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Analysis of postoperative nausea and vomiting in patients with lung cancer undergoing thoracoscopic surgery under general anesthesia and its influencing factors: a observational study

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Abstract

Objective To investigate the current situation and influencing factors of postoperative nausea and vomiting (PONV) in lung cancer patients undergoing thoracoscopic surgery under general anesthesia, providing a reference for developing targeted PONV prevention and management strategies.

Methods Using a consecutive sampling method, 200 lung cancer patients who underwent their first thoracoscopic surgery under general anesthesia between November 18, 2021, and March 1, 2022, at a tertiary class A cancer hospital in Liaoning Province, China, were selected. The occurrence of PONV within 24 h post-operation was assessed using WHO Postoperative Nausea and Vomiting Rating Criteria. Patient general information, surgical and medication data were systematically collected to analyze the independent influencing factors of PONV.

Results Among the 200 patients undergoing thoracoscopic lung cancer surgery under general anesthesia, 75 (37.5%) experienced PONV. Logistic regression analysis indicated that being female, having a history of motion sickness, and a history of PONV were independent risk factors for the occurrence of PONV in these patients. Long-acting antiemetics such as penehyclidine hydrochloride and methylprednisolone were protective factors against PONV.

Conclusion The incidence of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia is relatively high. Nursing staff should focus on female patients and those with a history of motion sickness and PONV. Comprehensive preoperative assessments should be conducted, exploring multimodal analgesia and applying integrated prevention measures to reduce the occurrence of PONV and promote the rapid recovery of patients.

Keywords Lung cancer, Thoracoscopic surgery, General anesthesia, Nausea and vomiting, Influencing factors, Nursing

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Introduction

The latest data from 2020 shows that there were 2.2 million new cases of lung cancer worldwide, with 1.79 million deaths, accounting for 11.4% of all cancer incidences and 18.0% of all cancer deaths [1]. In China, in 2020, there were 810,000 new cases of lung cancer and 710,000 deaths, accounting for 37.3% and 39.4% of the global annual incidence and death totals of lung cancer, respectively, making it the malignant tumor with the highest incidence and mortality rate in China [2]. Surgery, as one of the primary treatment options for lung cancer, has seen an increasing number due to the rising incidence of lung cancer. Video-Assisted Thoracic Surgery (VATS) is a widely used surgical approach in thoracic surgery, offering advantages over traditional open surgery such as less trauma, reduced short-term postoperative pain, fewer cardiopulmonary complications, and significantly shorter hospital stays [3, 4]. General anesthesia, commonly used in thoracoscopic lung cancer surgery, involves a combination of intravenous and inhalation anesthetics to induce a state of unconsciousness with sedation and pain relief. It is effective in providing sedation and analgesia, but it has a higher incidence of postoperative nausea and vomiting (PONV) compared to local anesthesia, nerve block, and spinal anesthesia [5]. PONV, which refers to nausea and vomiting occurring within 24 h postoperatively, affects 20–30% of patients undergoing general anesthesia, with rates as high as 68.42–73.68% in patients after thoracoscopic surgery [6]. In patients with high risk factors but without any preventative measures, the incidence of PONV can reach up to 80% [7, 8].

The pathogenesis of postoperative nausea and vomiting (PONV) is complex and influenced by multiple factors, related to a variety of interacting receptors, neural conduction pathways, and both peripheral and central nervous systems. There are five pathways involved in the afferent transmission of PONV, including the chemoreceptor trigger zone, gastrointestinal vagal nerve system, vestibular labyrinth system, cerebral cortex reflexive afferent pathway, and midbrain afferent pathway. The main symptoms are threefold: nausea, retching, and vomiting, which can occur separately or simultaneously after surgery [9, 10]. PONV not only causes gastrointestinal discomfort but can also lead to electrolyte imbalance, surgical wound dehiscence, aspiration pneumonia, subcutaneous emphysema, bilateral pneumothorax, and other adverse outcomes. These complications increase patient suffering and treatment costs, prolong hospital stays, and severely affect the quality of life of patients [11–13]. As an essential part of perioperative management and enhanced recovery after surgery, identifying high-risk groups and preventing PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia is a pressing issue in thoracic surgery.

