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A Clinical Comparison of Laparoscopic Nissen and Toupet Fundoplication for Gastroesophageal Reflux Disease

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Abstract

Aim: To compare the advantages and disadvantages of laparoscopic Nissen and Toupet fundoplication in the treatment of gastroesophageal reflux disease (GERD) and their indications.

Patients and Methods: From June 2001 to December 2011, 383 patients with GERD were randomized into two groups according to the last number in their hospitalization number. Overall, 215 patients underwent laparoscopic Nissen fundoplication, and 168 underwent laparoscopic Toupet fundoplication.

Results: No conversions to laparotomy or deaths were observed, and the symptoms disappeared completely postoperatively in both groups. Average follow-up was 5.6 years. No recurrence of symptoms was observed in the Nissen group. Eighteen patients experienced recurrence of symptoms in the Toupet group and were administered acid-suppressing drugs. Esophageal manometry and acid reflux testing were performed 4 months postoperatively, with normal results in both groups. The cure rate of esophageal inflammation was 88.4% in the Nissen group and 67.7% in the Toupet group. Four days postoperatively, the incidences of dysphagia and abdominal distension were significantly higher in the Nissen group compared with the Toupet group (28.4% and 16.7%, respectively); the difference between the two groups significantly decreased 1 year postoperatively (1.5% and 0.8%, respectively).

Conclusions: In the short term, the incidence of dysphagia was significantly lower after Toupet fundoplication, but the difference decreased significantly with extension of the postoperative recovery period. For patients with moderate to severe GERD, the laparoscopic Nissen fundoplication may be optimal; for elderly patients or for patients with significantly reduced esophageal peristalsis detected in preoperative examinations, the laparoscopic Toupet fundoplication should be considered.

Introduction

Laparoscopic fundoplication is a surgical procedure mainly used for gastroesophageal reflux disease (GERD). It can improve the patient's symptoms by forming an antireflux valve in the lower esophagus. The advantage of fundoplication is that it improves esophageal function without resection of any tissue. The characteristics of GERD are as follows: it seriously affects the quality of life of patients, but it is not life-threatening; most patients are relatively young; and it can be fully or partially controlled in most patients by medication, although a small number of moderate to severe patients must undergo surgical treatment. Therefore, it is required that the surgical treatment should be effective, durable, and safe and cause little suffering. Laparoscopic fundoplication meets the above criteria, as it significantly reduces postoperative pain and shortens the hospital stay and postoperative recovery time by combining a minimally invasive surgical approach with traditional fundoplication. However, because there are many surgical procedures, selection of the appropriate technique has always perplexed clinicians. For this purpose, our medical center compared the surgical results of the Nissen and Toupet fundoplication procedures and conducted follow-ups. Our findings are summarized in this report.

Patients and Methods

General information

From June 2001 to December 2011, laparoscopic fundoplication was performed on 383 patients with severe GERD in our hospital. The 383 patients included 194 men and 189

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women, 34–82 years of age, with an average age of 56.3 years. In total, 266 patients had uncontrolled symptoms after systematic medication for more than 1 year or recurrence after withdrawal. The 383 patients were randomized into two groups according to the parity of the last number in their hospitalization number. Overall, 215 patients underwent laparoscopic Nissen fundoplication, and 168 patients underwent laparoscopic Toupet fundoplication.

Preoperative examination and diagnosis

Routine 24-hour esophageal manometry and pH monitoring were performed before the operation. The extent of reflux was graded according to the DeMeester score calculated by computer software: 50–100 was considered moderate, and >100 was considered severe. There were 93 patients with moderate reflux and 37 patients with severe reflux in the Nissen fundoplication group (122/215 [56.7%]). The mean esophageal pressure was 8.9 mm Hg (1 mm Hg = 0.133 kPa) among the moderate reflux patients and 6.8 mm Hg among the severe reflux patients. The DeMeester scores on 24-hour pH monitoring were 85.8 and 195.8, respectively, in the moderate and severe reflux patients. There were 75 patient with moderate reflux and 93 patients with severe reflux in the Toupet fundoplication group (the severe reflux patients accounted for 55.3%). The mean esophageal pressure was 8.8 mm Hg among the moderate reflux patients and 6.7 mm Hg among the severe reflux patients. The DeMeester scores on 24-hour pH monitoring were 87.2 and 194.1, respectively, in the moderate and severe reflux patients.

