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ORIGINAL ARTICLE

Post-esophagectomy patients presenting for general anesthesia induction: a survey of practice among US anesthesiologists (PESO-GAIN-S)

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Abstract

Purpose Following esophagectomy, annually several thousand patients in the United States (US) reach a stable post-esophagectomy status. Such patients may require general anesthesia (GA) for elective procedures, but no generally accepted guidelines exist for the induction of GA in post-esophagectomy patients.

Methods A national survey describing a post-esophagectomy patient was emailed to 23,524 attending anesthesiologists who were members of the American Society of Anesthesiologists. The survey included 3 demographic and 12 anesthetic management questions. Responses were further stratified by gender, years in practice and frequency of exposure to the patient population of interest.

Results A total of 744 (3.2%) respondents completed the survey. The respondent demographic characteristics closely reflected recent US anesthesiology workforce analyses. Endotracheal tube was the preferred method of airway management for 648 (87.1%), 419 (64.7%) used a rapid sequence induction, and 504 (67.7%) elected a reverse Trendelenburg position, with the latter two choices being favored among anesthesiologists with routine (vs. rarely/never) exposure to post-esophagectomy patients (76.6% vs. 58.4%; $p < 0.001$; and 73.6% vs. 63.9%; $p = 0.021$, respectively). Across survey participants, induction of GA was highly variable with differential effects of gender, years in practice and exposure frequency to post-esophagectomy patients.

Conclusions US attending anesthesiologists' approach to induction of GA in a patient with a history of successful esophagectomy was not uniform. The majority of responses reflected a concern for aspiration in such a patient. Considering surgical and non-surgical upper gastrointestinal changes, establishment of practice guidance to optimize perioperative care is an unmet need.

Keywords Esophagectomy · Aspiration on induction · Airway management · Anesthesia in esophagectomy

Introduction

Esophageal cancer is the 11th most common cancer globally and is the 7th leading cause of cancer-related deaths [1]. Across the world, the prevalence of this disease varies between countries, ethnicities and sexes. The reported age-standardized rate in 2020 per 100,000 individuals was 18.2 and 6.8 for Eastern Asian countries, 8.2 and 2.7 for Northern European countries and 4.8 and 1.1 for Northern America for men and women, respectively [2]. In the United States (US), an estimated 21,560 new cases were diagnosed in 2023 [3]. Overall, esophageal cancer carries a poor prognosis with a 5 year survival rate of 14.3% in a cohort of 46,063 patients diagnosed from 1973 to 2015, and 21.7% for those diagnosed from 2013 to 2019 [3, 4]. Esophagectomy is the

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primary curative treatment of esophageal cancer and some non-cancer-related esophageal diseases, and is performed on average 8800 times annually in the US [5]. However, despite advancements in neoadjuvant therapy and surgical techniques, esophagectomy is associated with up to 60% postoperative morbidity and 5% mortality within 30 days [6]. Recurrence rates are high. According to a meta-analysis of six randomized controlled trials with 822 patients, 3 year disease-free survival was 54% and 50% for patients undergoing minimally invasive and open esophagectomy, respectively [7].

Although the exact number of current patients with a history of successful esophagectomy (> 90 days post-esophagectomy) in the US is unknown, more than 4000 patients join this cohort annually. Some of these patients will require elective surgery necessitating general anesthesia (GA), often for reasons unrelated to their esophageal cancer or post-esophagectomy status. Some literature suggests that patients after successful esophagectomy are at increased risk for regurgitation and pulmonary aspiration [8, 9]. This risk may exist even in asymptomatic patients and aspiration on induction of GA has been reported despite the use of a rapid sequence induction (RSI) technique [10, 11]. Much of this literature comes from countries with a higher esophageal cancer rate than in the US, such as Japan.

There are currently no guidelines for patients presenting for elective post-esophagectomy GA induction (PESO-GAIN). The approach to anesthetic induction in such patients by US anesthesiologists is unknown. We conducted a survey study (PESO-GAIN-S) of members of the American Society of Anesthesiologists (ASA) to assess current practices for patients with a history of successful esophagectomy.

Methods

The following review by the Albany Medical Center Institutional Review Board, this anonymous survey study was determined to be exempt.

Survey questionnaire

The survey questions and processes were initially developed by the research team. The final survey is the result of a Delphi process and consensus among eight US board-certified anesthesiologists (four men and four women), with a diverse range of clinical experience, duration of practice and racial backgrounds. The collective clinical experience of these anesthesiologists ranged from 2 to 33 years (median of 6.5 years; mean of 11.8 years), totaling 95 years of experience as attending anesthesiologists.

