

## Same-day discharge in benign esophageal surgery: a prospective cohort study

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**SUMMARY.** Day-case esophageal surgery has been demonstrated to be safe in small prospective cohorts and only for laparoscopic fundoplication. The aims of this study are to assess the feasibility and safety of a large series of esophageal day-case surgeries, including laparoscopic Nissen fundoplication (LNF), Zenker diverticulectomy (ZD), and laparoscopic Heller myotomy (LHM) and to compare the outcomes among three procedures.

This was a prospective, observational study of selected patients who underwent day-case LNF, ZD, and LHM between 2003 and 2013. Postoperative outcomes, the patients' satisfaction, and functional results were evaluated with dedicated scores and compared.

Of the 427 patients who underwent surgery for those indications during the study period, 168 (39.3%) eligible patients underwent day-case procedures (134 LNF, 14 LHM, and 20 ZD). The overnight unplanned admission rate was 16.2% and was similar among the groups ( $P = 0.681$ ). Ten patients were readmitted during the first postoperative week because of dysphagia ( $n = 6$ , all in the LNF group), flu-like syndrome ( $n = 1$ ), and secondary perforation ( $n = 3$ , all in the LHM group). The unplanned seven-day readmission rate was significantly higher in the LHM group than in the ZD and LNF groups ( $P = 0.042$ ). The 30-day rates of unplanned readmission and consultation were 8.9% ( $P = 0.300$ ) and 4.8%, respectively. At follow-up, 87.5% of the patients were satisfied with day-case treatment, and the functional results were good for 81.4% of the patients.

Day-case esophageal surgery is feasible for LNF and seems to be feasible for ZD. Safety criteria have not yet been met for LHM, requiring further adaptations.

**KEY WORDS:** day-case surgery, esophageal surgery, Heller laparoscopic myotomy, laparoscopic fundoplication, Zenker diverticulectomy.

### INTRODUCTION

Day-case surgery has been associated with improved care, with fewer hospital-related infections, increased satisfaction, an earlier return to work, and reduced healthcare costs.<sup>1–3</sup> For all of these reasons, the use of day-case surgery is expected to increase significantly, with an expansion in the array of procedures deemed eligible.

In the field of esophageal surgery, only laparoscopic fundoplication for gastroesophageal reflux disease (GERD) has currently been developed into a

day-case procedure.<sup>4–6</sup> Through a matched cohort study, we recently demonstrated that day-case and inpatient approaches after laparoscopic fundoplication gave similar results in terms of postoperative and functional outcomes, and quality of life, with an additional cost saving in favor of a day-case procedure.<sup>3</sup> However large confirmatory series have been lacking and still warranted to be reported.<sup>4</sup> Among other procedures in esophageal surgery, Zenker's diverticulum and laparoscopic achalasia surgical treatment could be potential candidates for day-case approaches due to rapid postoperative recovery, early refeeding, and low complication rates.<sup>7,8</sup> To our knowledge, only one study reported on limited experience with laparoscopic Heller myotomy (LHM)<sup>9</sup> and Zenker's diverticulum treatment, and the trans-cervical approach has not been reported to date.

The aims of this study are to assess the acceptability, feasibility, and safety of a large series of day-case

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esophageal surgeries, including laparoscopic Nissen fundoplication (LNF), Zenker diverticulectomy (ZD), and LHM in a university-based tertiary care center and to compare the outcomes of the three groups.

## MATERIALS AND METHODS

Data were collected prospectively from the beginning of the day-case programs for all consecutive patients benefiting from day-case LNF from January 2004 to December 2013, LHM from July 2009 to January 2011, and ZD from July 2009 to December 2013. The study protocol was approved by the French North-West Ethical Committee.

