shoe shine maneuver to calibrate floppy Nissen.

Interrupted non-absorbable sutures form and secure the wrap. This wrap was fixed to the esophagus by stitches (**Fig. 9**) this for group A, as regard group B; the wrap was fixed to the remaining part of the phrenoesophageal membrane over the abdominal part of esophagus (**Fig. 10**).

The final appearance of fundal wrap facing anteriorly to the right side of the patient with preservation of hepatic branch of anterior vagus nerve (**Fig. 11**). Drain was placed and removed after 24 hours. The ports were removed and its site closed with sutures.



Figure (9): Fixation of the wrap to the esophagus with a stitch in group A.



Figure (10): Fixation of the wrap to phrenoesophageal membrane in group B.



Figure (11): The final appearance of fundal wrap facing anteriorly to the right side with preservation of hepatic branch of anterior vagus nerve.

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using Microsoft Office Excell® 2010. The numerical data were presented as mean and standard deviations; while categorical data were presented as relative frequency and percent distribution. For qualitative data and quantitative data, Chi square (X^2) and student's (t) test were used respectively. P value < 0.05 was considered significant.

RESULTS

Forty nine patients were included in our study in New Damietta University Hospital, from May 2013 to December 2015, these patients underwent laparoscopic Nissen fundoplication for gastroesophageal reflux disease and/or hiatal hernia and divided into two groups; (**A**) 24 patients underwent fixation of the fundal wrap to the esophageal musculature and (**B**) 25 patients underwent fixation of the fundal wrap to the remaining part of the phrenoesophageal membrane over the abdominal part of esophagus.

The original number of patients was 53 patients, there were 4 patients could not be contacted and missed early during the follow up period (3 from group A and 1 from group B), their results were excluded and results of the remaining 49 patients were presented in our study.

The mean follow up period was 17.3 months (7-30 months). The mean age for group (A) was 36.6 years (20-50 years) and for group B was 38.2 years (22-50 years). There were 18 (75%) male patients and 6 (25%) female patients in group A, in group B; there were 17 (68%) male patients and 8 (32%) females. The mean operative time was 83.5 minutes (40-100 minutes) for group A and 83.8 minutes (41-106 minutes) for group B. Post-operative oral feeding was started after a mean time of 18 hours (8-24 hours) for group A and 17.56 hours (8-24 hours) for group B.

There was no mortality in both groups. Conversion was done due to severe adhesions in one patient (4.2%) in group A and in one patient (4%) in group B. Regurgitation was graded as: none = 0, mild = 1 (occasional after straining, large meal, or lying down), moderate = 2 (predictable with position change, straining, or lying down), severe = 3 (history of aspiration). Heartburn grades were: none = 0, mild = 1 (recognizable symptom, no prior history of medical treatment), moderate = 2 (primary reason for medical visit or medical problem), severe = 3 (constant, marked disability in activities of daily living). Dysphagia grades were none = 0, mild = 1 (occasional with coarse foods), moderate = 2 (require liquids to clear), severe = 3 (history of meat impaction necessitating medical attention).

Pre-operative regurgitation was present in 23 patients (95.8%) in group A {one severe (4.4%), 7 moderate (30.4%) and 15 mild (65.2%)} and 22 patients (88%) in group B {2 severe (9.1%), 9 moderate (40.9%) and 11 mild (50%)}, post-

operative it became mild in 3 patients (13.04%) in group A and mild in one patient (4.54%) of group B. Pre-operative heartburn was present in 22 patients (91.6%) in group A {2 severe, 8 moderate and 12 mild} and 21 patients (84%) in group B {one severe, 16 moderate and 4 mild}, post-operative it became mild in 2 patients (8.3%) in group A and mild in one patient (4%) of group B.

