ORIGINAL ARTICLE

IS IT IMPORTANT TO DIVIDE THE SHORT GASTRIC VESSELS DURING LAPAROSCOPIC NISSEN FUNDOPLICATION?

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Abstract

Summary/ Background Data: Laparoscopic Nissen Fundoplication (LNF) is the most common antireflux operation and can be performed with or without short gastric vessels division (SGVsD). Some series claimed that SGVsD minimizes postoperative dysphagia, bloating and inability to belch, while others found similar outcomes without SGVsD.

Objective: This study evaluates the symptomatic and physiologic outcomes among patients with gastroesophageal reflux disease (GERD) who underwent LNF with or without SGVsD.

Design: Retrospective case series.

Setting: Mansoura Gastroenterology Surgical Center, Mansoura University, Egypt.

Methodology: Between January 2002 and January 2010, 250 patients (155 males, 95 females) with a mean age of 35+10 years with typical symptoms of Gastro-esophageal reflux disease (GERD), adequate motility study and positive 24-hour pH studies underwent LNF; 195 (78%) had a satisfactory wrap after careful and complete fundal dissection without the need for SGVsD while, 55 (22%) had SGVsD for better creation of a floppy wrap. One hundred and eighty patients (150 without division and 30 with) agreed to come for reassessment (at least 3 years between their operation and date of contact). Outcome measures included assessment of the relief of the primary symptom responsible for surgery, repeated endoscopy, barium study, 24-hour pH metry and the lower esophageal sphincter (LES) manometry.

Results: In June, 2012 we started to contact all patients (250 cases). By February, 2013 we could contact 180 patients (150 without division and 30 with) agreed to come for reassessment (at least 3 years between their operation and date of contact). Division of the short gastric vessels prolonged the mean operative time (115±50 vs 90±40 minutes). Relief of the primary symptom responsible for surgery was achieved in 93.3% of patients with division and 90% of patients without. Recurrent attacks of abdominal distension were documented in 3 patients (10%) with division and 14 patients (9.3%) without division. Occasional Dysphagia not present before surgery occurred in 35 patients (19.4%) at 3 months; 7 (23.3%) with division and 28 (18.7%) without, and decreased to 14 patients (7.8%) on late follow up; 3 (10%) with division and 11 (7.3%) without (four cases had endoscopic dilatation; two with division and two without). Endoscopic esophagitis healed in 28 of 30 patients (93.3%) with division and 142 of 150 patients (94.7%) without. LES pressures had returned to normal in all patients except 3 cases; one with division and 2 without with a mean pressure (17.8mmHg

among those with division and 19.1 mmHg among those without) and relaxation (87.5% with division and 84.5% without) nearly similar. 24-hour esophageal acid exposure had returned to normal in 28 of 30 patients (93.3%) with division and 140 of 150 patients (93.3%) without. Five cases were reoperated upon: 3 with no division; one with tight wrap and 2 with recurrent reflux and wrap migration while, the other 2 cases had division; both had recurrent reflux.

Conclusions: Construction of a satisfactory loose complete wrap was possible without the need for SGVsD in about 78% of patients. SGVsD lengthens the procedure, adds complexity and expense without adding more for the operative outcome. We believe it is unnecessary to divide the short gastric blood vessels routinely during LNF.

Keywords: Short Gastric Vessels, Laparoscopic Nissen Fundoplication.

INTRODUCTION

The majority of GERD patients have mild symptoms requiring only occasional treatment. However, a minority has persistent symptoms refractory to medical management and may go on to develop significant complications. This latter group initiated the interest in minimal access surgical approaches to treatment pioneered in the early 1990s.[1]

Many clinical studies of LF documented successful relief of reflux symptoms in more than 90% of patients. As a result, LF is positioned to become the standard of surgical care for patients with GERD. Further, its popularity has significantly increased the number of patients referred for surgical therapy.[2,3]

Despite the great progress in the field of laparoscopic fundoplication (LF), there is a small cohort of patients with persistent dysphagia or recurrent reflux in all published series.[4,5] This fact has driven the need for a careful assessment of what can be accomplished with this maturing procedure. LF failure is associated with technical shortcomings, large hiatal hernias, and early postoperative vomiting, which should be prevented as much as possible.[6] Full esophageal mobilization, meticulous closure of the diaphragmatic crura posterior to the esophagus, and satisfactory fundic mobilization should minimize anatomic functional failure after LF.[7]