Currently, most existing studies on postoperative nausea and vomiting (PONV) in cancer patients utilize retrospective research methods to analyze risk factors. These studies may encounter various issues, such as recall bias, insufficient data completeness, and numerous uncontrollable interfering factors [14, 15]. Moreover, the research is mostly concentrated on populations undergoing laparoscopic surgery, gynecological surgery, gastrointestinal surgery, cranial surgery, urological surgery, and head and facial surgery [16, 17], with scarce reports specifically addressing PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia. This study aims to investigate the incidence of PONV in patients undergoing their first thoracoscopic lung cancer surgery under general anesthesia using WHO Postoperative Nausea and Vomiting Rating Criteria. It analyzes demographic factors, medical history, surgery, anesthesia, and perioperative medication as potential risk factors influencing PONV in these patients. The goal is to implement proactive control over the potential postoperative nausea and vomiting consequences of the surgery and to provide references for the joint prevention and management of PONV in thoracoscopic lung cancer surgery in operating rooms and wards.

The study

Aims

To investigate the current situation and influencing factors of postoperative nausea and vomiting (PONV) in lung cancer patients undergoing thoracoscopic surgery under general anesthesia.

Design

This is a observational research study, A consecutive sampling method was used to select patients who were scheduled for their first thoracoscopic lung cancer surgery under general anesthesia at our hospital from November 18, 2021, to March 1, 2022, as the study subjects.

Sampling and inclusion criteria

Inclusion criteria: ① Age≥18 years; ② Diagnosed with lung cancer according to the " Chinese Medical Association guideline for clinical diagnosis and treatment of lung cancer (2023 edition)" [18], and scheduled for their first thoracoscopic lung cancer surgery under general anesthesia; ③ Assessed as American Society of Anesthesiologists (ASA) physical status I-II (I: normal healthy, with no systemic disease other than the local lesion; II: with mild to moderate systemic disease); ④ Detailed case data recorded within 24 h postoperatively; ⑤ No contraindications to surgery; ⑥ Clear consciousness, able to communicate normally, and willing to participate in this study. Exclusion criteria: ① Concurrent diseases that could

cause nausea and vomiting; ② History of chemotherapy, radiotherapy, acute nausea or vomiting, or use of antiemetic drugs within 24 h before surgery; ③ Conversion from thoracoscopic to open surgery during the procedure; ④ Postoperative mechanical ventilation for >2 h; ⑤ Coexisting psychiatric disorders; ⑥ Participation in other clinical trials. This study has been approved by The Ethics Committee of Liaoning Cancer Institute & Hospital (20210824YG), and all subjects were informed and agreed to participate in the study.

The method for determining the sample size was as follows. According to Kendall's [19] rough estimation method for sample sizes, the calculation formula is [Max(Dimension Number × (5 ~ 10))] × [1 + (10%~20%)]. The sample size should be 5 to 10 times the number of variables. In this study, there are 14 variable items, so we took 10 times the number of variables. Considering the possibility of loss to follow-up and patient non-cooperation, the sample size was further increased by 20% on the original basis, ultimately including 200 subjects in the study.

Measures

General Information and surgery-related data survey form

The survey form was designed by the researchers after reviewing literature and consulting thoracic surgery medical and nursing experts. The general information survey form includes gender, age, BMI (Body Mass Index), body surface area, history of smoking, history of alcohol consumption, history of motion sickness, and history of PONV (Postoperative Nausea and Vomiting). The surgery-related data survey form includes the duration of surgery, method of general anesthesia, anesthesia classification ASA (American Society of Anesthesiologists), and perioperative medication factors (anesthetics, analgesics, sedatives, muscle relaxants, anticholinergics, intraoperative fluid volume).