Post-operative disturbed belching ability and bloating were analyzed with degree of disturbance on a scale where: no change = 0, mild change = 1, moderate change = 2, and severe change = 3. As regard post-operative disturbed ability of belching, there were 18 patients (75%) of group A {15 patients (83.3%) spontaneous regression and 3 patients (16.7%) got better with antispasmodics} and 15 patients (60%) of group B {11 patients (73.3%) spontaneous regression and 4 patients (26.7%) got better with antispasmodics}. There were 17 patients (70.8%) of group A complaining of bloating post-operatively {14 patients with spontaneous regression and 3 patients got better with antifatulence} and 16 patients (64%) of group B {14 patients with spontaneous regression and 2 patients needed antifatulence}.

Post-operatively, there was a recurrence of GERD in 5 patients (20.8%) of group A {3 patients with grade 1, improved spontaneously, one patient with grade 2, improved with PPI treatment, and one patient with grade 3, necessitate reoperation}. As regard group B, there was a recurrence of GERD in 3 patients (12%) {2 patients with grade 1, improved spontaneously, and one patient with grade 2, improved with PPI}. As regard recur-

rence of hiatal hernia, there was one (4.2%) recurrence in group A, this patient had grade 3 GERD and necessitate redo surgery and no one in group B.

Pre-operative dysphagia was present in 16 patients (66.7%) in group A {12 moderate and 4 mild} and 15 patients (60%) in group B {11 moderate and 4 mild}. Post-operative dysphagia found in 12 patients (50%) in group A {one severe

and 11 moderate}, all of them got better gradually during the follow up period except one which needed dilation and 5 patients (20%) in group B were moderate and gradually got better during the follow up period. So, postoperative dysphagia was less for group B and required no intervention. Patients data were presented in table (1).

Table (1): Patients data.

	A (24)	B (25)	Test	P value
The mean age	36.6±8.4	38.2±8.6	0.66	0.51
Sex: Male	18 (75%)	17 (68%)	0.29	0.58
Female	6 (25%)	8 (32%)		
The mean operative time (min)	83.5 ±17.4	83.8± 16.9	0.06	0.95
Post-operative oral feeding (h)	18.0±4.4	17.56±4.6	0.34	0.73
Conversion rate	1 (4.2%)	4 (4%)		
Regurgitation				
Pre-operative:	23 (95.8%)	22 (88%)		
Severe	1 (4.4%)	2 (9.1%)	1.18	0.56
Moderate	7 (30.4%)	9 (40.9%)		
Mild	15 (65.2%)	11 (50%)		
Post-operative:				
Mild	3 (13.04%)	1 (4.54%)	1.18	0.27
Heartburn				
Pre-operative:	22 (91.6%)	21 (84%)		
Severe	2 (9.1%)	1 (4.8%)	6.98	0.03
Moderate	8 (36.4%)	16 (76.2%)		
Mild	12 (54.5%)	4 (19%)		
Post-operative:				
Mild	2 (9.1%)	1 (4.8%)	0.40	0.53
Dysphagia				
Pre-operative:	16 (66.7%)	15 (60%)		
Moderate	12 (75%)	11 (73.3%)	0.01	0.92
Mild	4 (25%)	4 (26.7%)		
Post-operative:	12 (50%)	5 (20%)		
Severe	1 (8.3%)	0 (0.0%)	0.4	0.51
Moderate	11 (91.7%)	5 (100%)		
Post-operative belching disturbance	18 (75%)	15 (60%)	1.25	0.26
Post-operative bloating	17 (70.8%)	16 (64%)	0.26	0.61
Recurrence of GERD	5 (20.8%)	3 (12%)		
Grade 1	3 (60%)	2 (66.7%)	0.75	0.67
Grade 2	1 (20%)	1 (33.3%)		
Grade 3	1 (20%)	0 (0.0%)		
Recurrence of hiatal hernia	1 (4.2%)	0 (0.0%)	1.06	0.30

As regard postoperative dysphagia, there was significant difference between the two groups; it was less with group B and necessitated no intervention.