However, up till now, argument has intensified about whether the short gastric vessels should be divided to allow full fundal mobilization, or whether an anterior wall complete fundoplication constructed without SGVsD can achieve equally low rate of postoperative dysphagia or other adverse outcomes.[8] Because good results have been published following series of LF, performed with and without SGVsD, it has been difficult to resolve from the evidence of uncontrolled case series whether division of these vessels is necessary.[9]

This study is designed to evaluate the possibility of creating a floppy wrap without the need for SGVsD, a factor that has consistently been underestimated in previous publications. It also helps us to determine whether SGVsD makes a difference as regard clinical and / or physiologic outcome among GERD patients who undergo LNF.

PATIENTS AND METHODS

Study population

Between January 1997 and January 2010, 250 consecutive patients underwent LNF; 195 (78%) were possible after complete fundal dissection, without the need to divide the short gastric vessels, to create a satisfactory wrap (120 males and 75 females with mean age 37±10 SD years) while, 55 (22%) had SGVsD for fear of tension or torsion of the esophagus during creation of a floppy complete wrap (35 males and 20 females with mean age 35±9 SD years).

Preoperative assessment

Preoperatively, the patients had primarily experienced daily heartburn and regurgitation. All patients had received medical treatment up to proton pump inhibitors for at least 6 months with improvement of the symptoms during treatment but early recurrence after discontinue. The mean duration of symptoms was 3 years (range 6 months to 9 years). Barrett's esophagus with intestinal metaplasia (but without severe dysplasia) was diagnosed in only 3 patients.

All patients underwent a thorough preoperative assessment beside the clinical evaluation; upper gastrointestinal endoscopy, barium study, esophageal manometry and ambulatory 24-hour pH monitoring were performed.

The diagnosis of esophagitis was made by endoscopy and its severity was graded according to modified Savary-Miller classification. Barium study was done in both prone and Trendelenburg positions with the use of provocative tests as straining and water siphon test to detect the degree of reflux. Esophageal manometry was carried out with an eight-lumen sidehole catheter using

the classic withdrawal technique; a mechanical sphincter defect was defined as an average resting pressure < 8 mmHg and/or length of the intraabdominal LES zone < 2 cm. An ambulatory digitrapper was used to perform 24-hour pH testing; the pH probe was positioned 5 cm above the position of the LES, as determined earlier by manometry. The data were collected using De-Meester score; gastroesophageal reflux was considered as a drop in esophageal pH below 4 and the percentage reflux in 24 hours was calculated for each patient. All patients were asked to stop any antireflux medication for one week before pH monitoring.

Operation

All patients had LNF. If a satisfactory wrap was possible after careful and complete fundal dissection, no division of short gastric vessels was needed. Sometimes, it was better to divide the short gastric vessels to create a floppy wrap without tension or torsion of the esophagus; the gastrosplenic ligament is exposed by countertraction, using a second forceps, isolated with a dissector, doubly clipped and divided or recently better by using the Harmonic scalpel. Complete mobilization of the fundus is achieved by division of some or all the short gastric vessels.

Postoperative care

Oral intake started on the second day in nearly all cases; the patients started on fluid diet and discharged home on the third postoperative day if they were tolerating the diet. Patients were given instructions slowly to change their food over the ensuing 3 weeks. They were allowed to resume full activity on discharge.

Postoperative evaluation

In June, 2012 we started to contact all patients (250 cases). By February, 2013 we could contact 180 patients (150 without division and 30 with) agreed to come for reassessment (at least 3 years after the date of their operation). Patients were contacted at first by letters sent for each (135 accepted to come) and second by phone (45 accepted to come). Patient satisfaction with surgery was documented. Any persistent or recurrent symptom and its severity were recorded. Repeated upper endoscopy, barium study and postoperative physiologic studies, consisting of esophageal motility and pH metry were performed in these 180 patients (150 without division and 30 with).

Statistical analysis

All values are expressed as mean. Paired values were compared with Student's t-test. $P < 0.05$ was considered statistically significant.

RESULTS

All patients were admitted to the hospital the day before surgery. No conversion to open laparotomy in our series. There were no significant complications or deaths. Hospital stay averaged 3±1 days (range 1-6 days). Operative time was prolonged with division of the short gastric vessels (115±50 vs 90±40 minutes) ($p<0.05$).