Postoperative nausea and vomiting

The WHO postoperative nausea and vomiting assessment criteria [20]are used, classifying patients into four levels based on their subjective feelings and the expulsion of gastric contents from the mouth. Level I is no nausea or vomiting; Level II is mild nausea and abdominal discomfort without vomiting; Level III involves vomiting but without gastric contents; Level IV is severe PONV, often with gastric contents and requiring medication control. Level I is classified as no occurrence of PONV, and Level II or higher is classified as the occurrence of PONV. This evaluation criterion has been widely applied in clinical practice [21, 22].

Data collection

Two research nurses from our department were appointed as data collectors. To avoid excessive variability in results due to the subjectivity of different investigators, the data collectors received uniform training. They were instructed to strictly follow the inclusion and exclusion criteria of this study for questionnaire administration and data extraction, ensuring the completeness of the survey data through prompt data checking after questionnaire completion. Specifically, the collectors explained the purpose of the study and the requirements for cooperation to the patients and their families one day before the surgery, obtained informed consent, and collected demographic data from the patients. Twenty-four hours after the surgery, the collectors entered the postoperative care ward to assess the patients' nausea and vomiting within 24 h after the surgery face-to-face. Data related to thoracoscopic lung cancer surgery were obtained by reviewing surgical and anesthesia records.

Data analysis

A database was established and statistical analysis was conducted using SPSS 26.0. The general information of the patients, surgery, and medication-related data were statistically described. Quantitative data with normal distribution were presented as mean ± standard deviation ($x \pm s$), while count data were described using rates and percentages (%). Statistical inferences were made using the chi-square test to analyze the impact of gender, smoking history, drinking history, history of motion sickness, PONV history, and surgery and anesthesia-related drugs on PONV in the general data. The independent sample t-test was used to analyze the impact of patient age, BMI, body surface area, surgery duration, and intraoperative fluid volume on PONV in the general and medication data. The Kruskal-Wallis rank sum test was used to analyze the effect of anesthesia classification on PONV in the medication data. Factors related to PONV with a P-value < 0.05 in univariate analysis were included in a Logistic regression analysis for multivariate analysis. The occurrence of PONV was used as the dependent variable, and the single factors affecting PONV were used as independent variables, with $P < 0.05$ indicating statistical significance.

Validity and reliability

This study adhered to the STROBE guidelines for reporting observational studies in epidemiology, obtained informed consent from all participants, and complied with research ethical guidelines. All methods and procedures were conducted in strict accordance with applicable regulations and the ethical principles outlined in the declaration.

Results

General information of study subjects

This study included a total of 200 patients undergoing thoracoscopic lung cancer surgery under general anesthesia. Among them, 87 (43.5%) were male and 113 (56.5%) were female, with ages ranging from 32 to 77 years (58.64±9.80 years).

Incidence of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia

Out of the 200 patients included in this study who underwent thoracoscopic lung cancer surgery under general anesthesia, 75 experienced PONV, resulting in an incidence rate of 37.5%.

Univariate analysis of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia

The comparison of general information between the two groups of patients showed that gender, body surface area, history of alcohol consumption, history of motion sickness, and history of PONV were all related to the occurrence of PONV in thoracoscopic lung cancer surgery under general anesthesia ($P<0.05$), as shown in Table 1. The comparison of surgery-related data showed that the occurrence of PONV was related to the use of remifentanil, Ciprofol, sevoflurane, Penehyclidine hydrochloride, Dezocine, and Methylprednisolone during the general anesthesia process ($P<0.05$), as shown in Table 1.

Multivariate analysis of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia

Variables with statistical significance in the univariate analysis were used as independent variables for Logistic regression analysis, with the occurrence of PONV after thoracoscopic lung cancer surgery under general anesthesia as the dependent variable. The results of the multivariate analysis indicated that gender, history of motion sickness, history of PONV, intraoperative use of Penehyclidine hydrochloride, and Methylprednisolone are all influencing factors for PONV in thoracoscopic lung cancer surgery under general anesthesia ($P<0.05$), as shown in Table 2.

Discussion

This study aimed to investigate the incidence and risk factors of postoperative nausea and vomiting (PONV) in patients undergoing video-assisted thoracoscopic surgery (VATS) for lung cancer under general anesthesia. The findings revealed that the incidence of PONV in patients following VATS for lung cancer was 37.5%. The main factors influencing PONV were identified as gender, history of motion sickness, history of PONV, and the use of atropine and dexamethasone.

