

Complications in Antireflux Surgery

National-Based Analysis of Laparoscopic and Open Funduplications

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Hypothesis: Longer experience of surgeons has reduced the rate of complications in antireflux surgery.

Design: Comparison of the rate of serious complications between open and laparoscopic fundoplication in Finland at the national level.

Setting: University teaching hospital.

Patients: From January 1, 1992, to December 31, 2001, 10 846 funduplications were performed in Finland. Of these, 3987 (37%) were open and 6859 (63%) were laparoscopic.

Main Outcome Measures: Administrative databases provided the number of funduplications, the rate of severe complications, and the mortality. Medical records allowed for evaluation of the nature and cause of severe complications of laparoscopic and open funduplications.

Results: From January 1, 1992, to December 31, 2001, hospital mortality was significantly lower after laparos-

copy ($P = .01$). In comparable groups, surgical mortality or the overall rate of serious complications did not differ. The rate of serious complications decreased after both open surgery ($P = .01$) and laparoscopic surgery ($P = .03$). After laparoscopy, patients made claims for injuries more often ($P = .003$) and had a higher rate of dysphagia ($P < .001$). In all of the patients with severe dysphagia or fundic perforations after laparoscopy, the short gastric vessels were not divided. Furthermore, 1 open fundoplication and 22 laparoscopic funduplications had to have reoperations performed owing to dysphagia, mostly involving technical failure.

Conclusions: At the national level, the first 10-year experience of laparoscopic fundoplication reduced the rate of serious complications. The complications largely were technical failures related to the lack of a standardized surgical technique.

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THE PREVALENCE OF WEEKLY symptoms of gastroesophageal reflux disease (GERD) in the adult Finnish population is around 10%.¹ Although most of these patients are managed medically with proton pump inhibitors,² the number of antireflux operations is increasing.³ At the present, for the treatment of GERD, laparoscopic Nissen fundoplication is the surgical therapy most commonly applied.

See Invited Critique at end of article

The midterm success rates of laparoscopic antireflux surgery have reached 90%.⁴⁻⁶ The rate of serious complications has been less than 5%.^{7,8} In 1 small randomized study,⁹ short-term benefits of the laparoscopic technique were shorter hospital stay, less need for analgesics, and bet-

ter respiratory function. In a national population-based study of 5500 operations, however, patients faced more life-threatening complications after laparoscopic antireflux surgery than after the open technique.¹⁰ Furthermore, the only multicenter randomized study¹¹ comparing these techniques was halted, mainly owing to a high rate of persistent dysphagia after laparoscopic Nissen fundoplication. The update of this study, though, revealed comparable results at the 5-year follow-up.¹²

As our earlier report of complications from antireflux surgery at a national level came from the era when laparoscopic antireflux surgery had been performed for only 4 years,¹⁰ we could hypothesize that greater surgical experience would yield improved results. Early in the era of laparoscopic antireflux surgery, the significance of a learning curve was recognized, a learning curve highly dependent on the annual rate of operations at any institu-

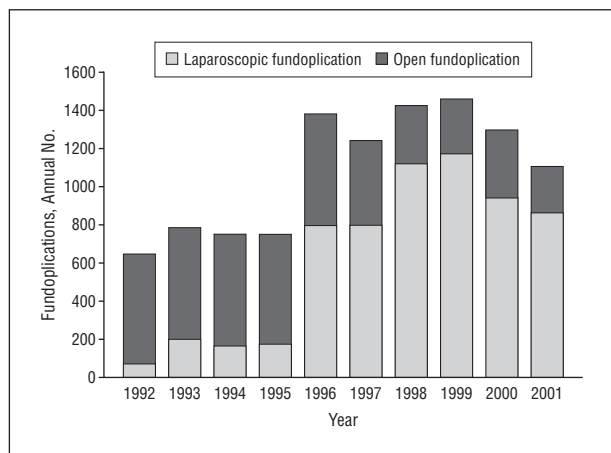


Figure 1. Number of laparoscopic and open funduplications in Finland between 1992 and 2001. Owing to a lack of separate coding, annual numbers of open and laparoscopic funduplications performed between 1992 and 1995 are estimates from the overall number and the data were received from hospitals by questionnaire.

tion.^{13,14} In a recent population-based study,¹⁵ an increased rate of laparoscopic antireflux surgery was associated with a decreased risk for mortality and splenectomy; however, the investigators were unable to separately analyze mortality and morbidity from laparoscopic and open procedures.