Postoperative assessment

In June, 2012 we started to contact all patients (250 cases). By February, 2013 we could contact 180 patients (150 without division and 30 with) agreed to come for reassessment:

Clinical assessment (Tables 1,2)

All patients had daily symptoms before surgery. The primary symptom responsible for surgery (heartburn) was relieved in 28 of 30 patients (93.3%) with division and 135 of 150 (90%) without ($p>0.05$). Regurgitation was persistent in 2 patients with division (6.7%) and persistent in 12 (8%) without ($p>0.05$) (Fig. 1).

Occasional dysphagia not present before surgery occurred in 35 patients immediately postoperative; 7 (23.3%) with division and 28 (18.7%) without. This figure is improved with late follow-up and decreased to 14 (7.8%) patients; 3 (10%) with division and 11 (7.3%) without ($p>0.05$). Five cases developed marked dysphagia proved by an endoscopic and radiological stricture; 2 with division (had endoscopic dilatation with great response) and 3 without (2 had endoscopic dilatation with great response while the other was re-operated upon) (Fig. 2).

When asked, 40 patients (22.2%) reported occasional symptoms of abdominal distension immediately postoperative; 7 (23.3%) with division and 33 (22%) without and decreased to 17 (9.4%) with late follow-up; 3 (10%) with division and 14 (9.3%) without ($p>0.05$). These patients required no further treatment but anti-flatulent (Fig. 2).

Endoscopic assessment

Erosive esophagitis was documented among 228 patients (91.2%) before surgery. It was resolved in 28 of 30 patients (93.3%) with division and 142 of 150 patients (94.7%) without. Postoperative lower end esophageal stricture was documented in 5 cases; two (6.7%) with division (both had Barrett's esophagus) and 3 (2%) without division (one of them had redo surgery) (Fig. 3).

Radiological assessment

Esophageal reflux detected by barium study was detected among 212 patients (84.8%) preoperatively. Radiological results were nearly, similar to the endoscopic findings. Persistent reflux was documented in 7 cases; two (6.7%) with division and 5 (3.3%) without. Also, stricture was detected in another 5 cases; two with division (Barrett's esophagus) and 3 without (Fig. 4).

Esophageal motility study

LES pressure had returned to normal in all patients (in both groups) except 3 patients: one with division and 2 without. Both groups had nearly similar mean LES pressure (17.8 with division and 19.1 without) and relaxation (87.5% with division and 84.5% without) ($p>0.05$) (Fig. 5).

24-hour esophageal pH study

Esophageal acid exposure had returned to normal in 28 of 30 patients (93.3%) with division and 140 of 150 (93.3%) without. The mean score had significantly reduced in both groups; (56.3 to 19.1 De-Meester score) in patients with division and (54.7 to 18.2 De-Meester score) in patients without ($p>0.05$) (Fig. 6).

Re-Operation Up

Three cases without short gastric division (2%) were re-operated upon. The first was a male patient aged 40 years old who developed a marked postoperative dysphagia proved by a tight endoscopic and radiological stricture; he was explored 3 weeks postoperative with division of the short gastric vessels and refashioning of the tight wrap into a floppy one. The second and third were females aged 45 and 37 years old who developed persistent heartburn with severe esophagitis and migration of the wrap upward; both received repeated courses of proton pump inhibitors with a little improvement. Finally, they were explored 2 and 2.5 years respectively postoperative with satisfactory mobilization of the esophagus, perfect repair of the hiatus, division of the short gastric vessels and refashioning of the wrap into a floppy complete one. On late follow up, the 3 cases had satisfactory symptomatic and physiologic outcome. Another 2 cases (6.7%) with division were re-operated upon one and 2 years postoperative due to recurrent severe reflux with wrap migration upward. Both underwent refashioning of the wrap with satisfactory results on late follow up.

Table 1. Clinical Assessment.

Data	-Ve*				+Ve**			
	Pre-op.		Post-op.		Pre-op.		Post-op.	
	No.	%	No.	%	No.	%	No.	%
Heart burn	195	100	15	10	55	100	2	6.7
Regurgitation	45	23.1	12	8	15	27.3	2	6.7
Dysphagia	8	4.1	11	7.3	2	3.6	3	10
Distension	0	0	14	9.3	0	0	3	10
Total	195	100.0	150	100.0	55	100.0	30	100.0

* - Ve without division.
** +Ve with division.

Table 2. Improvement in dysphagia and abdominal distension with follow up.