We utilized the Qualtrics (Qualtrics ^{XM}, UT, US) online platform for constructing, processing and collecting responses for the survey. The questionnaire included a sample index case presentation followed by 15 questions (12 questions pertaining to anesthetic management of the described case and three demographic questions), with an estimated completion time of no more than 5 min (Online Resource 1). The sample index case was abstracted from a real case by one of the authors that resulted in solid particulate aspiration following standard induction of GA. At the end of the survey, the respondents were given the option to review a fact sheet regarding patients with a history of successful esophagectomy (Online Resource 1) and subsequently had the opportunity to retake the survey, which was tracked separately for analysis.

The fact sheet was written by the research team and an experienced thoracic surgeon following a review of the anesthesia and surgical literature. All team members agreed to its content as relevant.

Survey participants

Upon approval of the survey by the research division of the ASA on April 14th, 2024, the questionnaire was sent to the ASA email list of attending anesthesiologists, comprising 23,524 active ASA members. No incentive was offered for participation in the survey. Following the initial invitation, the ASA sent two reminders at 3-week intervals. Data collection was conducted anonymously. Forty-nine members had their governmental institutional email addresses listed in the server that would block access to the retake survey option by their governmental information technology firewall mechanism.

Statistical analysis

All analyses were completed with R Statistical Software (version 4.2.3, Foundation for Statistical Computing, Vienna, Austria). Descriptive statistics for responses are presented as frequency (n, %) for categorical variables. Comparison of demographics and practice characteristics was performed using the Chi-square test of independence for categorical variables with counts ≥ 10 in either group or Fisher's exact test for categorical variables with counts < 10 in either group. Results were considered statistically significant where $p < 0.05$.

Results

Response rate and demographics

Of the 23,524 US attending anesthesiologists who received the survey, 830 (3.5%) accessed the survey link. Of those who accessed the link, 744 (89.6%) respondents completed

the survey and were included in the statistical analysis (effective response rate: 3.2%). Eighty-six (10.4%) respondents did not complete the survey and were not included in the analysis. Demographic characteristics of the respondents are presented in Table 1.

Table 1 Demographic characteristics of survey respondents ($N = 744$)

Variables	*n* (%)
Gender	
Male	482 (64.9)
Female	205 (27.5)
Non-binary	11 (1.5)
Prefer not to state	46 (6.2)
Years in practice	
> 20	337 (45.3)
16–20	115 (15.5)
11–15	114 (15.3)
5–10	142 (19.1)
< 5	36 (4.8)
Similar prior encounters	
Routinely	292 (39.2)
Rarely	410 (55.1)
Never	42 (5.6)

Values are presented as *n* (%)

Among respondents, there were 482 (64.9%) men and 205 (27.5%) women, 11 (1.5%) were non-binary individuals, and 46 (6.2%) preferred not to disclose their gender. Of the 744 respondents, 452 (60.8%) had > 15 years of experience as an attending anesthesiologist. Post-esophagectomy patients were routinely encountered in their daily practice by 292 (39.2%) respondents, whereas 410 (55.1%) and 42 (5.6%) anesthesiologists encountered these patients rarely or never, respectively.

Airway management and induction strategy

Overall practice patterns are shown in Fig. 1 and Table 2. An endotracheal tube was the choice to manage the airway for 648 (87.1%) anesthesiologists, of whom 419 (64.7%) would use an RSI, and 209 (32.2%) would use a standard induction technique. Awake fiberoptic intubation as a primary approach was chosen by nine (1.4%) respondents. An additional 11 (1.7%) respondents stated they would not perform RSI, standard induction or awake fiberoptic intubation and were excluded from further statistical analysis as they did not provide any additional methods of