Our aim was to evaluate at a national level, after the learning curve phase of laparoscopic fundoplication, any change in the rate of serious complications after both open and laparoscopic surgery. Finland's administrative databases provided the numbers of both of these operations, the rate of complications from antireflux surgery claimed by patients as injuries, and the mortality.

METHODS

Data for this study were assessed by the use of 3 Finnish administrative databases: those held by the National Research and Development Center for Welfare and Health (STAKES), the Patient Insurance Association, and Statistics Finland.

Although the main indication for antireflux surgery in Finland is refractory GERD, the decision to operate in this retrospective database analysis has been at the discretion of the operating surgeon. All of the hospitals in Finland licensed to perform surgery must annually report every patient to the Central Registry held by STAKES. Each operation has a separate code (JBC 00, open fundoplication due to GERD; JBC 01, laparoscopic fundoplication due to GERD), including a diagnostic code (K21.0, GERD with esophagitis; K21.9, GERD without esophagitis; K22.1, Barrett esophagus or esophageal ulcer), so that all of these procedures can be reliably identified in the STAKES database. This database provides the number of both open and laparoscopic funduplications performed in Finland (population approximately 5 million) between January 1, 1992, and December 31, 2001. Between January 1, 1992, and December 31, 1995, however, the coding did not separate laparoscopic and open fundoplication, so the number of laparoscopic procedures during that period came from the hospitals in a questionnaire.

The second database, held by the Patient Insurance Association, provided data to evaluate the rate of complications from antireflux surgery. Patient insurance is mandatory for doctors in Finland; it is impossible to practice medicine or surgery without it. The patients themselves make claims concerning their in-

juries, and every notification must be handled by 2 experts independently. Because compensation for injuries does not require proof of guilt against a hospital or a single surgeon, reliability concerning major complications is generally regarded as all inclusive. This system includes a 3-year period during which all claims concerning patient injuries must be received. Therefore, all of the settled notifications of patient injury after fundoplication between January 1, 1992, and December 31, 2004, were available for analysis of all of the injuries occurring between January 1, 1992, and December 31, 2001. Medical records of these allowed for evaluation of the nature, rate, and cause of severe complications after both open and laparoscopic fundoplication. Serious complications were classified as esophageal or gastric perforation leading to mediastinitis or peritonitis, massive intra-abdominal bleeding, septic intra-abdominal abscess resulting in repeated reoperations and lengthy hospitalization, and total esophageal obstruction unresponsive to dilatation and resulting in parenteral nutrition. The Savary-Miller grading system served for severity of esophageal mucosal damage.¹⁶

Data for mortality resulting from fundoplication came from both the Patient Insurance Association and Statistics Finland. All deaths in Finland must be reported to Statistics Finland with a death certificate including at least 1 diagnostic code, and these certificates received for all of the patients between January 1, 1992, and December 31, 2001, included in our study stated that esophagitis, esophageal ulcer, esophageal stricture, or hiatus hernia was the primary, contributing, or immediate cause of death. These patients' hospital records allowed for evaluation of whether death was related to antireflux surgery. Data from Statistics Finland allowed for analysis of surgical or hospital mortality and early surgical mortality within 6 months of fundoplication.

We used SPSS version 11.0 statistical software (SPSS Inc, Chicago, Illinois) for statistical analysis. The mean, minimum, and maximum were the descriptive statistics. Statistical differences were calculated by the χ^2 test or *t* test. Change in the rate of antireflux surgery was analyzed by a linear regression technique. Trends were evaluated in 5-year calendar periods. Significance was set at $P < .05$.

This study was approved by the ethics committee of the Department of Surgery, Helsinki University Central Hospital and the Ministry of Health and Welfare of Finland.

RESULTS

CHANGE IN THE RATE OF ANTIREFLUX SURGERY

The annual number of antireflux operations in Finland increased from 600 (11.7 per 100 000 inhabitants) to 1400 (27.4 per 100 000) ($P < .001$) between January 1, 1992, and December 31, 2001. These numbered 10 846 overall; of these, 3987 (37%) were open and 6859 (63%) were laparoscopic (**Figure 1**). Laparoscopic surgery increased from the first 5-year period (January 1, 1992, to December 31, 1996) to the second 5-year period (January 1, 1997, to December 31, 2001) ($P < .001$), with no change in the rate of open antireflux surgery.