Data	-Ve				+Ve			
	Early postoperative		Late follow up		Early postoperative		Late follow up	
	No.	%	No.	%	No.	%	No.	%
Dysphagia	28	18.7	11	7.3	7	23.3	3	10
Distension	33	22	14	9.3	7	23.3	3	10
Total	150	100	150	100	30	100	30	100

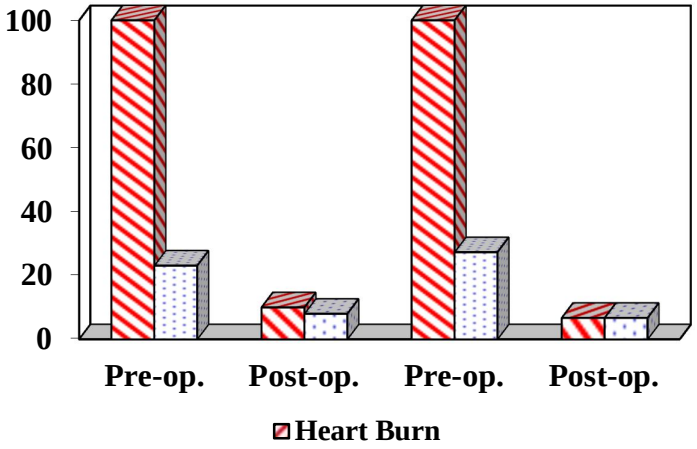

Fig 1. Clinical assessment: Heartburn and regurgitation.

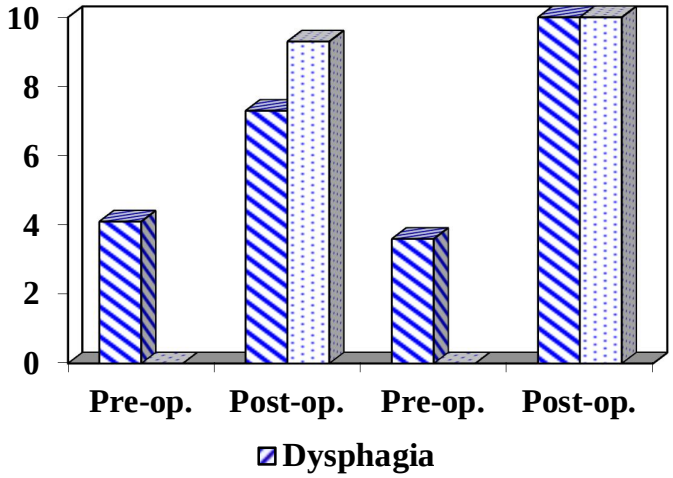

Fig 2. Clinical assessment: Dysphagia and distension.

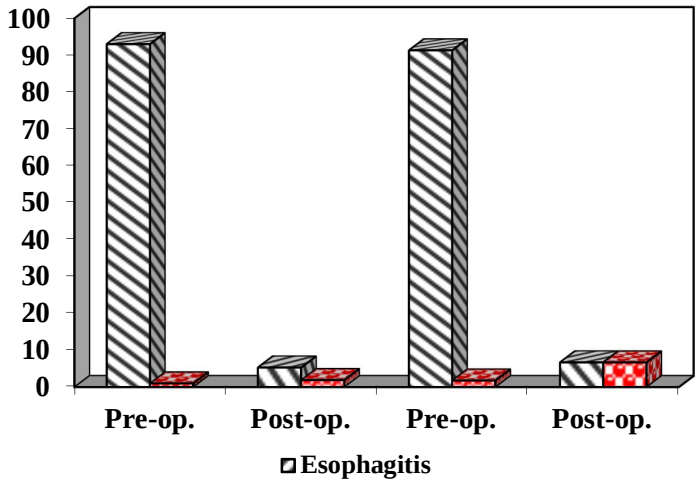

Fig 3. Endoscopic evaluation.

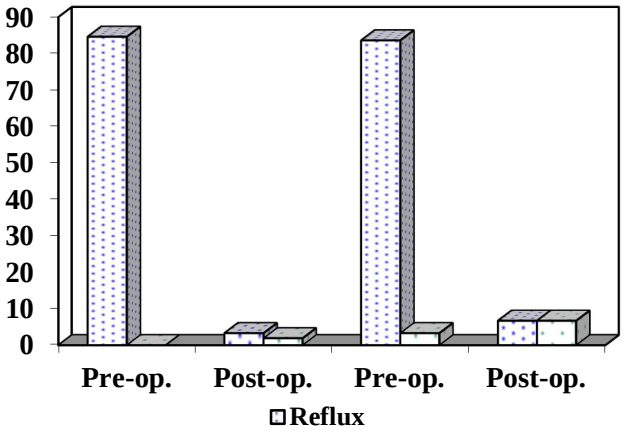

Fig 4. Radiological study.