DISCUSSION

Gastroesophageal reflux disease (GERD) is a chronic, relapsing disease that infrequently progresses (**Sontag et al., 2006**) but is associated with a range of potentially serious esophageal complications (esophageal ulcer, esophageal stricture or obstruction, Barrett's esophagus or esophageal cancer) and extra-esophageal diseases such as respiratory problems, chest pain, angina, and increased mortality (**Ruigomez et al., 2004**).

In large number of patients there is association between hiatal hernia with gastroesophageal reflux. Antireflux surgery emerged in the 1950s. It had a greater role when there is a defective lower esophageal sphincter (LES) with advanced and difficult-to-control disease. There has been a gradual advancement in surgical techniques and improvement in outcomes. The advent of laparoscopic technology has catalyzed renewed interest in the surgical treatment of GERD. Clinical studies of laparoscopic Nissen fundoplication documented successful relief of reflux symptoms in >90% of patients. As a result, laparoscopic Nissen fundoplication is positioned to become the standard of surgical care for patients with GERD (**Peters et al., 1998**).

There is a risk of short-term dysphagia in 10-40% following Nissen fundoplication (**Khan et al., 2010**).

In our study, as regard operative time and post-operative oral feeding, there was no statistical difference between both groups. As regard heartburn, regurgitation, disturbed belching ability, bloating,

recurrence of GERD and hiatal hernia, it occurred more frequently in group A.

Dysphagia was significantly less in group B, in which the fundal wrap was fixed to phrenoesophageal membrane and no other intervention required. The idea of the wrap is to create a high pressure zone and retain the bared lower part of esophagus intra-abdominally without overstretching to avoid dysphagia. Fixation of fundal wrap to muscle fibers of esophagus can be disrupted leading to displacement of the lower part of esophagus above the diaphragm resulting in recurrence. A phrenoesophageal membrane is tough layer and can hold sutures of fundal wrap fixation, preventing displacing the wrap and recurrence of GERD or hiatal hernia and can avoid postoperative dysphagia. Also, vagus nerve can be entrapped within the sutures which fix the wrap to the muscle fibers of esophagus.

When the wrap facing to the right side of the patient it means that; the posterior part of the gastric fundus is not too much twisted or stretched, so prevent disrupted wrap and recurrence, also prevent dysphagia.

Several reports studied the changes in GERD-related symptoms, endoscopic findings, radiological findings and the results of intraesophageal 24-h pH monitoring, and concluded that the effectiveness of laparoscopic Nissen fundoplication was 89.5%, with acceptable complication rates (**Seki et al., 2015**).

Kellokumpu et al. (2013) in their study revealed that, Long-term outcomes after laparoscopic antireflux surgery were examined in multiple domains including

symptom response, side effects of surgery, durability of the antireflux surgery, patient's subjective perception of the overall success of the operation, and quality of life. 5-year (88%) and 10-year (73%) cure rates compare well to other studies reporting long-term control of reflux in 74%-90% of patients.

Manning et al. (2006) found that 89.2% of patients were satisfied with the results of surgery. There was no mortality and their conversion rate of 1.8% compares favorably with existing data. Only three patients required esophageal dilation in the postoperative period, which may reflect very selective policy for crural approximation. One patient had persisting dysphagia unresponsive to dilatation, despite not having had crural approximation, and eventually underwent reoperation to take down the wrap.

After laparoscopic or conventional surgical correction of gastroesophageal reflux some complaints are common like postprandial bloating, difficulty on burp and vomit, and sometimes dysphagia. In most cases, dysphagia symptom is intermittent and tends to disappear within 30 days after the procedure, without the need for specific or new intervention (**Zilberstein et al., 2014**).

The new idea of fixation of fundal wrap to phrenoesophageal membrane is simple, feasible, do not alter the operation time and can decrease operative hazards. Success in the surgical treatment of gastroesophageal reflux disease and hiatal hernia depends on correct patient selection, correct choice of surgical procedure, and performance of a good quality operation. Fixation of the fundal wrap to the phrenoesophageal membrane

is preferable and good alternative to its fixation to muscle fibers of lower part of esophagus, as it decreases post Laparoscopic Nissen Fundoplication dysphagia and recurrence.

