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Laparoscopic revision surgery for gastroesophageal reflux disease

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Abstract

Laparoscopic antireflux surgery is a frequently performed procedure for the treatment of gastroesophageal reflux in surgical clinics. Reflux can recur in between 3% and 30% of patients on whom antireflux surgery has been performed, and so revision surgery can be required due to recurrent symptoms or dysphagia in approximately 3% to 6% of the patients. The objective of this study is to evaluate the mechanism of recurrences after antireflux surgery and to share our results after revision surgery in recurrent cases.

From 2001 to 2014, revision surgery was performed on 43 patients (31 men, 12 women) between the ages of 24 and 70 years. The technical details of the first operation, recurrence symptoms, endoscopy, and manometry findings were evaluated. The findings of revision surgery, surgical techniques, morbidity rates, length of hospitalization, and follow-up period were also recorded and evaluated.

The first operation was Nissen fundoplication in 34 patients and Toupet fundoplication in 9 patients. Mesh hiatoplasty was performed for enforcement in 18 (41.9%) of these patients. The period between the first operation and the revision surgery ranged from 4 days to 60 months. The most common finding was slipped fundoplication and presence of hiatal hernia during revision surgery. Revision fundoplication and hernia repair with mesh reinforcement were used in 33 patients. The other techniques were Collis gastroplasty, revision fundoplication, and hernia repair without mesh. The range of follow-up period was from 2 to 134 months. Recurrence occurred in 3 patients after revision surgery (6.9%). Although revision surgery is difficult and it has higher morbidity, it can be performed effectively and safely in experienced centers.

Abbreviations: GERD = gastroesophageal reflux disease, GI = gastrointestinal, PPI = proton pump inhibitors.

Keywords: antireflux surgery, gastroesophageal reflux disease, Nissen fundoplication, Toupet fundoplication

1. Introduction

The first trial of antireflux surgery was described by Rudolph Nissen in 1956, using total (360°) transabdominal fundoplication, which will be referred to with his name afterwards.[1] Since then, various technical details of total or partial (less than 360°) fundoplication have been suggested and the procedure has undergone many modifications. In 1963, André Toupet proposed a posterior partial (270°) fundoplication to obviate the postoperative dysphagia that may result from a total fundoplication.[2] With the advances in minimally invasive surgery, Dallemagne et al carried out the procedure of fundoplication successfully using the laparoscopic method in 1991.[3]

Since the early 1990s, laparoscopic interventions have almost completely replaced open antireflux procedures as gold standard techniques for the surgical treatment of gastroesophageal reflux disease (GERD). It is comparable to conventional open procedures with its low morbidity rates, faster recovery, lower cost, and long-term outcomes. In 10 years of postoperative follow-up, excellent symptomatic results were obtained with the rate of 90% to 95%.[4,5]

However, reflux recurrence occurs in between 3% and 30% of patients who have undergone fundoplication, and in approximately 3% to 6%, revision surgery is required due to recalcitrant and recurrent symptoms.[6,7] One advantage of laparoscopic operation is that it can be possible to carry out revision using laparoscopic intervention again in recurrent cases. Although the revision surgery is a complex operation and becoming more frequent; there have been only a limited number of studies on this issue, and a thorough assessment is crucial before treatment.[6,8–10]

The objective of the present study was to evaluate the mechanisms of recurrence after laparoscopic antireflux surgery, and to share results obtained with laparoscopic revision surgery. This study aims to share "what we have learnt" and "what we recommend."

2. Methods

2.1. Patient population

A total of 43 patients, 35 of these were referred to us from another clinic, who underwent revision surgery after failed fundoplication between 2001 and 2014 were included in this study. The study was approved by the Local Ethics Committee (Approval number: 2016–1260) and patient consent was obtained from all patients.

2.2. Perioperative evaluation

Patient data, including demographics, techniques of both first and the revision surgery, preoperative symptoms, the pattern of

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failure, perioperative morbidity, operative complications, duration of hospitalization, recurrence rates, recurrence period, and follow up were evaluated. The complaints and symptoms were classified using postoperative Visick score (Table 1).[11] As part of the preoperative assessment, all patients had a complete medical history/physical examination and preoperative endoscopy was also performed.