### Patients

The day-case eligibility criteria have been previously reported.<sup>3</sup>

The patients considered for day-case LNF had symptomatic GERD. Upper digestive endoscopy was routinely performed to identify complications of GERD and/or large hiatal hernias (>5 cm). Patients who had undergone previous abdominal surgery (including a previous antireflux procedure) or who had complicated GERD or a large hiatal hernia were not eligible. Esophageal motility was routinely assessed by preoperative esophageal manometry. A 24-hour pH-metry examination was performed in cases of nontypical clinical symptoms of GERD.

The patients considered for day-case LHM had proven achalasia on esophageal manometry, showing esophageal aperistalsis and insufficient low esophageal sphincter relaxation with swallowing. All of the patients underwent upper endoscopy to exclude pseudoachalasia arising from a tumor at the gastroesophageal junction and barium esophagography to eliminate a megaesophagus (diameter >7 cm). Patients who had pseudoachalasia, megaesophagus, previous abdominal surgery, (including a previous myotomy procedure) or esophageal diverticula in the distal esophagus were not eligible.

The patients considered for day-case ZD had a symptomatic Zenker's diverticulum confirmed by barium swallow. Upper digestive endoscopy was selectively performed in the patients with dysphagia to eliminate other organic causes. Indirect laryngoscopy was systematic to assess vocal cord function before the procedure. Patients who had previous cervical surgery, vocal cord paralysis, intrathoracic or right-sided ZD, or suspicion of carcinoma arising in the diverticulum were not eligible.

### Pre- and perioperative management

The pre- and perioperative management followed a detailed therapeutic protocol, as described previously and recommended.<sup>10,11</sup>

## Surgical approaches

LNF consisted of a laparoscopic Nissen–Rossetti, without division of the short gastric vessels and with sutured crural closure, as previously described.<sup>3</sup>

LHM consisted of a combination of laparoscopic myotomy with monopolar scissors and partial fundoplication.<sup>12</sup> The length of the myotomy was at least 8 cm. A methylene blue test was routinely performed through the nasogastric tube to detect mucosal injury. In such cases, the zone was oversewn with 4-0 resorbable sutures, and a subsequent anterior fundoplication was used to cover the area.

ZD was performed according to the technique recently published.<sup>13</sup> A cricopharyngeal myotomy (3–4 cm) was associated with stapling of the diverticulum at its origin, using a linear stapler with 3 staggered rows of 2.5 mm height staples. A methylene blue test was routinely performed to ensure the sealing of the staples. If a leak was observed during this test, it was oversewn with 4-0 resorbable sutures.

### Postoperative management

The immediate and post-discharge pain management and prevention of postoperative nausea and vomiting (PONV) protocols have been described elsewhere.<sup>3</sup> The patients were told to maintain a strict mixed diet during the first three postoperative weeks.

### Evaluation criteria

The primary endpoints were dedicated ambulatory endpoints, including reoperation on the same day of surgery, unplanned overnight admissions, and unplanned 30-day readmissions and consultations. The secondary endpoints were postoperative 30-day mortality and morbidity, including the severity of complications evaluated by the Dindo–Clavien classification,<sup>14</sup> the patients' satisfaction (evaluated at 3 months), and the functional results (evaluated in April 2014) for each day-case procedure.

After day-case LNF, the detailed evaluation of functional results used the Visick score.<sup>15</sup> For LHM, the Eckardt score was calculated before surgery and at the time of the last follow-up.<sup>16</sup> For ZD, a verbal questionnaire was used, as described by Seth *et al.*<sup>17</sup> to evaluate symptoms before and after surgery. Validated criteria were used for treatment success i.e. a reduction in the Eckardt symptom score to 3 or less in the LHM group, a Visick score of 1 and 2 in the LNF group and a Seth score  $\leq 1$  in the ZD group.

### Statistical analysis

Data were collected in a prospective database and analyzed with the intent to treat using the SPSS software version 19.0 (SPSS, Chicago, IL, USA). The data are

presented as the prevalence, mean (standard deviation), or median (range). Continuous data were compared by means of the Mann–Whitney *U* test or Student's *t* test as appropriate and ordinal data by the Chi-square test or the Fisher's exact test as appropriate.  $P < 0.05$  was considered statistically significant. The analyses were performed with the intent to treat.