MORTALITY FROM ANTIREFLUX SURGERY

Hospital or 30-day mortality from funduplications was 1.0 per 1000 operations based on 11 deaths: 8 patients died after open surgery and 3 died after laparoscopic surgery, producing respective mortality rates of 2.0 per 1000 operations and 0.4 per 1000 operations ($P = .01$). Be-

Table 1. Characteristics of 68 Patients Facing Severe Complications After Open and Laparoscopic Antireflux Surgery^a

Characteristic	Patients With Open Fundoplication ^b (n=21)	Patients With Laparoscopic Fundoplication ^b (n=47)	P Value
Age, mean (SD)	57.8 (13.8)	50.6 (13.5)	.05
Concomitant disease	11	7	.001
Reoperation ^c	7	1	<.001
Severity of GERD, grade ^d			.009
0-1	1	15	
2-4	20	28	
Type of hiatal hernia ^e			.70
None	1	6	
Small	8	21	
Large or type 3	5	11	
Technical details of surgery			
Ligation of short gastric vessels ^d	11	4	<.001
Crural repair ^f	6	17	.43

Abbreviation: GERD, gastroesophageal reflux disease.

^aComparisons were made only between adults.

^bValues are expressed as number unless indicated otherwise.

^cPrevious operations were 4 funduplications, 1 each of proximal selective vagotomy, abdominal trauma, and intestinal occlusion in the open group and 1 fundoplication in the laparoscopic group.

^dData were unavailable for 4 patients.

^eData were unavailable for 16 patients.

^fData were unavailable for 3 patients.

cause patients facing severe complications after different surgical techniques were not comparable (**Table 1**), mortalities by subgroups are shown in **Table 2**. Only in the group of open surgery was mortality associated with reoperations of the abdominal cavity. Of 8 patients, 1 each had undergone fundoplication, proximal selective vagotomy, intestinal occlusion, and abdominal trauma. Furthermore, the 1 patient with previous abdominal trauma underwent combined operations of fundoplication and proximal selective vagotomy. Only after laparoscopic fundoplication did 2 patients die early (34 days and 5 months) after discharge, with both dying from incarceration of paraesophageal hernias. Overall, no difference existed between open and laparoscopic surgery in early surgical mortality after primary abdominal surgery (within 6 months) ($P=.63$).

The 3 hospital deaths after laparoscopic operations were due to esophageal perforation (1 patient) or fundic perforation (2 patients), and the 8 deaths after open surgery were due to fundic perforation (5 patients), intestinal ischemia (2 patients), and pulmonary embolism (1 patient). Among the 68 patients experiencing severe complications after funduplications, those who died were older (mean [SD] age, 62.7 [12.3] years for those who died vs 50.8 [13.4] years for those who survived; $P=.008$), with a higher prevalence of a concomitant disease ($P=.04$) or reoperation of the abdominal cavity ($P=.01$). No significant difference existed in the severity of GERD between those who died and those who survived ($P=.54$). Of those 2 patients eventually having fatal incarceration early after discharge, the 67-year-old

Table 2. Mortality After Open and Laparoscopic Antireflux Surgery by Subgroup

Period and Subgroup	Operations, No.	Mortality, Deaths per 1000 Funduplications (Actual No.)	P Value
1992-1996			
Open	2352	2.6 (6)	.10
Laparoscopic	1962	0.5 (1)	
Overall	4314	1.6 (7)	
1997-2001			
Open	1635	1.2 (2)	.25
Laparoscopic	4897	0.4 (2)	
Overall	6532	0.6 (4)	
1992-2001			
Open	3987	2.0 (8)	.01
Laparoscopic	6859	0.4 (3)	
Overall	10 846	1.0 (11)	
Mortality in primary surgery ^a			
Open		1.0 (4)	.26
Laparoscopic		0.4 (3)	
Mortality in adults within 6 mo			
Open		1.8 (7)	.12
Laparoscopic		0.7 (5)	
Mortality in adults within 6 mo in primary surgery ^a			
Open		1.0 (4)	.63
Laparoscopic		0.7 (5)	

^aFour patients had undergone abdominal surgery: 1 each had fundoplication, proximal selective vagotomy, intestinal occlusion, and abdominal trauma. At the time of fundoplication, the patient with previous abdominal trauma underwent proximal selective vagotomy as well.

woman had undergone laparoscopic Nissen fundoplication with anterior hiatoplasty due to GERD and type 3 hiatal hernia. The details of the surgical report on the 23-year-old woman with GERD symptoms are unknown.