If nonerosive esophagitis was detected during preoperative endoscopic evaluation, modified Toupet fundoplication was performed. Nissen fundoplication was also preferred in patients with erosive esophagitis. All patients were evaluated regarding with symptoms existence and Visick score on the 1st, 6th, and 12th months following the operation. Upper gastrointestinal (GI) endoscopy was performed to all patients routinely 6 months after the operation. Then, Visick grade I–II patients were followed with annual upper GI endoscopy. The barium swallow study and esophageal manometry were only performed selectively in patients with Visick grade III and IV.

Patients were offered further revision surgery if suffering recurrent reflux symptoms, severe heartburn, and/or dysphagia despite maximum medical treatment. This study excluded the patients requiring reoperation following primary paraesophageal hernia repair.

2.3. Surgical technique

All of the operative procedures were performed by an experienced laparoscopic surgeon (AGT) in a standardized manner. Laparoscopic surgery was conducted using a standard 5-port technique (1 of them was Nathanson liver retractor) with the patient in reverse Trendelenburg position. Adhesions were invariably present between the left lobe of the liver and the stomach. Adhesiolysis was performed cautiously to avoid inadvertent injury to the gastric wall or excess bleeding from liver. Next, the right and left crus were dissected away from the esophagogastric junction for hiatal mobilization. The short gastric vessels were routinely divided by using a laparoscopic harmonic scalpel (Ultracision; Ethicon Endo-Surgery, Inc., Cincinnati, OH), if not done during the prior operation. Then, the esophagus was mobilized 3 to 4 cm intraabdominally without tension and a sufficient window was created posteriorly. If necessary, the esophageal hiatus was repaired using interrupted 2-0 silk sutures avoiding inferior vena cava and aorta. Laparoscopic Nissen fundoplication and hiatal hernia repair with or without synthetic mesh (Ultrapro; partially absorbable light mesh, Ethicon, Somerville, NJ) was carried out. In patients with whom mesh was used, a circular (oval) mesh was inserted and placed on the diaphragmatic surface (Fig. 1). ProTack (Tyco Healthcare, Norwalk, CT) was used for mesh fixation and the mesh was fixed on the posterior diaphragmatic surface as a safe area. The use of this device is dangerous for the anterior diaphragmatic area, since it may result in pleural and pericardial injuries. Furthermore, synthetic mesh should never be in contact with the esophagus since the esophagus is extremely sensitive to migration.

Table 1

Visick classification of upper gastrointestinal symptoms.

Grade	Characteristics
Grade I	No symptoms
Grade II	Minimal symptoms, no change in life style and no need to seek medical attention
Grade III	Important symptoms despite using PPI, several changes in life style, medical attention is required
Grade IV	Severe symptoms or worse despite using PPI

PPI = proton pump inhibitors.

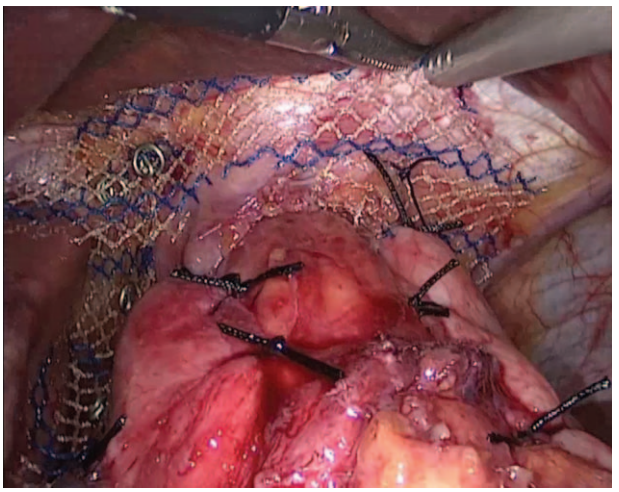

Figure 1. Mesh is fixed with ProTack on the posterior diaphragmatic surface.

2.4. Postoperative care

A fluid diet was begun on postoperative day 1. Patients were discharged on home if they tolerated the fluids. Instructions were given to slowly change their intake from pureed to normal food over the ensuing 3 weeks. They were allowed to resume full activity on discharge. Follow-up consisted of clinic appointments at 1 week, 1 and 6 months, and yearly thereafter. Diagnostic studies, such as barium swallow study or esophageal manometry were ordered in patients with Visick grade III and IV during follow-up.

2.5. Statistical analysis

All statistical data were analyzed with the use of Statistical Package for the Social Sciences version 16.0 for Windows (SPSS, Chicago, IL) software. The descriptive data were expressed as mean ± standard deviation.