## RESULTS

### Patients' characteristics and perioperative data

Among the 427 patients who underwent surgery for those indications during the study period, 168 (39.3%) eligible patients underwent day-case procedures. The rate of ambulatory surgery was similar between the LNF, LHM, and ZD procedures (40.8% vs. 41.2% vs. 30.7%,  $P = 0.681$ ). The patients' characteristics and perioperative data are shown in Table 1. Age and American Society of Anesthesiologists (ASA) score were significantly more advanced in the ZD group than in the LNF ( $P < 0.001$  and  $P = 0.001$ ) and LHM ( $P < 0.001$  and  $P = 0.001$ ) groups. Body mass index (BMI) was lower in the LHM group when compared to LNF ( $P = 0.002$ ) and ZD groups ( $P = 0.135$ ). In the LHM group, four (28.6%) patients had a history of pneumatic dilation. In the LNF group, 46 patients (34.8%) had a hiatal hernia. Median operative time was shorter in the ZD group when compared to LNF and LHM groups ( $P < 0.001$  and  $P < 0.001$ , respectively). A perioperative complication occurred in four cases (2.4%), more frequently in the LHM group ( $P = 0.037$ ). In the LNF group, one patient (0.7%) underwent chest tube insertion due to accidental opening of the pleural space during dissection, and this patient was admitted overnight. In the LHM group, two (14.3%) patients experienced a

mucosal injury at the myotomy site, and these patients were admitted overnight without subsequent event. In the ZD group, one patient (5%) had a leak on the staple line that was oversewn, and the patient was discharged the same day.

### Primary objective: day-case-related endpoints (Table 2)

#### Unplanned overnight admissions

In the overall population, 27 patients had an unplanned overnight admission (16.2%) (detailed in Table 2) with no significant differences among the three groups ( $P = 0.681$ ) and 17 patients (63%) were discharged at postoperative day (POD) 1 (69.5% in the LNF group and 50% in the other groups); five of these patients (18.5%) underwent reoperation. No pre- or perioperative factors were predictive of same day-discharge failure in univariate or multivariate analyses (Table 3).

#### Unplanned 30-day readmissions

The unplanned 30-day readmission rate was 8.9% ( $n = 15$ ) with no significant differences among the three groups ( $P = 0.300$ ), and the unplanned seven-day readmission rate was significantly higher in the LHM group than in the ZD and LNF groups ( $P = 0.042$ ). Among the readmitted patients, seven patients (46.7%) required a reoperation (three in the LHM group, four in the LNF group, and none in the ZD group), mostly during the first postoperative week ( $n = 6$ ).

In the ZD group, one patient each was readmitted on PODs 9 and 14 for leaks on the staple line. Both cases were treated conservatively with the cervical wound infection opened bedside, insertion of a nasogastric tube with enteral nutrition and nil by mouth and enteral antibiotherapy.

**Table 1** Patients' characteristics and perioperative data in the overall population of esophageal day-case surgeries and for each day-case procedure group

Variables		Total $N = 168$ (%)	LNF group $N = 134$ (%)	LHM group $N = 14$ (%)	ZD group $N = 20$ (%)
Sex	Male	105 (62.5)	85 (63.4)	6 (42.9)	14 (70.0)
	Female	63 (37.5)	49 (36.6)	8 (57.1)	6 (30.0)
Median age [range]		40.6 [15.4–80.6]	39.2 [15.6–70.6]	33.8 [18–72.2]	67.9 [44.0–80.0]
ASA score	I	108 (64.3)	91 (67.9)	10 (71.5)	7 (35.0)
	II	58 (34.5)	43 (32.1)	3 (21.4)	12 (60.0)
	III	2 (1.2)	0 (0.0)	1 (7.1)	1 (5.0)
Median BMI (kg/m <sup>2</sup> ) [range]		25.2 (16.4–38.0)	26.1 (16.4–38.0)	21.1 (17–31.3)	24 (18.4–29.8)
Median Operative time (minutes) [range]		68 (23–305)	70 (35–178)	79 (61–305)	49 (23–94)
Perioperative complications		4 (2.4)	1 (0.7)	2 (14.3)	1 (5)