RATE OF COMPLICATIONS AFTER ANTIREFLUX SURGERY

Including all of the deaths, 68 adults faced a serious complication: 21 patients (31%) after open surgery (5.3 per 1000 operations) and 47 (69%) after laparoscopic surgery (6.9 per 1000 operations), with no significant difference between groups ($P=.31$). In addition, an 8-month-old boy had fatal intestinal ischemia and a 4-year-old girl had an esophageal perforation. Comparison of open and laparoscopic techniques was performed only among adults (Table 1). The rate of serious complications decreased after both laparoscopic fundoplication ($P=.03$) and open fundoplication ($P=.01$). Again, the difference (5.5 per 1000 operations vs 1.8 per 1000 operations, respectively) in the second 5-year period of the study did not reach significance ($P=.06$).

Although some small-volume centers showed a relatively high rate of complications (**Figure 2**), no overall difference existed in the rate of severe complications between centers with a mean annual rate of funduplications fewer than 10 (7.9 per 1000 operations), 10 to 40 (6.5 per 1000 operations), and more than 40 (6.2 per 1000 operations) ($P=.53$). The rate of complications de-

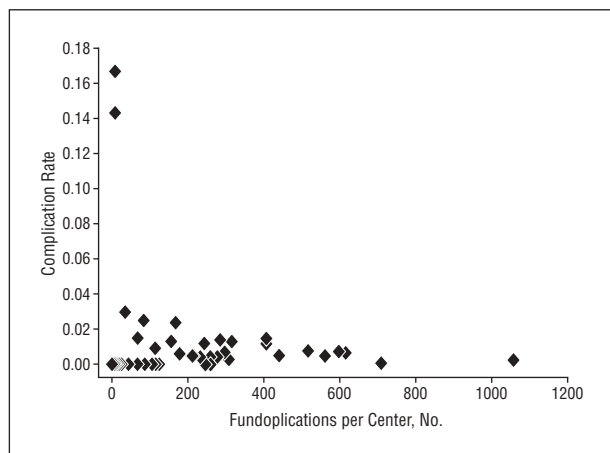


Figure 2. Scatter plot of the number of funduplications performed between January 1992 and December 2001 and the rate of severe complications in Finnish hospitals.

Table 3. Cause for Claims After Fundoplication Among 220 Patients in Finland From 1987 to 2001

Type	Patients With Open Fundoplication, No.	Patients With Laparoscopic Fundoplication, No.	P Value
Problems with wound	24	16	.002
Dysphagia	1	43	<.001
Esophageal perforation	2	12	.08
Fundic perforation	3	11	.23
Abdominal hemorrhage	7	9	.56
Complicated paraesophageal hernia	0	6	.06
Pulmonary complications	0	7	.04
Other infections	0	1	.45
Intestinal complications	0	1	.45
Dissatisfaction with surgical result	4	19	.05
No symptom relief	0	12	
Relapse of symptoms	4	7	
Problems not related to fundoplication ^a	4	14	.20
Total	45	139	<.001

^aDental injuries and postoperative prolonged pain in the upper extremities and neck related to the positioning of the patient during surgery.

creased, however, only in high-volume centers ($P=.008$). Among these high-volume centers ($n=9$), the decrease in the rate of complications was evident only in university hospitals ($n=5$) ($P=.002$).

TYPE OF COMPLICATION AND TECHNICAL DETAILS OF FUNDOPLICATION

For comparison of surgical groups, see Table 1. Patients facing complications after open surgery were older ($P=.05$), had a preponderance of severe esophagitis ($P=.009$), and had a significantly higher prevalence of concomitant disease ($P=.001$) or previous abdominal surgery ($P<.001$). However, the severity of esophagitis among patients having severe complications after the laparoscopic technique decreased ($P=.01$). Among all of the