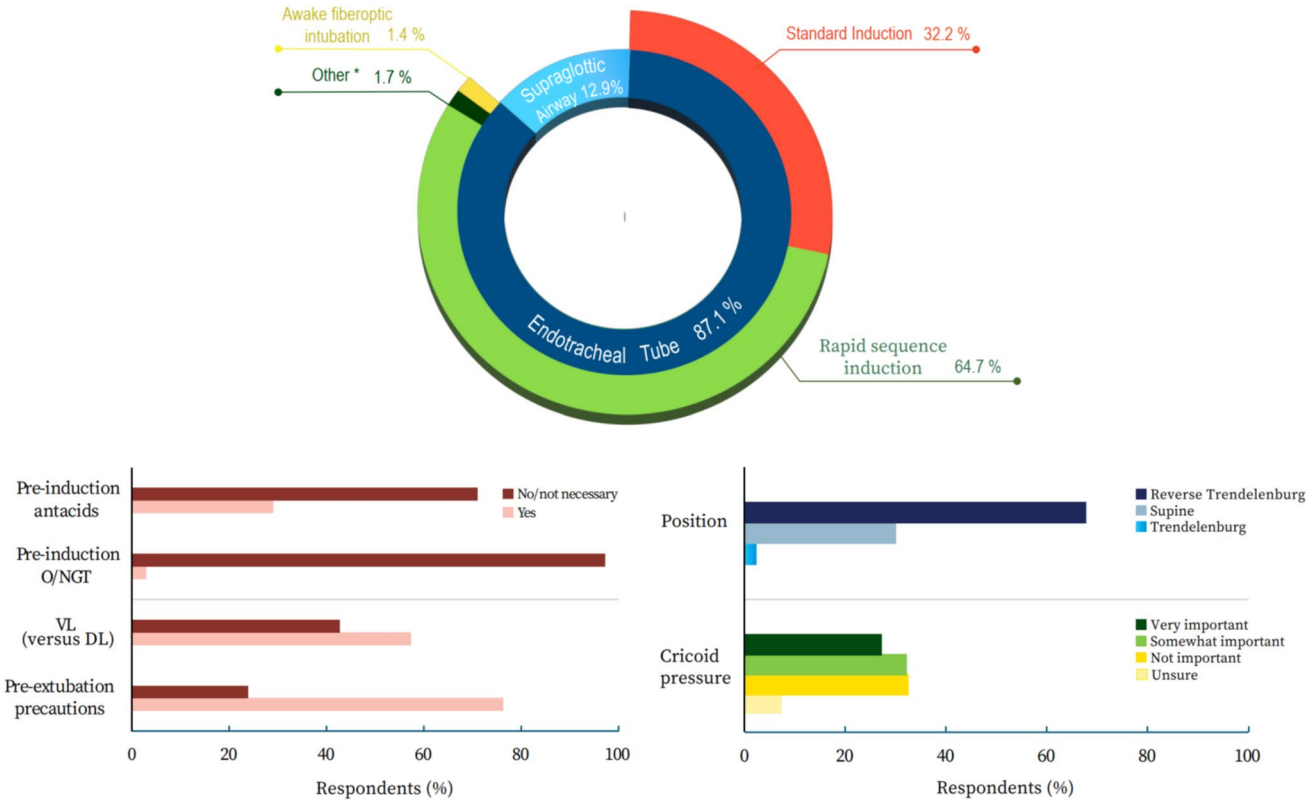

Fig. 1 Aggregate survey result of the respondent cohort ($n = 744$). Legend: top: airway management and induction technique, bottom left: precautionary measures, bottom right: positioning, and importance of cricoid pressure. *DL* direct laryngoscopy; *O/NGT* oro-/nasogastric tube, *VL* video laryngoscopy