ASA, American Society of Anesthesiologists; BMI, body mass index; LNF, laparoscopic Nissen Fundoplication; LHM, laparoscopic Heller myotomy; ZD, Zenker's diverticulum resection.

**Table 2** Postoperative course in the overall population undergoing esophageal day-case surgery and for each day-case procedure group (primary objective)

Evaluation criteria	Total <i>N</i> = 168 (%)	LNF group <i>N</i> = 134 (%)	LHM group <i>N</i> = 14 (%)	ZD group <i>N</i> = 20 (%)
Primary objective: day-case endpoints				
Unplanned overnight admission (%)	27 (16.2)	23 (17.2)	2 (14.3)	2 (10.0)
Causes of unplanned overnight admission		Chest tube insertion ( <i>n</i> = 1)	Mucosal injury sutured during the procedure ( <i>n</i> = 1) Associated open inguinal hernia repair ( <i>n</i> = 1)	Inadequate pain control ( <i>n</i> = 1)
		PONV ( <i>n</i> = 7) Reoperation for dysphagia ( <i>n</i> = 3)		Reoperation on the same day for a cervical hematoma ( <i>n</i> = 1)
		Reoperation for intrathoracic migration ( <i>n</i> = 1)		
		Inadequate pain control ( <i>n</i> = 4)		
		Vasovagal syncope ( <i>n</i> = 3)		
		Anxiety ( <i>n</i> = 1)		
		Late return to recovery room ( <i>n</i> = 1)		
		No adult company for the first postoperative night ( <i>n</i> = 2)		
Median length of stay among admitted patients		2 (2–8)	3 (3–3)	3 (2–4)
Same day reoperation (%)	1 (0.6)	0 (0)	0 (0)	1 (5.0)
Cause of same day reoperation				cervical hematoma
Unplanned 30-day readmission (%)	15 (8.9)	10 (6.7)	3 (21.4)	2 (10.0)
Causes of unplanned readmission		Dysphagia ( <i>n</i> = 8) including four reoperations Flu-like syndrome ( <i>n</i> = 1)	Leak at the myotomy site ( <i>n</i> = 3) after Toupet fundoplication ( <i>n</i> = 1) or Dor fundoplication ( <i>n</i> = 2)	Leak on the staple line ( <i>n</i> = 2)
		Wound abscess ( <i>n</i> = 1)		
Median length of stay among readmitted patients		4 (1–12)	14 (9–17)	9 (7–11)
Unplanned 7-day readmission (%)	10 (6.0)	7 (5.2)	3 (20.4)	0 (0)
Unplanned 30-day consultation (%)	8 (4.8)	7 (5.2)	0 (0)	1 (5)
Causes of unplanned 30-day consultation		Dysphagia ( <i>n</i> = 5) Epigastric pain ( <i>n</i> = 1) Port-site abscess ( <i>n</i> = 1)		Dysphagia ( <i>n</i> = 1)

LNF, laparoscopic Nissen fundoplication; LHM, laparoscopic Heller myotomy; ZD, Zenker's diverticulum resection; PONV, postoperative nausea and vomiting.

#### Unplanned 30-day consultations

The unplanned 30-day consultations were reported in eight patients in the overall population (4.8%) without significant differences between groups ( $P = 0.489$ ). Port-site abscess was treated with antibiotics. In the other patients, barium swallows were normal, and they were treated symptomatically, in association with reassurance.