complicated funduplications, ligation of short gastric vessels was performed in only 23% of patients, with a significant difference between surgical approaches (open, 11 of 21 patients [52%]; laparoscopic, 4 of 43 patients [9%]; $P<.001$). Crural repair was performed in 35% of patients, with no difference between laparoscopic and open surgery ($P=.43$). The most common types of complication were esophageal perforation (18 patients), fundic or other gastric perforation (18 patients), dysphagia (16 patients), and complicated paraesophageal hernia (9 patients). Other severe complications included intestinal complications (4 patients), deep surgical infections (3 patients), intra-abdominal bleeding (3 patients), and pulmonary embolism (1 patient). The only significant difference between surgical approaches was the higher rate of severe dysphagia after laparoscopic fundoplication ($P=.01$). Twenty-two patients after laparoscopy but only 1 patient after open surgery had to have a reoperation due to dysphagia. In all of these cases after laparoscopy, a clear reason for dysphagia existed: tight hiatal repair (9 patients [41%]), slipped wrap around the stomach (7 patients [32%]), achalasia (3 patients [14%]), and tight fundic wrap (3 patients [14%]). The reason for the only reoperation after open surgery was achalasia. The causes for esophageal and fundic perforations seemed to be instrument handling (40%), mobilization of the esophagus (35%), sutural trauma (15%), or perforation caused by the nasogastric tube or endoscope (10%).

Among all of the patients with complications, fundoplication with or without division of the short gastric vessels was not associated with fundic perforation. In none of the 12 fundic perforations in laparoscopic surgery were the short gastric vessels ligated, however. Esophageal perforation was not associated with the type of surgical approach or any technical details of fundoplication (ligation of short gastric vessels, crural repair, or fixation of the fundic wrap). In none of the 15 patients with severe dysphagia after laparoscopic fundoplication were the short gastric vessels divided. Crural repair was associated with dysphagia as well (9 of 15 patients with crural repair vs 8 of 29 patients without crural repair; $P=.04$). Paraesophageal hernia was associated with division of the short gastric vessels (5 of 15 patients with short gastric vessels divided vs 2 of 49 patients with short gastric vessels not divided; $P=.001$), but this was statistically evident only in the laparoscopic group ($P=.003$ in the laparoscopic group vs $P=.07$ in the open group). Although only 1 patient had a paraesophageal hernia after crural repair (1 of 23 patients with crural repair vs 7 of 42 patients without crural repair), this difference did not reach significance ($P=.15$).

CLAIMS FOR PATIENT INJURIES

Of 184 claims for patient injuries, 45 (24%) were after open fundoplication and 139 (76%) were after laparoscopic fundoplication (Table 3). As for claimants, the median age of the 100 males and 84 females was 49.5 years (range, 0.7-80 years). The rate of claims was 1% (47 of 3987 patients) after laparotomy and 2% (137 of 6859 patients) after laparoscopy ($P<.001$). Only after open fundoplication did the decrease in the number of claims from

the first to the second 5-year period approach significance ($P = .06$ for open fundoplication vs $P = .27$ for laparoscopic fundoplication) (**Figure 3**). During both of these periods, the rate of claims after laparoscopic surgery was significantly higher ($P = .04$ for open fundoplication vs $P = .003$ for laparoscopic fundoplication). After laparoscopic fundoplication, patients significantly more often had dysphagia ($P < .001$) and dissatisfaction—either a relapse of symptoms or no symptomatic relief—with the surgical result ($P = .05$). Patients had wound problems more often after open antireflux surgery ($P < .001$). There were 36 total wound complications: all of the 22 in open surgery were infections, whereas of the 14 in laparoscopic surgery, 9 (64%) were infections and 5 (36%) were hernias. All of the causes for claims following fundoplication appear in Table 3. Of 184 claims, 73 (40%) were compensated and 111 (60%) were rejected.

COMMENT

This nationally based evaluation of 10 846 fundoplications revealed no significant difference in early mortality within 6 months or in the overall rate of serious complications between the laparoscopic and open techniques. During the first 10 years of laparoscopic antireflux surgery, the incidence of serious complications after both open and laparoscopic surgery decreased. Laparoscopic antireflux surgery was characterized by an increased risk for severe dysphagia and by dissatisfaction with the surgical results. Among the group of patients experiencing severe complications after fundoplication, the lack of standardized technique was characteristic.