	Pre-op.	Post-op.	Pre-op.	Post-op.
LES R (%)	92.7	84.5	94.2	87.5

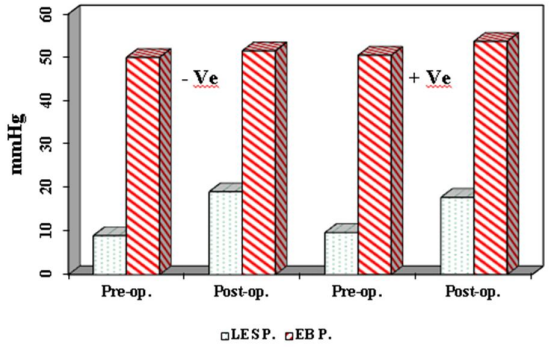

Fig 5. Esophageal manometry.

	Pre.op.	Post-op.	Pre-op.	Post-op.
Acid reflux (%)	100	10	100	6.2

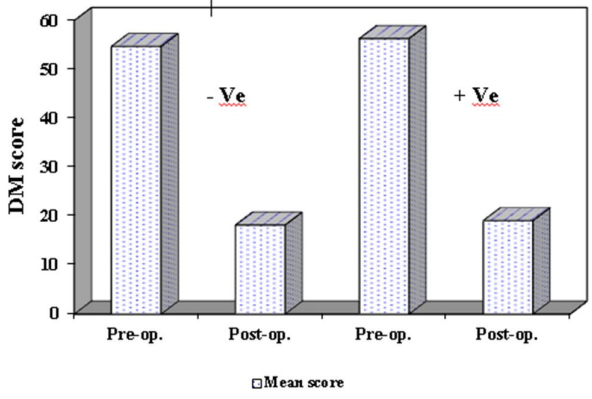

Fig 6. 24-hour esophageal pH.

DISCUSSION

The proven safety and efficacy of LF has increased acceptance and demand for this treatment among patients and healthcare providers. At laparoscopy, dissection of the hiatus is facilitated by the magnified image, which can demonstrate the entire dissection including that of the back wall of the esophagus. These benefits make it more attractive than open operation. LF thus has the potential to become an alternative therapy for patients with GERD who require long-term continuous omeprazole therapy for control of daily activity.[10]

The advent of the laparoscopic approach provides an ideal opportunity to standardize the technique of LF because it markedly limits the technical variability that can occur with open procedure.[11] When the technical aspects of the procedure are agreed on, the referring physician can have greater confidence in a predictable outcome. For the present, considerable discussion continues regarding the importance of technical aspects such as the orientation of the fundoplication and the need for fundic mobilization and crural closure. It has become clear that no closure of the diaphragmatic hiatus by approximating the crura during fundoplication has resulted in a high prevalence of migration of the fundoplication into the chest. Routine crural closure prevents this problem.[12]

Complete mobilisation of the gastric fundus with SGVsD (Classic Nissen's fundoplication) ensures a floppy tension-free fundoplication, thus preventing dysphagia from a tight wrap or twisted oesophagus. An incompletely mobilised fundus pulls tightly around the oesophagus, thereby twisting the lower oesophagus and the fundoplication valve itself, and leading to postoperative dysphagia (13). Many studies have failed to reveal any benefit from complete SGVsD.[14,15] This remains an issue under debate.

A number of surgeons have compared their laparoscopic experience of a fundoplication performed without SGVsD with their subsequent experience of SGVsD. In these studies, LF was performed initially without dividing the vessels. With improving laparoscopic experience, the surgeons began to divide the short gastric vessels and then compared their experience with the two techniques. Analysis of the outcomes suggested that dysphagia was more common in patients in whom the short gastric vessels were left intact. From this it has concluded that the short gastric vessels should be divided to minimize the incidence of postoperative dysphagia.[16,17] However, such analysis discounts learning curve bias where experience-related improvement in outcomes falsely conveys benefit for vessel division. In one of our studies published in Hepatogastroenterology magazine, 2005 upon 150 cases that had LNF in our center between 1996 and 2001, we found that despite of prolongation of the operative time; SGVsD provided a better symptomatic and physiologic outcome.[18]