#### Secondary objectives: postoperative outcomes and satisfaction

##### Postoperative outcomes (Table 4)

There were no postoperative deaths. The overall 30-day postoperative morbidity rate was 19.0% in the

overall population, including 11.3% Dindo–Clavien complications of at least grade II and 7.1% reoperations with no significant differences among the groups ( $P = 0.963$ ,  $P = 0.411$ , and  $P = 0.186$ , respectively).

##### Patients' satisfaction

The median follow-up was 48.1 months (3–132.3). Satisfaction results are shown in Table 5. At 3 months, 87.8% of the patients were very satisfied or satisfied with the day-case treatment, and 84.1% of the patients would undergo a similar surgical procedure in a day-case setting in the future. No significant differences were observed between the three groups ( $P > 0.526$ ).

**Table 3** Predictive factors for the success of same day discharge in the overall population of esophageal day-case surgeries

		Unplanned overnight admission <i>n</i> = 27 (%)	No overnight admission <i>n</i> = 141 (%)	<i>P</i> -value
Sex	Male	20 (74.1)	84 (59.6)	0.155
	Female	7 (25.9)	57 (40.4)	
Age	<50 years old	21 (77.8)	93 (66.0)	0.228
	≥50 years old	6 (22.2)	48 (34.0)	
Type of intervention	LNF	23 (85.2)	111 (78.7)	0.681
	LHM	2 (7.4)	12 (8.5)	
	ZD	2 (7.4)	18 (12.8)	
ASA score	1	17 (63.0)	91 (64.5)	0.681
	2	10 (37.0)	48 (34.0)	
	3	0	2 (1.5)	
BMI	<30 kg/m <sup>2</sup>	26 (96.3)	123 (87.3)	0.316
	≥30 kg/m <sup>2</sup>	1 (3.7)	18 (12.7)	
Operative time	<60 min	7 (25.9)	47 (33.3)	0.313
	≥60 min	20 (74.1)	94 (66.7)	

ASA, American society of anesthesiologists; BMI, body mass index; LNF, laparoscopic Nissen fundoplication; LHM, laparoscopic Heller myotomy; ZD, Zenker's diverticulum resection.

**Table 4** Postoperative course in the overall population undergoing esophageal day-case surgery and for each day-case procedure group (secondary endpoints)

Evaluation criteria	Total <i>N</i> = 168 (%)	LNF group <i>N</i> = 134 (%)	LHM group <i>N</i> = 14 (%)	ZD group <i>N</i> = 20 (%)
Secondary endpoints: other postoperative endpoints				
Overall 30-day morbidity (%)	32 (19.0)	25 (18.6)	3 (21.4)	4 (20.0)
Clavien–Dindo ≥II morbidity (%)	19 (11.3)	13 (9.4)	3 (21.4)	3 (15)
Reoperation (%)	12 (7.1)	8 (6.0)	3 (21.4)	1 (5.0)
	Causes of reoperation	Six laparoscopic revision to Toupet	Three laparoscopic revisions for a leak on the myotomy site (suture+Dor fundoplication ( <i>n</i> = 2) or omentoplasty ( <i>n</i> = 1))	Drainage of a cervical hematoma
Length of stay (day)	1 (1–8)	Two laparoscopic revision for intrathoracic migration 1 (1–8)	1 (1–3)	1 (1–4)

LNF, laparoscopic Nissen fundoplication; LHM, laparoscopic Heller myotomy; ZD, Zenker's diverticulum resection.

### Secondary objective: functional results

Functional results are shown in Table 5. At final follow-up, using dedicated scores treatment was successful in 79.4% in group LNM, 82% in group LHM, and 100% in group ZD.