Follow-ups

Follow-ups included querying the patients about the improvement of symptoms and the occurrence of acid reflux, abdominal distension, and dysphagia, etc., every month after the operation. Gastroscopy, lower esophageal manometry, and 24-hour pH monitoring were performed 4 months postoperatively.

Techniques

In both procedures, the abdominal esophagus was freed, then the left and right crura of the diaphragm in the rear of the abdominal esophagus were sutured with one or two stitches, and the esophageal hiatus was closed. In order to ensure adequate patency of the esophagus, we ensured that there was a distance of 1.0 cm between the esophagus and the uppermost suture. In Toupet fundoplication, a 270° fundoplication was formed in the lower esophagus, and the gastric fundus and both sides of the esophagus were secured with two or three stitches, respectively. In Nissen fundoplication, a 360° fundoplication was formed in the lower esophagus, and two or three stitches were placed for securing in the order of fundus–esophagus–fundus.

Regarding the tightness standard, we ensured that the esophagus was freed enough to allow the wrapped fundus to slide up and down and that a grasping forceps could pass between the wrapped fundus and the esophagus.

Results

In the Nissen fundoplication group, the operation time was 70–110 minutes, with an average of 68.2 ± 3.8 minutes. Intraoperative blood loss was 30–150 mL, with an average of 55 mL. The mean length of hospital stay was 3.8 days. In the Toupet fundoplication group, the operation time was 82–125 minutes, with an average of 71 ± 2.9 minutes. Intraoperative blood loss was 40–135 mL, with an average of 58 mL. The mean length of hospital stay was 4.2 days. No conversions to laparotomy or deaths were observed in either group.

Improvement of symptoms

In both groups, symptoms disappeared completely after operation. Follow-up lasted for 0.3–11.5 years, with an average of 5.6 years. No recurrence of symptoms in the Nissen group was observed, whereas in the Toupet group, 18 patients experienced recurrence of acid reflux 2 years after the operation. These patients were administered acid-suppressing drugs.

Improvement of objective indicators

In the Nissen group, prior to the operation, 101 patients had grade II and 114 had grade III esophageal inflammation; 4 months after the operation, 45 patients had converted to grade 0, 67 patients to grade I, and 68 patients to grade II (the cure rate was 88.4%), as confirmed by postoperative gastroscopy. In the Toupet group, prior to the operation, 72 patients had grade II esophageal inflammation, and 94 had grade III; 4 months after the operation, 34 patients had converted to grade 0, 47 patients to grade I, and 33 patients to grade II (the cure rate was 67.7%). The changes in esophageal manometry and 24-hour pH monitoring 4 months before and after the operation are shown in Table 1. In both groups, significant differences existed between the values of pre- and postoperative esophageal manometry and 24-hour pH monitoring. No significant differences were observed compared with normal values.

Postoperative dysphagia and abdominal distension

The patients began eating 4 days after the operation. The incidences of dysphagia and abdominal distention 3 months and 1 year after the operation are shown in Table 2. Early after the operation the incidences were higher in the Nissen group compared with the Toupet group, but the difference between the two groups was significantly decreased with extension of the postoperative recovery period.

Table 1. Pre- and Postoperative Results of Esophageal Manometry and 24-Hour pH Monitoring in the Nissen and Toupet Fundoplication Groups

	Esophageal manometry (LESP) (mm Hg)	*24-hour pH monitoring (DeMeester score)*
Nissen group		
Preoperative	7.36 ± 1.42	181.16 ± 92.73
Postoperative	18.28 ± 3.43[a]	8.04 ± 2.12[a]
Toupet group		
Preoperative	7.52 ± 1.36	163.42 ± 72.34
Postoperative	15.94 ± 2.96[b]	9.5 ± 2.66[b]
Normal value	22 ± 6.12	7.36 ± 3.76

[a]In the Nissen group, compared with the preoperative value, $P < .01$.

[b]In the Toupet group, compared with the preoperative value, $P < .01$.

LESP, lower esophageal sphincter pressure.

Table 2. Incidence of Postoperative Dysphagia and Abdominal Distension in the Two Groups

	Postoperative		
Fundoplication	*4 days*	*3 months*	*12 months*
Nissen group	27.9 (60/215)	13.9 (30/215)	1.4 (3/215)
Toupet group	16.7 (28/168)	11.3 (19/168)	0 (0/168)

Data are percentages (cases).