Table 2 Impact of respondent gender on anesthetic management

Variables	Overall	Gender			*p* value[1]
		Male	Female	Non-binary/prefer not to state‡	
Total no. of respondents *n* (%)	744 (100)	482 (64.8)	205 (27.5)	57 (7.7)	
Airway					**0.022**
Endotracheal tube	648 (87.1)	408 (84.6)	189 (92.2)	51 (89.5)	
Supraglottic airway	96 (12.9)	74 (15.4)	16 (7.8)	6 (10.5)	
Intubation by an experienced anesthesiologist*					0.37
Not necessary	322 (49.7)	211 (51.7)	86 (45.5)	25 (49.0)	
Yes	326 (50.3)	197 (48.3)	103 (54.5)	26 (51.0)	
Laryngoscopy*					0.43
Indirect	371 (57.2)	226 (55.4)	113 (59.8)	32 (62.7)	
Direct	277 (42.8)	182 (44.6)	76 (40.2)	19 (37.3)	
Induction*					0.33
Rapid sequence	419 (64.7)	256 (63.8)	132 (71.0)	31 (62.0)	
Standard	209 (32.2)	138 (34.4)	53 (28.5)	18 (36.0)	
Awake fiberoptic	9 (1.4)	7 (1.7)	1 (0.5)	1 (2.0)	
Positioning during induction					0.34
Reverse trendelenburg	504 (67.7)	323 (67.0)	146 (71.2)	35 (61.4)	
Supine	223 (30.0)	148 (30.7)	56 (27.3)	19 (33.3)	
Trendelenburg	17 (2.3)	11 (2.3)	3 (1.5)	3 (5.3)	
Cricoid pressure†					NA
Not important	136 (32.5)	82 (32.0)	45 (34.1)	9 (29.0)	
Somewhat important	131 (31.3)	80 (31.3)	39 (29.5)	12 (38.7)	
Very important	114 (27.2)	71 (27.7)	37 (28.0)	6 (19.4)	
Unsure	38 (9.1)	23 (9.0)	11 (8.3)	4 (12.9)	
Other precautions					
Preoperative antacids					0.91
Not necessary	528 (71.0)	343 (71.2)	146 (71.2)	39 (68.4)	
Yes	216 (29.0)	139 (28.8)	59 (28.8)	18 (31.6)	
Pre-induction oro-/nasogastric tube					0.077
Not necessary	723 (97.2)	466 (96.7)	203 (99.0)	54 (94.7)	
Yes	21 (2.8)	16 (3.3)	2 (1.0)	3 (5.3)	
Pre-extubation measures§*					**0.005**
Not necessary	154 (23.8)	110 (27.0)	29 (15.3)	15 (29.4)	
Yes	494 (76.2)	298 (73.0)	160 (84.7)	36 (70.6)	

[1]Pearson's Chi-squared test; Fisher's exact test

NA: statistical analysis not applicable due to a small number of respondents

Values are presented as *n* (%), where n represents the total number of respondents except for: **n* represents respondents who elected to use an endotracheal tube

†n represents respondents who elected to perform rapid sequence induction

‡Includes 46 respondents who preferred not to state their gender and 11 respondents who identified as non-binary

§Measures include gastrointestinal decompression with an oro-/nasogastric tube, table positioning, or state of wakefulness

induction. Comments noted by these 11 respondents are depicted in Online Resources 2, Table 3. The remaining 96 (12.9%) anesthesiologists would use a supraglottic airway (SGA)/laryngeal mask airway.

Precautionary measures

Prior to induction, the use of non-particulate antacid and placement of an oro-/nasogastric tube (O/NGT) were deemed

Table 3 Impact of post-esophagectomy patient exposure frequency in practice on anesthetic management

Variables	Encounter		*p* value[1]
	Routinely	Rarely/never	
Total no. of respondents *n* (%)	292 (39.2)	452 (60.8)	
Airway			0.20
Endotracheal tube	260 (89.0)	388 (85.8)	
Supraglottic airway	32 (11.0)	64 (14.2)	
Intubation by an experienced anesthesiologist*			0.97
Not necessary	129 (49.6)	193 (49.7)	
Yes	131 (50.4)	195 (50.3)	
Laryngoscopy*			0.055
Indirect	137 (52.7)	234 (60.3)	
Direct	123 (47.3)	154 (39.7)	
Induction*			**< 0.001**
Rapid sequence	197 (76.6)	222 (58.4)	
Standard	58 (22.6)	151 (39.7)	
Awake fiberoptic	2 (0.8)	7 (1.8)	
Positioning during induction			**0.021**
Reverse trendelenburg	215 (73.6)	289 (63.9)	
Supine	71 (24.3)	152 (33.6)	
Trendelenburg	6 (2.1)	11 (2.4)	
Cricoid pressure†			0.43
Not important	71 (36.0)	65 (29.3)	
Somewhat important	58 (29.4)	73 (32.9)	
Very important	53 (26.9)	61 (27.5)	
Unsure	15 (7.6)	23 (10.4)	
Other precautions			
Preoperative antacids			**0.006**
Not necessary	224 (76.7)	304 (67.3)	
Yes	68 (23.3)	148 (32.7)	
Pre-induction oro-/nasogastric tube			0.31
Not necessary	286 (97.9)	437 (96.7)	
Yes	6 (2.1)	15 (3.3)	
Pre-extubation measures‡*			0.20
Not necessary	55 (21.2)	99 (25.5)	
Yes	205 (78.8)	289 (74.5)	