Current status of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia

In this study, the incidence rate of PONV in patients after thoracoscopic lung cancer surgery under general anesthesia was 37.5%, which is higher than that in patients undergoing thoracoscopic lung wedge resection (16.9%) [23], lung cancer surgery (17.7%) [14], thoracic surgery (20.7%) [24], and elderly patients undergoing partial lung resection by thoracoscopy (32.6%) [25]. This may be due to the older age of the patients in this study, which can lead to a decline in gastrointestinal protective mechanisms and regulatory functions, along with aging organs and reduced functional metabolism. These factors can impact the efficacy and metabolism of anesthetic drugs used during surgery, making patients more prone to PONV [26]. Additionally, although thoracoscopy is a minimally invasive technique, data shows that 78% of patients still experience moderate to severe pain. Effective pain management is a critical prerequisite for early respiratory function exercises in lung cancer patients [27]. The use of first-line drugs like opioids for effective pain relief and the adverse reactions of PONV caused by these drugs interact, leading to an increased incidence of PONV in patients [28]. Furthermore, compared to other types of surgery, thoracic surgery requires higher standards for anesthesia and analgesia. Thoracic surgery often necessitates the routine insertion of a double-lumen bronchial tube after anesthesia, which can cause strong irritation to the airway. Thoracoscopic surgery involves entering the thorax through the intercostal space, inevitably causing damage to the intercostal nerves, leading to significant pain stimulation and stress response in patients. Postoperative chest tube drainage and encouraging effective coughing for lung re-expansion also contribute to this. To meet the demands of effective pain relief, various analgesics are used during and after thoracic surgery, hence the relatively high incidence of PONV.

Higher risk of PONV in female patients undergoing thoracoscopic lung cancer surgery under general anesthesia

In this study, the incidence rate of PONV in females was higher than in males, being 2.804 times higher. Women are more prone to PONV, possibly due to their lower psychological tolerance, perioperative emotional stress, and anxiety leading to increased sympathetic nervous tension, neurotransmitter release, and promotion of catecholamine release, thereby inducing nausea and vomiting [24]. Additionally, it could be related to hormonal

Table 1 General Information Comparison of Two Patient Groups (n (%))