3. Results

Forty-three patients (31 men and 12 women) with a mean age of 44.4 ± 10.3 years (range, 24–70) were included in this study between 2001 and 2014. The first operation was Nissen fundoplication in 34 patients (79%) and Toupet fundoplication in 9 patients (21%). Synthetic mesh hiatoplasty was also carried out in 18 patients (41.9%) in first operation. Preoperative symptoms and findings are shown in Table 2.

The mean time from first operation to the redo operation was 26.3 ± 14.14 months (range, 4 days to 60 months). The cause of redo surgery 4 days after operation was severe dysphagia. Primary surgery had been performed in our hospital in 8 (18.7%) and elsewhere in 35 (81.3%). The mean operation time was detected as 114.6 ± 20.5 minutes. Forty-one redo fundoplications were completed laparoscopically and only 2 were converted to laparotomy (conversion rate, 4.6%) because of dense adhesions

Table 2

Preoperative symptoms and findings.

	Number (%)
Symptoms	
Heartburn	28 (65.1%)
Heartburn and dysphagia	6 (13.9%)
Nausea	4 (9.3%)
Epigastric pain	4 (9.3%)
Dysphagia	1 (2.3%)
Findings	
Hiatal hernia and esophagitis	34 (79%)
Dysmotility	4 (9.3%)
Hiatal hernia	3 (6.9%)
Stenosis	2 (4.6%)

and failure to mobilize the esophagus via the laparoscopic method adequately.

Several causes of failure of the previous antireflux procedure were identified during subsequent operation (Table 3). Hiatal hernia occurred in 33 patients (76.7%). Slipped fundoplication was seen in 28 of these and malpositioned fundoplication was seen in others. In patients with malpositioned fundoplication, wrap was sutured mostly to large or small curvature or to the corpus of the stomach. The methods employed in the revision surgeries are outlined in Table 4. The most frequently performed operation was revision fundoplication and hiatal herniorrhaphy with mesh reinforcement (33 patients). The decision to suture the hiatal opening or remove the suture from the hiatus was given according to preoperative evaluation and intraoperative findings. In 2 patients (4.6%) sutures were removed due to hiatal narrowing and dysphagia. Collis gastroplasty was performed on these patients.

Pneumothorax occurred in 2 cases as an intraoperative complication. Postoperative complications for the redo operation were observed in 4 patients (9.3%), including pneumonia (n=3) and wound infection (n=1). There was no perioperative mortality. The median duration of hospital stay was detected as 2 days (range, 1 day from 5 days). The follow-up period range was from 2 to 134 months (mean, 63.27±34.11).

At 1 month postoperatively, 36 of 43 patients (83.7%) scored Visick I or II and 7 patients (16.3%) scored Visick III or IV. Three of these 7 patients had a second revisional surgery for further symptoms within 12 months; and when we analyzed these patient's redo operation notes, synthetic mesh was used in one of these patients. At 12 months postoperatively, other 4 patients' Visick score changed from Visick III to Visick II.

4. Discussion

Gastroesophageal reflux is a common problem worldwide. Since the extensive use of laparoscopic surgery for GERD in the 1990s, an increasing number of antireflux operations have been performed.[1,4,5] However, short- and long-term reflux recurrences following surgical treatment still remain a serious problem.[12] In the literature, long-term success rates up to 5 years after surgery are as high as 90%; but even operative failure and reoperative intervention for primary antireflux surgery range from 3% to 6%.[6–8,12–17] Despite the good results reported after laparoscopic fundoplication, a multicentric trial showed that 62% of the patients continued to use antireflux medications regularly after the surgery.[18] Postoperative proton pump inhibitors (PPI) dependence cannot be taken as the sole indicator of the recurrence, as many patients continue to take PPI preparations to relieve dysphagia, gas bloat, and other dyspeptic symptoms.[18,19]

Although preventive measures can be taken intraoperatively by an experienced surgeon to decrease the recurrence and failure rates following laparoscopic antireflux surgery, various diaphragm stressors may cause disruption of the crural closure.[16] With the primary closure of the diaphragmatic crus, repair in this dynamic area is uniformly exposed to tension. The diaphragm is constantly mobile with respiration, vomiting, laughing, and straining, and also high tension and mobility of the tissue can cause a disruption in these muscle bundles of the crura.[4,12] The most frequent pattern of fundoplication failure is anatomic, which includes wrap failure, hiatus failure, paraesophageal hernia, or slipped Nissen. The primary etiologies of recurrence remain crural breakdown and the short esophagus.[6,12,13,20] In reported series, wrap herniation with or without hiatal disruption was the most common intraoperative finding, observed in up to 54% at the time of the redo operation.[15,21,22] This may be the result of inadequate closure of the diaphragmatic crura or rupture of the crural sutures used to close the hiatal ring or disruption of the muscle fibers due to vomiting during the early or late period.[12,17] In the present study, this rate was also detected as 65.1%.