An alternative hypothesis is that the dysphagia rate fell as the surgeons gained experience in laparoscopic antireflux surgery. Tsiaoussis J. et al[19] reported that SGVsD at LF does not improve the symptomatic and physiologic outcome, while it is associated with prolongation of the operating time and increased incidence of epigastric fullness. In another series, David D. C. et al[20] assured that SGVsD is completely unnecessary in most cases, as most patients have a hiatal hernia that has resulted in stretching of the fundus until it is so large that there is generally more than enough to make a very loose wrap. Dividing these vessels adds considerable time to the procedure and increases the risk of bleeding and the possibility of conversion into laparotomy or the need for blood transfusion. Although leaving the short gastric vessels intact is technically a modification of the original Nissen fundoplication, they found no difference in the appearance, anatomical relationships, or function of the wrap whether or not the short gastric vessels are taken down. Colm J.O. et al[21] in their double blind prospective study held in Adelaid University, South Australia concluded that SGVsD during LNF does not improve any measured clinical outcome at 5 years of follow-up and is associated with an increased incidence of flatus production and epigastric bloating and a decreased incidence of ability to relieve bloating in patients who underwent SGVsD. It is possible that the most important technical step necessary for the avoidance of postoperative complications following LF is to ensure a short loose wrap, irrespective of whether the short gastric vessels are divided or not.

The results of our study show similar clinical and physiologic outcomes among those with SGVsD and those without. We could not show any statistically significant outcome differences between the two groups, with the exception of longer operating time with SGVsD (115±50 vs 90±40 minutes) with a significant p-value ($p<0.05$). Patients with and without SGVsD had nearly the same symptomatic and physiologic outcome. Relief of heartburn was achieved among 28 patients (93.3%) with division and 135 (90%) without. Persistence of regurgitation was recorded in 2 patients (6.7%) with division and 12 (8%) without ($p>0.05$). The incidence of postoperative dysphagia was nearly equal in both groups immediately postoperative (23.3% with division and 18.7% without) and on late follow up (10% and 7.3% respectively) ($p>0.05$). Abdominal distension should also similar results both early (23.3% with division and 22% without) and late (10% and 9.3% respectively).

Endoscopic esophagitis healed in 28 of 30 patients with division (93.3%) and 142 of 150 (94.7%) without ($p>0.05$).Lower end esophageal stricture was reported in 5 patient (2.8%); 2 with division (Barrett's esophagus) and 3 without. Radiological assessment assured the endoscopic findings. LES pressure had returned to

normal in all patients (in both groups) except 3 patients: one with division and 2 without. The mean LES pressure was slightly higher among those without division (19.1 vs 17.8 mmHg) ($p > 0.05$). LES relaxation was 87.5% among those with division and 84.5% among those without division ($p > 0.05$). Esophageal acid exposure had returned to normal in 28 of 30 patients (93.3%) with division and 140 of 150 (93.3%) without. The mean score had significantly reduced in both groups; (56.3 to 19.1 De-Meester score) in patients with division and (54.7 to 18.2 De-Meester score) in patients without (no significant difference in comparing both groups).

These results are similar to those reported by the above authors as with more experience we got and the technologic facilities we have as harmonic scalpel, we can have a better mobilization of the gastric fundus and creating a floppy complete wrap without the need for SGVsD.

The reliability of the clinical data collected in this study and the method of collection are important issues to consider when determining the validity of conclusions drawn from the study. We have sought to reduce the risk of bias in data collection by ensuring that interviews should have been undertaken in person rather than by telephone and by a single investigator rather than many. The further potential problem of learning curve bias was minimized by excluding cases of our initial experience with laparoscopic antireflux surgery from 1994 through 2002.

In conclusions laparoscopic antireflux surgery is positioned to become the standard of surgical care for patients with GERD. Its success requires satisfactory fundic mobilization to create a floppy wrap without tension or torsion of the esophagus. In this study, construction of a satisfactory loose complete wrap was possible in about 78% of patients without the need for SGVsD. Data from this study have shown no benefit for routine SGVsD during LNF. This study, in association with data reported previously, suggests that SGVsD lengthens the procedure, adds complexity and expense without adding more to the symptomatic or physiologic outcome. On the basis of these findings, we believe it is unnecessary to divide the short gastric blood vessels routinely during LNF.

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