[1]Pearson's Chi-squared test; Fisher's exact test

Values are presented as *n* (%), where n represents the total number of respondents except for: **n* represents respondents who elected to use an endotracheal tube

†n represents respondents who elected to perform rapid sequence induction

‡Measures include gastrointestinal decompression with an oro-/nasogastric tube, table positioning, or state of wakefulness

unnecessary by 528 (71.0%) and 723 (97.2%) respondents, respectively. Among anesthesiologists who elected to manage the airway with an endotracheal tube, indirect (video) laryngoscopy was preferred over direct (standard) laryngoscopy (57.2% vs 42.8%). The most favored positioning during induction was reverse Trendelenburg by 504 (67.7%), followed by supine by 223 (30.0%), and Trendelenburg by 17 (2.3%) anesthesiologists (Fig. 1). Prior to extubation, 494 (76.2%) anesthesiologists would take special precautions, including but not limited to gastrointestinal decompression with an O/NGT, table positioning, or state of wakefulness (Fig. 1).

Practice variability during rapid sequence induction

Among the 419 (64.7%) participants who would use an RSI, 405 (96.7%) regarded the use of O/NGT prior to induction as unnecessary, and 272 (64.9%) deemed

antacids as unnecessary, while 326 (50.3%) believed intubation should be performed by the most experienced anesthesiologist, and 338 (80.7%) preferred reverse Trendelenburg positioning. The importance of cricoid pressure varied and was considered not important by 136 (32.5%), somewhat important by 131 (31.3%), and very important by 114 (27.2%) participants.

Impact of demographics on practice patterns

The influence of gender, prior PESO-GAIN patient encounters, and years in anesthetic practice are depicted in Tables 2, 3, and 4, respectively.

Significantly more men chose an SGA compared to women and non-binary/not stated anesthesiologists (15.4% vs. 7.8% vs. 10.5% respectively; $p = 0.022$; Table 2). Routine vs. rarely/never PESO-GAIN encounters or years in

Table 4 Impact of years in practice on anesthetic management

Variables	Years in practice		*p* value[1]
	≤ 15	> 15	
Total no. of respondents *n* (%)	292 (39.2)	452 (60.8)	
Airway			0.55
Endotracheal tube	257 (88.0)	391 (86.5)	
Supraglottic airway	35 (12.0)	61 (13.5)	
Intubation by an experienced anesthesiologist*			0.96
Not necessary	128 (49.8)	194 (49.6)	
Yes	129 (50.2)	197 (50.4)	
Laryngoscopy*			**0.033**
Indirect	134 (52.1)	237 (60.6)	
Direct	123 (47.9)	154 (39.4)	
Induction*			**0.004**
Rapid sequence	186 (72.9)	233 (61.0)	
Standard	65 (25.5)	144 (37.7)	
Awake fiberoptic	4 (1.6)	5 (1.3)	
Positioning during induction			0.17
Reverse trendelenburg	209 (71.6)	295 (65.3)	
Supine	76 (26.0)	147 (32.5)	
Trendelenburg	7 (2.4)	10 (2.2)	
Cricoid pressure†			**< 0.001**
Not important	83 (44.6)	53 (22.7)	
Somewhat important	55 (29.6)	76 (32.6)	
Very important	30 (16.1)	84 (36.1)	
Unsure	18 (9.7)	20 (8.6)	
Other precautions			
Preoperative antacids			0.53
Not necessary	211 (72.3)	317 (70.1)	
Yes	81 (27.7)	135 (29.9)	
Pre-induction oro-/nasogastric tube			**0.017**
Not necessary	289 (99.0)	434 (96.0)	
Yes	3 (1.0)	18 (4.0)	
Pre-extubation measures‡*			0.70
Not necessary	59 (23.0)	95 (24.3)	
Yes	198 (77.0)	296 (75.7)	

[1]Pearson's Chi-squared test; Fisher's exact test

Values are presented as *n* (%), where n represents the total number of respondents except for: **n* represents respondents who elected to use an endotracheal tube

†n represents respondents who elected to perform rapid sequence induction

‡Measures include gastrointestinal decompression with an oro-/nasogastric tube, table positioning, or state of wakefulness

practice as an attending (≤ 15 years vs. > 15 years) did not significantly impact the chosen airway management strategy (Tables 3 and 4).