During the late 1990s, the rate of antireflux surgery in several countries increased to around 12 to 15 per 100 000 population.^{3,15,17} The rate in Finland during those years was twice that. However, in many countries, including Finland, large regional disparities existed^{3,17,18} and the rate has increased most in those areas offering laparoscopic surgery.¹⁷ The prevalence of typical reflux symptoms of GERD does not differ, though, between Finland and the United States for example.^{1,19} It therefore seems that the rise in antireflux surgery is due to the lower threshold for surgery stemming from surgeons' increased enthusiasm regarding laparoscopic operations. During the ascending portion of the learning curve for laparoscopic surgery, this policy in Finland yielded more life-threatening complications than did the open technique.¹⁰ With more experience, incidences of serious complications between laparoscopic and open antireflux surgery have not differed.

Since laparoscopic surgery began in 1992 in Finland, the incidence of fundoplication has risen more than 3-fold. During the early years of laparoscopic surgery, it was probable that only patients without risk factors were selected for this new approach. Whether during the latter years of the study more patients with complicated reoperations or with large hiatal hernias with difficult esophageal strictures underwent laparoscopic antireflux surgery cannot be estimated; separate coding for these more demanding operations is lacking. Among complicated laparoscopic fundoplications, the severity of GERD has

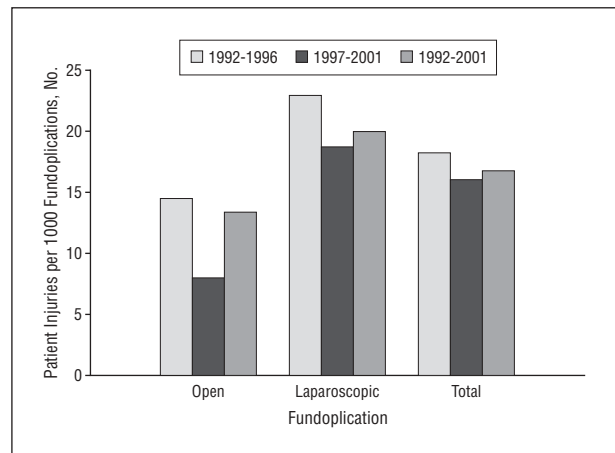


Figure 3. Number of patient injury claims after open and laparoscopic fundoplication in Finland in two 5-year periods and overall.

decreased, indicating that with the laparoscopic technique, many more patients with milder GERD are undergoing surgery. Overall, in our study, those patients experiencing severe complications after open surgery were older and had a higher prevalence of some concomitant disease, severe esophagitis, or previous abdominal surgery. Patients undergoing laparoscopic fundoplication are thus likely to be a completely different cohort from those who previously had or are currently undergoing open surgery.

Although the functional results of laparoscopic antireflux surgery have been excellent among experienced surgeons in selected small series, at a national level the laparoscopic technique is still characterized by a higher rate of severe dysphagia and symptoms. Because of the high frequency of severe dysphagia after laparoscopy, the only multicenter prospective study comparing open and laparoscopic fundoplication was halted.¹¹ Even the updated results have revealed a higher rate of reoperation during the first postoperative year, although the 5-year results were comparable.¹² The most recent single-center prospective randomized study revealed a higher rate of dissatisfaction after laparoscopic Nissen based on dysphagia, recurrent heartburn, and epigastric pain.²⁰ In that study, 11 dissatisfied patients who underwent postoperative endoscopy showed slipped or tight fundoplication as their most common abnormal finding.²⁰ Other suggested explanations for this early postoperative dysphagia have been lateral stretching, a small posterior window, and slow esophageal clearance.^{6,21,22} In our study, of those 22 patients requiring reoperation after laparoscopic fundoplication owing to severe dysphagia unresponsive to dilatations, 19 had a clear anatomical reason for dysphagia: a slipped wrap around the stomach, hiatal stenosis, or a tight fundic wrap. Because of the high rate of technical complications causing postoperative dysphagia, all patients unresponsive to 2 to 3 dilatations should be considered for reoperation.

Technical aspects in perforations—instrument handling, esophageal mobilization, sutural trauma, or perforation caused by the nasogastric tube or endoscope—and those technical failures causing dysphagia all focus attention on the importance of technical experience. For

a more highly experienced surgeon, the rate of complications is low.²³ Striking learning curve differences have appeared with experienced supervision and high hospital volume as well.^{14,23} Although in our study hospital volume was not correlated with the rate of severe complications, a group of high-volume hospitals—university hospitals—were the only ones to show a decrease in this complication rate. Therefore, experience seems to be one issue and technical skills another.