### DISCUSSION

In the literature on day-case esophageal surgery, only laparoscopic fundoplication has emerged to date,<sup>5</sup> and it is considered to be feasible for patients who fulfill the medical and socioeconomic prerequisites for ambulatory care.<sup>18</sup> However, this procedure has not yet gained popularity in France or in most European countries, with reported rates ranging from 0.1% in Spain and 0.2% in France to 11% in Denmark.<sup>19</sup> We have gained experience with day-case LNF in our

department since 2003 and introduced day-case LHM and ZD in 2009. Despite the inclusion of our learning curve, 83.8% of the patients were discharged on the same day, in agreement with the recommended rates for more prevalent ambulatory surgical procedures, such as cholecystectomy.<sup>20</sup>

In previous studies, we demonstrated the feasibility and safety of outpatient LNF as well as compared this procedure with inpatient procedures in small cohorts.<sup>3,10</sup> The aim of the present study is to assess the acceptability, feasibility and safety of enlarged indications of ambulatory esophageal surgery, including LNF, ZD, and LHM and to compare the outcomes among the three groups.

We confirm the feasibility and safety of LNF in the day-case setting, including a return to home in fewer than 12 hours, with good functional results. Unplanned overnight admissions were mostly due to

**Table 5** Satisfaction and functional results in the overall population of esophageal day-case surgeries and for each day-case procedure group

Secondary endpoint: satisfaction		Total <i>N</i> = 132 (%)	LNF group <i>N</i> = 101 (%)	LHM group <i>N</i> = 14 (%)	ZD group <i>N</i> = 17 (%)
Satisfaction	1: very dissatisfied	2 (1.5)	1 (0.9)	1 (7.1)	0 (0)
	2: dissatisfied	5 (3.8)	3 (2.9)	1 (7.1)	1 (5.9)
	3: ambivalent	8 (6.0)	7 (6.9)	0 (0)	1 (5.9)
	4: satisfied	27 (20.5)	24 (23.8)	2 (14.4)	1 (5.9)
	5: very satisfied	90 (68.2)	66 (65.5)	10 (71.4)	14 (82.3)
Would undergo a similar surgical procedure in the future in a day-case setting	No	21 (15.9)	18 (17.8)	2 (14.3)	1 (5.9)
	Yes	111 (84.1)	83 (82.2)	12 (85.7)	16 (94.1)
Secondary endpoint: functional results		Total <i>N</i> = 129	LNF group <i>N</i> = 98 (%)	LHM group <i>N</i> = 14 (%)	ZD group <i>N</i> = 17 (%)
	Median follow-up (months)		63 [24–132]	45.7 [37–61]	37.6 [5–50]
	Dedicated score		Visick score at final follow-up	Eckardt score (median [range])	Seth score (median [range])
			1 <i>n</i> = 59 (60.2%)	Preoperative: 6 [2–12]	Preoperative: 6.5 [2–12]
			2 <i>n</i> = 19 (19.4%)	1 month: 1.5 [0–9]	1 month: 0
			3 <i>n</i> = 12 (12.2%)	Final follow-up: 1 [0–8]	Final follow-up: 0 [0–1]
			4 <i>n</i> = 8 (8.2%)		

Visick score: 1: excellent results, 2: very good results, 3: acceptable results and 4: unsatisfying results.

LNF, laparoscopic Nissen fundoplication; LHM, laparoscopic Heller myotomy; ZD Zenker's diverticulum resection.

minor medical factors, which are known to be the main determinant factors of the length of postoperative stay after ambulatory surgery,<sup>21</sup> allowing for an extended recovery (hospital stay <23 hour) in 69.5% of these cases. The most frequent postoperative symptoms were dysphagia (11.2%) and PONV (5.2%). To optimize same-day discharge and to avoid PONV-related complications,<sup>10</sup> strict control of PONV is required using a prophylactic antiemetic protocol based on the identification of patients at risk for developing PONV with the Apfel's score.<sup>22</sup> Among the patients admitted or readmitted for dysphagia, most of the patients were subjected to reoperation without changes relative to our inpatient strategy. This aggressive and early surgical strategy now has our preference over delayed endoscopic dilatation, which can lead to fibrous modifications in the fundoplication, with potentially impaired long-term results. This explains the relatively high rate of reoperation after LNF due to a change in postoperative strategy.<sup>3</sup> Because the Toupet fundoplication seems to be associated with similar long-term results but less dysphagia than LNF,<sup>23</sup> this procedure might also be proposed and even be preferred in a day-case care setting.