Anesthesiologists with routine PESO-GAIN encounters were significantly more likely to consider preoperative administration of antacids as unnecessary (76.7% vs. 67.3%; $p = 0.006$), utilize an RSI (76.6% vs. 58.4%; $p < 0.001$), and position the patient in reverse Trendelenburg during induction (73.6% vs. 63.9%; $p = 0.021$) compared to those who never/rarely encountered PESO-GAIN in their daily practice (Table 3 and Fig. 2A).

Respondents with > 15 years of anesthesiology attending practice experience were significantly less likely to use an RSI technique (61.0% vs. 72.9%; $p = 0.004$) than those with ≤ 15 years of experience. Among anesthesiologists choosing an RSI, > 15 years of practice experience was significantly associated with considering cricoid pressure as very important (36.1% vs. 16.1%; $p < 0.001$) compared to those with ≤ 15 years of experience (Table 4 and Fig. 2B).

Free text response field results summary

Comments about the anesthetic management of patients with a prior history of esophagectomy were provided by 313 (42.1%) respondents. Of these, 194 (62.0%) stated a high aspiration risk in these patients as background for their response choice.

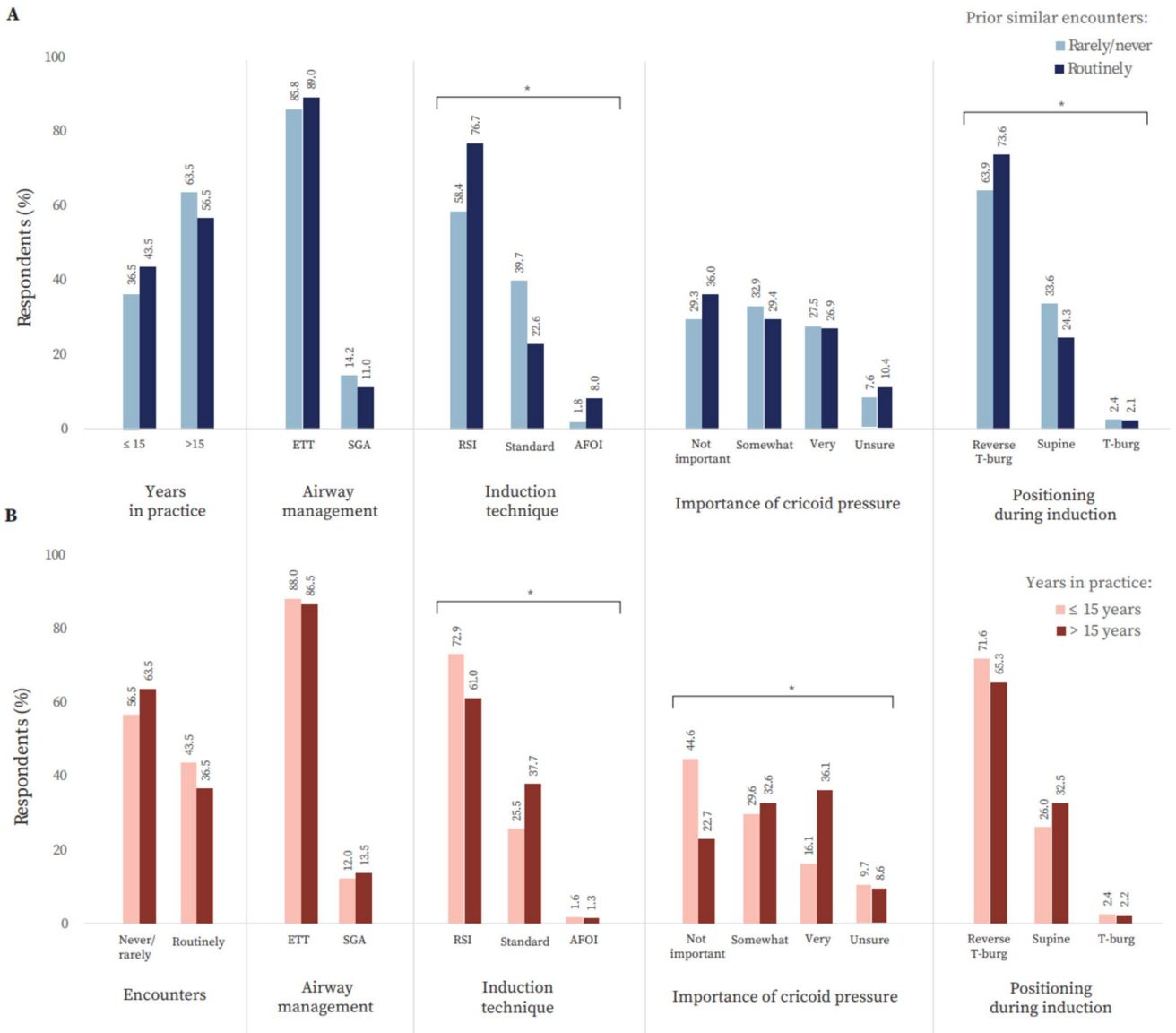

Fig. 2 Impact of exposure to post-esophagectomy patients (**A**) and duration of practice experience (**B**) on anesthesia induction practices. Legend: *signifies statistical significance. *AFOI* awake fiberoptic intubation, *ETT* endotracheal tube, *RSI* rapid sequence induction, *SGA* supraglottic airway, *T-burg* Trendelenburg

When specified, 107 (34.2%) attributed the elevated risk of aspiration to surgical factors (e.g., sphincterotomy, intra-thoracic stomach, altered anatomy) and 55 (17.6%) attributed it to the patient's signs and symptoms (e.g., history of gastroesophageal reflux disease, self-discontinuation of antacids, sleeping with head elevated, prior history of aspiration pneumonia).

Perioperative precautionary measures were discussed less frequently. Of the 313 respondents, 23 (7.3%) advised against the use of an O/NGT for fear of possible compromise of the neo-esophagus and/or the surgical anastomosis. Precautionary measures prior to extubation were reported by 26 (8.3%) respondents and included awake extubation with the patient following commands and demonstrating the ability to protect the airway. Several comments indicated no concerns for the routine use of an SGA for the described case scenario.

Retake survey results

Forty-one (5.5%) of the 744 respondents completed the second survey, of which 26 (63.4%) were men, 28 (68.3%) had > 15 years of experience as an attending anesthesiologist, and 15 (36.6%) routinely encountered PESO-GAIN patients in their daily practice. Demographic characteristics of the respondents are presented in Online Resource 2.

Airway management and induction strategy