Among those patients facing severe complications after fundoplication, only 35% had undergone crural repair and 23% had undergone division of the short gastric vessels. Although in 1 randomized study²⁴ this division of vessels had no influence on the outcome of laparoscopic fundoplication, in our population-based analysis all of the patients facing severe dysphagia or fundic perforation after laparoscopy had undergone surgery without division of the short gastric vessels. In experienced hands, routine division of the short gastric vessels thus appears to not be required, but in general, insufficient mobility of the fundus leads to an increased likelihood of fundic perforation and dysphagia. The drawback of this division is its association with paraesophageal hernia. To avoid the most common long-term failure, recurrent hiatal hernia, most surgeons consider hiatal repair mandatory during laparoscopic fundoplication and even prosthetic hiatal closure.²⁵ To reduce the rate of dysphagia associated with hiatal closure, many surgeons have used a bougie.²⁶ Overall, it seems that the use of a standardized surgical technique with crural closure and division of the short gastric vessels might reduce the rate of severe complications after laparoscopic Nissen fundoplication.

Administrative databases in countries like Finland are generally considered reliable. Additional strengths are a separate coding of laparoscopic and open fundoplication and the fact that neither mortality nor the rate of severe complications is based on the hospitals' own records. Studies using an administrative database always have limitations. Among functional outcomes, only the major disturbances could be assessed. The clinical accuracy of a database such as that of the Patient Insurance Association in regard to a minor complication can be questioned. Minor complications were, however, excluded from analysis. The reliability of the rate of severe complications should be considered good because the rate was based on a law requiring that patients' complaints be analyzed by 2 independent experts, and here, these complaints could be evaluated thoroughly by retrieval of all of the hospital records. The types and causes of these complications thus underwent detailed analysis.

The findings indicate that these operations, either open or laparoscopic, can be performed with very low mortality. The analysis revealed that even in recent years the major complications of the laparoscopic technique (esophageal and fundic perforations, complicated paraesophageal hernia, and severe postoperative dysphagia) were due to technical failures, apparently not to the new technique itself; rather, these complications are associated with the lack of standardized surgical techniques in laparoscopic surgery. The importance of experience should be made known to the patient prior to decisions about antireflux surgery.

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INVITED CRITIQUE

The article titled "Complications in Antireflux Surgery: National-Based Analysis of Laparoscopic and Open Funduplications" by Rantanen and colleagues is a retrospective analysis of 10 846 funduplications performed in Finland from January 1992 to December 2001. Information was collected from 3 Finnish administrative databases and a questionnaire was sent to hospitals. The study compares 3987 open procedures with 6859 laparoscopic procedures.

The annual number of antireflux operations increased during this 10-year period, with all of the increase related to laparoscopy. Surgical mortality and the overall rate of serious complications did not differ between groups, but claims for injuries and dysphagia were higher with laparoscopy.

This is an excellent article despite a number of drawbacks that raise several questions. We have no information about patients except that they had a hiatal hernia. We do not know the type or size, which can contribute to the risk of recurrence. We also do not know whether mesh was ever needed.

Preoperative symptoms are not mentioned. Balci and Turkcapar¹ used 2 different quality-of-life items (the 36-Item Short-Form Health Survey and the GERD-Health-Related Quality of Life scale) to measure the relation between symptoms and quality of life before and after laparoscopic Nissen fundoplication. They also realized that there is a need to develop a new quality-of-life questionnaire specifically for GERD.

No information about the surgeons could be retrieved from this article. Were the same surgeons always used? Were they beyond their learning curve? Likewise, there is no standardization of the procedure. Technical details are provided only for the 68 patients with serious complications. Rantanen and colleagues appropriately stress that point in their conclusion. The rate

of complications decreased in high-volume hospitals, particularly at universities. Are these surgeons involved in teaching?² Is there a full spectrum of clinical services in these institutions?³

Claims for injury and rates of reoperation are not reliable methods of assessing the problems of dysphagia and patient dissatisfaction. There is no correlation here between satisfaction and postoperative symptoms, and a consensus classification of fundoplication failure is needed.⁴

I believe that this excellent review by Rantanen and colleagues should serve as a platform to move beyond comparing laparoscopy with open surgery. We can proceed into a more radical exploration of new surgical approaches⁵ that will provide our patients and gastroenterology colleagues with long-lasting, better, more satisfying results.

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