Variables		Non-PONV group($n=125$)	POVN group ($n=75$)	Statistical values	*p*-value
Gender	Male	70(80.5)	17(19.5)	21.191[1)]	0.000
	Female	55(48.7)	58(51.3)		
Age	-	58.90 ± 9.41	58.21 ± 10.46	0.476[2)]	0.634
BMI	-	24.24 ± 3.02	23.55 ± 3.59	1.446[2)]	0.150
Body Surface Area	-	1.77 ± 0.20	1.71 ± 0.17	2.219[2)]	0.028
Smoking history	No	71(57.3)	53(42.7)	3.826[1)]	0.050
	Yes	54(71.1)	22(28.9)		
Alcohol History	No	89(56.7)	68(43.3)	10.525[1)]	0.001
	Yes	36(83.7)	7(16.3)		
Motion Sickness History	No	111(65.7)	58(34.3)	4.706[1)]	0.030
	Yes	14(45.2)	17(54.8)		
PONV History	No	124(63.9)	70(36.1)	5.544[1)]	0.019
	Yes	1(16.7)	5(83.3)		
Operation Duration	-	128.92 ± 42.41	117.36 ± 55.16	1.664[2)]	0.098
Intraoperative Fluid Volume	-	1069.20 ± 353.71	1068.67 ± 299.75	0.011[2)]	0.991
Anesthetic Grading(ASA)	Level 1	15(53.6)	13(46.4)	1.448[3)]	0.485
	Level 2	108(64.3)	60(35.7)		
	Level 3	2(50.0)	2(50)		
Anesthesia-Related Medications					
Sufentanil	Not Used	1(100)	0(0)	0.603[1)]	0.437
	Used	124(62.3)	75(37.7)		
Remifentanil	Not Used	12(36.4)	21(63.6)	11.519[1)]	0.001
	Used	113(67.7)	54(32.3)		
Propofol	Not Used	18(64.3)	10(35.7)	0.044[1)]	0.833
	Used	107(62.2)	65(37.8)		
Ciprofol	Not Used	89(57.4)	66(42.6)	7.587[1)]	0.006
	Used	36(80.0)	9(20.0)		
Sevoflurane	Not Used	93(67.4)	45(32.6)	4.544[1)]	0.033
	Used	32(51.6)	30(48.4)		
Rocuronium Bromide	Not Used	27(57.4)	20(42.6)	0.669[1)]	0.413
	Used	98(64.1)	55(35.9)		
Midazolam	Not Used	115(63.5)	66(36.5)	0.872[1)]	0.350
	Used	10(52.6)	9(47.4)		
Penehyclidine hydrochloride	Not Used	82(56.9)	62(43.1)	6.772[1)]	0.009
	Used	43(76.8)	13(23.2)		
Dexmedetomidine	Not Used	38(65.5)	20(34.5)	0.317[1)]	0.573
	Used	87(61.3)	55(38.7)		
Ephedrine	Not Used	107(63.7)	61(36.3)	0.635[1)]	0.426
	Used	18(56.2)	14(43.8)		
Dezocine	Not Used	22(46.8)	25(53.2)	6.454[1)]	0.011
	Used	103(67.3)	50(32.7)		
Methylprednisolone	Not Used	101(59.1)	70(40.9)	5.939[1)]	0.015
	Used	24(82.8)	5(17.2)		
Dexamethasone	Not Used	104(64.6)	57(35.4)	1.548[1)]	0.213
	Used	21(53.8)	18(46.2)		
Azasetron	Not Used	35(66)	18(34.0)	0.385[1)]	0.535
	Used	90(61.2)	57(38.8)		
Postoperative analgesic and antiemetic drugs					
PCA Pump	Not Used	76(63.9)	43(36.1)	0.234[1)]	0.629
	Used	49(60.5)	32(39.5)		
Dezocine	Not Used	30(68.2)	14(31.8)	0.777[1)]	0.378
	Used	95(60.9)	61(39.1)		

Table 1 (continued)

Variables		Non-PONV group($n=125$)	POVN group ($n=75$)	Statistical values	*p*-value
Tropisetron hydrochloride	Not Used	109(62.6)	65(37.4)	0.012[1)]	0.914
	Used	16(61.5)	10(38.5)		

1) Chi-square test; 2) T-Test; 3) Kruskal-Wallis Rank Sum Test

Table 2 Multifactor Logistic Regression Analysis of PONV incidence (n (%))

Variable	Beta Value	Standard Error	Wald Chi-Square	*P*-Value	Odds Ratio	95% Confidence Interval
Body Surface Area	-0.120	1.243	0.009	0.923	0.887	0.078～10.132
Gender	1.031	0.503	4.209	0.040	2.804	1.047～7.511
Alcohol History	-0.638	0.532	1.442	0.230	0.528	0.186～1.497
Motion Sickness History	1.484	0.465	10.184	0.001	4.411	1.773～10.975
PONV History	3.320	1.142	8.456	0.004	27.656	2.951～259.158
Remifentanil	-0.977	0.535	3.338	0.068	0.376	0.132～1.074
Sevoflurane	0.584	0.441	1.750	0.186	1.793	0.755～4.259
Ciprofol	-0.738	0.484	2.328	0.127	0.478	0.185～1.234
Penehyclidine hydrochloride	-1.084	0.462	5.499	0.019	0.338	0.137～0.837
Dezocine	-0.341	0.489	0.486	0.486	0.711	0.273～1.853
Methylprednisolone	-1.423	0.632	5.073	0.024	0.241	0.070～0.831