During the second survey attempt, 38 (92.7%) respondents elected to manage the airway with an endotracheal tube, of which 25 (65.8%) preferred direct laryngoscopy over indirect laryngoscopy, 28 (73.7%) would use an RSI technique, and 33 (80.5%) favored reverse Trendelenburg positioning during induction. Among the respondents who would use RSI, cricoid pressure was considered to be very or somewhat important by 12 (42.9%) and 10 (35.7%), respectively.

Precautionary measures

Prior to induction, 26 (63.4%) and 33 (80.5%) of the respondents considered the use of non-particulate antacid and placement of O/NGT to be unnecessary, respectively. Prior to extubation, 33 (86.8%) anesthesiologists would take special precautions, including but not limited to gastrointestinal decompression with an O/NGT, table positioning, or state of wakefulness. Overall practice patterns are shown in Online Resource 2, Table 3.

Discussion

Esophagectomy itself is a highly morbid procedure with (postoperative) aspiration accounting for 55% of postoperative mortalities. Beyond patient factors such as age, underlying disease, and co-existing conditions, surgical risk factors include damage to the recurrent laryngeal nerve and delayed gastric emptying (e.g., vagotomy, gastric tube reconstruction, and relocation of the gastric cavity into the thorax, Online Resource 1) [12]. Due to the poor long-term prognosis, the number of patients presenting for elective surgery after successful esophagectomy is relatively low and the number of those presenting without residual gastrointestinal symptoms is even smaller, although such symptoms progressively improve with time after esophagectomy [13]. Recommendations for the induction of GA in this patient population do not exist and the anesthesiologist is limited to decision-making based on clinical judgment. We conducted this nationwide survey study among members of the ASA to assess the current practices and common themes of anesthesia induction in asymptomatic patients with a history of successful esophagectomy undergoing GA for elective surgery.

The survey generated an effective response rate of 3.2% among more than 23,000 attending anesthesiologists. Although limited in response rate, the survey participants' demographic distribution closely reflects estimates of the US anesthesiologists' workforce from the ASA as of December 31, 2023, where 28.8% were women and 71.2% were men (non-binary or prefer not to state was not reported) [14]. The same workforce information reports the average anesthesiologists' age as 50.6 years (not including anesthesiologists > 70 years of age), which can explain our finding that nearly 61% of our survey participants had more than 15 years of clinical practice experience. The average response rate to ASA member surveys is 8%, and it remains elusive why our survey generated the low response rate presented here [15].