Both patient and technical factors may affect the endurance of the wrap or return of symptoms. These factors include an unexpected heavy burden on the diaphragmatic crura resulting from causes such as lifting heavy things, doing difficult sports and sportive exercises, chronic coughing, retching, postoperative gastric distention, degradation of silk sutures, misplaced wrap or creation of the wrap that is too loose or tight, and the lack of adhesions after a laparoscopic approach.[8,22]

The using of synthetic mesh for hiatal hernia repair in order to decrease recurrence rates was reported.[7,23,24] In fact, less than half of the patients (n=18, 41.9%) were found to have been treated with synthetic mesh application in this series. In our opinion, the problems observed in patients referred to us from other clinics with technical problem related to mesh application might in fact have occurred in first operation. We preferred light mesh with large pores (Ultrapro; partially absorbable light mesh, Ethicon) in revision surgery. The applying and suturing of this

Table 3

Intraoperative findings (causes of failure).

Findings	n (%)
Slipped fundoplication and hiatal hernia	28 (65.1%)
Malpositioned fundoplication and hiatal hernia	5 (11.6%)
Loose fundoplication	4 (9.3%)
Slipped fundoplication	3 (6.9%)
Tight cruroplasty	2 (4.6%)
Tight fundoplication	1 (2.3%)

Table 4

Redo operation types.

Operation	n (%)
Revision fundoplication and mesh reinforced hiatal herniorrhaphy	33 (76.7%)
Revision fundoplication alone	3 (6.9%)
Revision fundoplication and crus suturing	3 (6.9%)
Removal of suture from cruroplasty	2 (4.6%)
Collis gastroplasty (open method)	2 (4.6%)

mesh was easy due to its large pores. We placed it circumferentially on the hiatus and at least 1 cm away from the esophagus. Although erosive complications due to polytetrafluoroethylene mesh have been reported in literature, no complications related to using mesh occurred in our study.[25,26]

The recurrence of hiatal hernia occurs most commonly with wrap herniation as mentioned before. In the present study, herniation occurred most frequently from the posterior and to the left of the wrap. Since the liver is adjacent to the right crus and there is no place for elongation but to the left, the crus is slightly more semicircular and may lengthen. To prevent wrap herniation in the anterior and posterior areas, superficial sutures were inserted between the muscular layer of the esophagus and the wrap. The wrap was also fixed to both the crura and right posterior with sutures. In the present study, no serious complication occurred in long-term follow up except for temporary dysphagia in 3 patients (6.9%) who underwent 360° fundoplication.

Redo surgery after failed antireflux procedure is a complex operation with more technically demanding than primary fundoplication. Also, reoperative procedures have a higher morbidity, mortality, and complication rates, and symptomatic outcome is less satisfactory than primary antireflux surgery. In a systematic review of the literature, Furnée et al[27] reported intra- and postoperative complication rates of 21.4% and 15.6%, respectively. Conversion from laparoscopic redo surgery to open surgery is comparable with primary antireflux surgery, ranging from 3% to 8.7%.[15,27] Our conversion rate of 4.6%, because of dense adhesions and failure to mobilize the esophagus, was similar to other series.

Therefore, a thorough patient evaluation and workup is necessary before revisional surgery. In the light of our experience with redo surgery, the following points should be considered during antireflux surgery: the fundus should be completely released by cutting short gastric vessels, the exposure of his angle; there should be adequate mobilization of the esophagus, which should be pulled intraabdominal by at least 3 cm; full closure of the crus should be achieved; and relating to the use of mesh, close attention should be paid to correct formation and fixation of the wrap. Furthermore, our success rate in revision surgery stands at 93%, which is comparable to primary surgery success rates in literature (90–95%).[7,14,28]

In conclusion, revision surgery is a difficult and risky process with higher rates of morbidity than primary surgery, but it can be carried out efficiently and safely by experienced hands in dedicated centers.

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