In the literature, we found a single series of seven ambulatory LHM procedures, including five patients discharged within 23 hours and only two patients discharged within 12 hours, with no adverse outcomes or readmissions.<sup>9</sup> The most feared complication with LHM is mucosal perforation at the myotomy site, with a frequency of 6.9% (0%–25%),<sup>7</sup> and it might be favored by a history of endoscopic treatment.<sup>24,25</sup>

When immediately diagnosed and repaired, such complications have been associated with uneventful postoperative courses in 99.3% of cases and should not preclude day-case LHM<sup>7</sup> as it occurred two times in our series without postoperative complications. In our preliminary experience of 14 day-case LHM procedures, we observed an unacceptable rate of 21.4% readmission with reoperation for a late mucosal perforation at the myotomy site, which led us to stop our day-case LHM program. Among these three cases, two of them had previous endoscopic pneumatic dilatation histories, and dietetic errors were identified each time without a history of postoperative vomiting. The combination of these two factors should have weakened the mucosa and caused a secondary perforation as the methylene blue test was initially negative. In in-patient LHM, late perforation occurred in less than 1% of cases,<sup>26,27</sup> suggesting that hospitalization allows for controlled oral refeeding. Because of the severity of this complication, we concluded that day-case LHM was unsafe, and the program was stopped. We chose to keep patients hospitalized for a few days after surgery to improve dietetic education. However, day-case LHM might be further evaluated: (i) in patients with good understanding; (ii) after the implementation of reinforced therapeutic education with dietetic support; and (iii) after probable exclusion of patients with a dilatation history.

In this preliminary experience with day-case ZD, we observed a satisfactory rate of 90.0% of same-day discharged patients, despite patients with more advanced ages and ASA scores. One patient required

reoperation on the same day as the initial operation for a cervical hematoma, which is a rare complication occurring in 0% to 5% of cases,<sup>8,27</sup> with a favorable outcome after surgical drainage. After ZD, a leak of the suture line occurred in 8% to 14% of patients in the inpatient series.<sup>8,27</sup> In the present series, two leaks (10%) occurred late, on PODs 9 and 14, with favorable outcomes after conservative treatment, as advocated in the literature.<sup>28</sup> Because the mean length of stay after inpatient ZD is usually less than 6 days,<sup>29</sup> these readmissions would probably have occurred after in-patient procedures and should consequently not preclude day-case ZD. Because Zenker diverticulopexy has been associated with similar long-term results and less risk of leakage than ZD,<sup>30</sup> this procedure might also be eligible for day care.

Despite a strict evaluation of the postoperative course and functional results, this study had some limitations. The aim of this study is to describe a large confirmatory series of LNF and to evaluate enlarged indications of ambulatory esophageal surgery including ZD and LHM and not to compare results of inpatient versus outpatient surgery, for which the inclusion criteria are different. The limited number of patients in the ZD and LHM cohorts did not allow us to identify predictive factors for the failure of same-day discharge in esophageal surgery. Due to the tertiary university center structure, numerous patients were referred from large distances or with poor health conditions, limiting the number of eligible patients. Among other esophageal surgical procedures, laparoscopic or thoracoscopic enucleation of submucosal tumors or diverticulum resection could be evaluated in a day-case care setting.<sup>31</sup>

To conclude, we showed that day-case esophageal surgery was feasible in selected patients, with specificities related to the surgical technique. Whereas the feasibility of day-case LNF was demonstrated and has been suggested for ZD, safety endpoints were not met for LHM. This latter approach deserves further evaluation, requiring stringent selection criteria and reinforced patient education.

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