Overall, our survey responses demonstrate a wide range of anesthesiologists' approaches to GA induction in the patient population of interest, reflecting both, concern and unconcern for aspiration risk.

As a common theme, the majority of 64.7% of anesthesiologists would perform an RSI, especially when routine exposure to such patients was part of their practice (76.6%). Surprisingly, anesthesiologists with > 15 years of practice experience would choose a standard induction significantly more often than their less experienced counterparts (37.7% vs. 25.5%; $p = 0.004$). This management discrepancy indicates exposure to patients undergoing PESO-GAIN is an important driver for an RSI induction and likely more significant than duration of practice experience alone for this approach (Fig. 2A, B).

The decision to use an RSI technique requires careful risk–benefit analysis, as it is not a benign procedure, especially in patients with many co-existing conditions [16]. In addition, the variability in the approach to an RSI technique has been repeatedly highlighted across institutions worldwide [17–19]. In a 2020 international survey of 1921 anesthesiologists, the authors found significant variability

in practice, and it may come to no surprise that the present study is also echoing such variability for the provided case scenario [17]. Cricoid pressure during RSI, also called the Sellick maneuver, has remained controversial in the literature and likely does not consistently lower the risk of aspiration [20, 21]. This may be especially true for post-esophagectomy patients with a surgically altered upper gastrointestinal anatomy.

Despite these considerations, 58.5% of respondents who would use an RSI regarded cricoid pressure as somewhat or very important. This perspective was significantly more common among anesthesiologists with > 15 years of work experience compared to their less experienced counterparts (Fig. 2B). It is unclear if this result reflects an unquestioned adherence of respondents with longer work experience to the more traditional teaching of the RSI technique during their earlier training.

Significantly more women compared to men elected the use of an endotracheal tube and pre-extubation precautionary measures for their case management. Such defensive and safety-oriented practice aligns with recent insights presented at the 2023 ASA annual meeting [22]. Furthermore, there is recent emerging evidence for improved postoperative outcomes for patients who received care by a woman anesthesiologist compared to a male colleague [23].

Anesthesiologists with more years of experience as an attending were more likely to use an O/NGT pre-induction and intubate using indirect laryngoscopy.

Relatively few anesthesiologists (12.9%) elected to use a SGA for the case and very few practitioners (1.4%) used awake fiberoptic intubation approach.

The retake survey option elicited a very low response rate, and a direct formal comparison of this cohort with the original survey participants approach is not possible for this reason. In aggregate, informally proportionately more retakers elected intubation, use of an RSI, and reverse Trendelenburg positioning among some of the differences that indicate a more conservative induction management. Personal communication with survey participants suggested an issue with identifying the retake option within the survey completion workflow pointing to a suboptimal sequencing design of this part of the study.

Limitations

The low survey response rate is the single most important limitation of this study, which is just short of half of the average response rate for ASA member surveys. It is possible that US anesthesiologists' lack of familiarity with post-esophagectomy patients and therefore perceived limited survey relevance may have contributed to the low response rate. However, the survey respondents' demographics appear to reasonably mimic the current anesthesiologists' demographics as reported by the ASA [14]. In retrospect, the bundling of post-extubation measures comprising multiple options makes the responses to this question less refined. The sample index case, although closely abstracted from a real clinical case, remains hypothetical. The setting and preoperative information provided is equally based on an abstracted real-life case and was aimed to emulate most practitioners' environments of practice. Although the survey software allowed only a single response from the same device, responses may contain surveys taken more than once by the same anesthesiologists, as we did not track respondents' identities. The low retake survey response rate prevented a formal comparison of practice patterns based on information provided regarding post-esophagectomy patients.

Conclusions

Among the attending anesthesiologist members of the ASA answering the survey, 87.1% choose an endotracheal tube for an asymptomatic patient with a history of successful esophagectomy presenting for elective induction of general anesthesia. RSI technique is performed by 64.7%, presumably for aspiration concerns, while 33.6% of practitioners would not use RSI technique. Gender, years in anesthesiology practice, and routine exposure to PESO-GAIN patients all significantly influence some management details. Overall, anesthesiologists used a broad range of airway management approaches to the sample index patient, indicating a lack of published guidance for practitioners.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s00540-024-03432-3.

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Data availability All data supporting the findings of this study are available within the paper and its Supplementary Information, or can be provided upon request.

Declarations

Conflict of interest None.

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