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طريقة بسيطة لتجنب عسر البلع بعد جراحة نيسين لتثنية قاع المعدة بالمنظار لعلاج إرتجاع المريء أوفتق الحجاب الحاجز

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خلفية البحث: تعتبر جراحة نيسين لتثني قاع المعدة هي الإختيار الأمثل لعلاج إرتجاع المريء وذلك في معظم المراكز الجراحية في هذه الأيام.

الهدف من البحث: المقارنة بين تثبيت تثنية قاع المعدة بالجزء الأسفل من عضلات المريء، أو تثبيتها بالغشاء المشترك بين الحجاب الحاجز والمريء في عملية نيسين لتثنية قاع المعدة ودراسة التأثير علي صعوبة البلع بعد العملية.

المرضي وطرق البحث: في الفترة من مايو ٢٠١٣ إلي ديسمبر ٢٠١٥، تم إجراء عملية نيسين لتثني قاع المعدة لتسعة وأربعون مريضاً يعانون من إرتجاع المريء و/أو فتق الحجاب الحاجز، بمستشفى دمياط الجامعي.

وقد تم تقسيم المرضي إلي مجموعتين: (أ) إشتملت علي ٢٤ مريض خضعوا لتثبيت تثنية قاع المعدة لعضلات المريء، و(ب) إشتملت علي ٢٥ مريض خضعوا لتثبيت تثنية قاع المعدة بالغشاء المشترك بين الحجاب الحاجز والمريء المتبقي علي الجزء البطني للمريء.

النتائج: وجد عسر البلع قبل العملية لدي ١٦ مريض (٦٦,٧%) في المجموعة (أ) (١٢ متوسط، ٤ بسيط) و١٥ مريض (٦٠,٠%) في المجموعة (ب) (١١ متوسط، ٤ بسيط). وجد عسر البلع بعد العملية لدي ١٢ مريض (٥٠%) في مجموعة (أ) (واحد شديد و١١ متوسط)، كلهم تحسّنوا بالتدريج خلال فترة المتابعة ماعدا مريض واحد فقد احتاج الي توسيع المريء. بالنسبة لمجموعة (ب) وجد عسر البلع بعد العملية لدي ٥ مرضي (٢٠%) بدرجة متوسطة وتحسّنوا بالتدريج خلال فترة المتابعة. وقد وجد إرتجاع في أعراض إرتجاع المريء لدي ٥ مرضي (٢٠,٨%) في المجموعة (أ) (٣ مرضي من الدرجة الأولى وتحسّنوا بصورة تلقائية بينما كان هناك مريض واحد من الدرجة الثانية تحسن باستخدام مثبطات مضخة البروتون ومريض من الدرجة الثالثة إحتاج إلي إعادة التدخل الجراحي). أما بالنسبة للمجموعة (ب) فقد وجد إنتكاس في أعراض إرتجاع المريء لدي ٣ من المرضي (١٢,٠%) (٢ من الدرجة الأولى تحسّنوا بصورة تلقائية ومريض من الدرجة الثانية تحسن باستخدام مثبطات مضخة البروتون). وبالنسبة لإرتجاع فتق الحجاب الحاجز، فقد وجد لدي مريض واحد (٤,٢%) بمجموعة (أ)، ولم يحدث إرتجاع فتق الحجاب الحاجز في المجموعة (ب).

الاستنتاج: نجاح الجراحة في علاج إرتجاع المريء وفتق الحجاب الحاجز يعتمد علي إختيار المريض بطريقة صحيحة وإختيار التدخل الجراحي المناسب والقيام بأداء الجراحة بدرجة عالية من الدقة. تثبيت ثنية قاع المعدة بالغشاء المشترك بين الحجاب الحاجز والمريء هي الطريقة المفضلة وتمثل بديل مناسب لتثبيت ثنية قاع المعدة لعضلات المريء حيث أنها تؤدي إلي تقليل حدوث عسر البلع و إرتجاع فتق الحجاب الحاجز.