Discussion

Since the first laparoscopic fundoplication was performed in 1991, this surgical procedure has gradually become popular in Europe and North America. The safety and efficacy of this procedure have been demonstrated by a significant amount of clinical practice. It has been generally accepted that laparoscopic fundoplication is the gold standard in the treatment of moderate to severe GERD.[1–3] However, complications such as early postoperative dysphagia and abdominal distension have always been complex problems for physicians, and incidences of 69%[4] and 10%,[5] respectively, were reported. Anatomical factors that cause dysphagia include a tight and long antireflux valve, sliding of the antireflux valve into the mediastinum due to the presence of a short esophagus, and suturing of the crura of the diaphragm too tightly. At present, the building of a short and loose antireflux valve is advocated. Nevertheless, it has been reported that the incidence of postoperative dysphagia remains at 20%–40%.[6] Some experts believe that the separation of short gastric vessels can loosen the antireflux valve, thus reducing the incidence of postoperative dysphagia. However, several studies have shown that the separation of short gastric vessels has no effect on the incidence of dysphagia.[7] The most likely cause for postoperative dysphagia is the compression of the distal esophagus by the antireflux valve, which results in mechanical obstruction and limits the opening of the lower esophageal sphincter, thus delaying the emptying of food. Esophageal peristalsis can usually overcome obstruction and allow the transport of food into the stomach. However, severe GERD is usually associated with reduced esophageal peristalsis; thus it is believed that patients with reduced preoperative esophageal peristalsis tend to experience postoperative dysphagia.[8] Some experts believe that the 270° wrap in Toupet fundoplication can reduce the incidence of postoperative dysphagia and abdominal distension.[9,10] However, many experts doubt the persistent effect of Toupet fundoplication on controlling acid reflux.[11]

Operation and recovery time

In Toupet fundoplication, the gastric fundus and both sides of the esophagus were secured, respectively; therefore, operation time was slightly longer than that of the Nissen fundoplication surgery. No significant difference in the postoperative recovery time between the two groups was observed, and no conversions to laparotomy or deaths occurred in either group.

Operation effect

Large numbers of comparative studies have been conducted on the effects of laparoscopic Nissen and Toupet fundoplication. Some studies have demonstrated that both procedures could effectively offer short-term control of reflux, but Toupet fundoplication was more effective and persistent than Nissen fundoplication.[12–16] Studies have also demonstrated that Toupet and Nissen fundoplications shared a similar effect and persistence.[17,18] The present study revealed that both procedures could effectively offer control of reflux and that esophageal manometry and acid reflux testing performed 4 months after the operation had normal results in both groups. The cure rate of esophageal inflammation 4 months after the operation was slightly higher in the Nissen group than in the Toupet group. No recurrence of symptoms in the Nissen group was observed, whereas 18 patients experienced recurrence of symptoms in the Toupet group; these patients were treated with acid-suppressing drugs. Therefore, we believe that the effect of Toupet fundoplication may be less persistent.

Incidence of postoperative dysphagia and abdominal distension

Most experts think that the incidence of postoperative dysphagia is significantly lower in Toupet fundoplication than in Nissen fundoplication,[19,20] whereas some experts believe that there is no significant difference between the two. The present study revealed that the incidence of early postoperative dysphagia was significantly lower in the Toupet group than in the Nissen group; however, the difference decreased gradually with the extension in postoperative recovery time. According to the results of this study, it was preliminarily concluded that Toupet fundoplication offered a less persistent effect than Nissen fundoplication, but with a significantly lower incidence of dysphagia than Nissen fundoplication. In addition, the difference between the two techniques in the incidence of dysphagia became nonsignificant with the extension of the postoperative recovery time. Therefore, for patients with moderate to severe GERD, Nissen fundoplication should be considered; for elderly patients, or patients with significantly reduced esophageal peristalsis detected in preoperative examinations, Toupet fundoplication should be considered.

A larger amount of data from cases is needed, as is the accumulation of a greater number of experiences, to select an appropriate surgical procedure for different patients in order to achieve a satisfactory effect and reduce surgical complications.

Disclosure Statement

No competing financial interests exist.

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