Note Model Hosmer-Lemeshow Test, $\chi^2=9.162$, $P=0.329$

fluctuations and menstrual cycles [29], or gender differences in pharmacokinetics and pharmacodynamics [30]. Specifically, there are hormonal level differences between men and women, and in women patients postoperatively, fluctuations and changes in serum levels of hormones including progesterone and estrogen can lead to clinical symptoms such as nausea, vomiting, and irritability [31]. Data indicates that women have a higher incidence of PONV than men, up to three times higher. One important risk factor is related to hormonal fluctuations and menstrual cycles. In the 3rd and 4th week of the menstrual cycle, the rate of nausea and vomiting significantly increases, but there is no increase in the incidence among prepubescent children and postmenopausal women over 50 years of age [32, 33]. However, some researchers and guidelines suggest that there is insufficient evidence to establish a correlation between the menstrual cycle and PONV [20, 30].

Higher risk of PONV in patients with a history of motion sickness and ponv undergoing thoracoscopic lung cancer surgery under general anesthesia

Motion sickness, which includes car sickness, seasickness, and airsickness, refers to a condition of balance and steadiness disorder when the body is in a motion environment, primarily characterized by symptoms like dizziness, nausea, vomiting, pallor, and cold sweat [34]. Women are more prone to motion sickness than men and tend to have more severe symptoms [35]. In this study, patients with a history of motion sickness (MS) were 4.411 times more likely to experience PONV than those without a history of MS. Those with a history of PONV were 27.656 times more likely to experience it again compared to those without a history of PONV, which may be related to a lower threshold for nausea and vomiting in these patients [36]. Studies indicate that patients with a history of motion sickness have more active corresponding reflex pathways and a lower vomiting threshold, increasing the risk of experiencing PONV again, possibly related to a sensitive vestibular function [37]. Sudden movements perioperatively can stimulate the histamine H1 and muscarinic M2 receptors in the vestibular system, leading to nausea and vomiting [38]. Research by Li SY [39] also found a correlation between MS and PONV. Patients with a history of MS had a significantly higher incidence of PONV than those without, and past PONV history was closely related to the occurrence of PONV in patients in the anesthesia recovery room. Additionally, the authors pointed out that the mechanisms of PONV and MS might be similar. Further research into the mechanisms of MS can enhance the understanding of the mechanisms of PONV. For some intractable cases of PONV in patients with a history of MS, the use of anticholinergic drugs like scopolamine and antihistamines like diphenhydramine could enhance the prevention and treatment effectiveness.

Lower risk of PONV in patients undergoing thoracoscopic surgery under general anesthesia using penehyclidine hydrochloride

The results related to surgery in this study show that the use of Penehyclidine hydrochloride during surgery is a protective factor against PONV. The likelihood of experiencing PONV in patients who used Penehyclidine

hydrochloride was 0.338 times that of those who did not use the drug. This is because Penehyclidine hydrochloride is a long-acting anticholinergic medication administered before anesthesia. It has high selectivity for M3 receptors in the central nervous system, peripheral neurons, and gastric wall cells, as well as M1 receptors in smooth muscles and glands, but has no significant effect on M2 receptors in the heart and presynaptic neuronal membranes. It can produce central sedative effects and inhibit vagus nerve-induced smooth muscle spasms and glandular secretion, effectively preventing PONV. Additionally, it can maintain heart rate stability without increasing the cardiac burden on patients [40]. Research by Li RR [41] also found that compared to the saline group, preoperative administration of Penehyclidine hydrochloride alone in thyroid cancer patients could effectively reduce the incidence of PONV by 79.9%, with significant statistical and clinical significance. Moreover, the severity of nausea within 24 h postoperatively in the Penehyclidine hydrochloride group was lower than in the control group, indicating that Penehyclidine hydrochloride can effectively reduce the severity of PONV in patients.

Lower risk of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia using methylprednisolone

The results of this study show that the likelihood of experiencing PONV in patients who used Methylprednisolone was 0.241 times that of those who did not use the drug. Methylprednisolone is a synthetically produced corticosteroid that works against nausea and vomiting by inhibiting the synthesis of prostaglandins, releasing endogenous opioid peptides, and reducing 5-HT levels in organs and the nervous system [42]. However, current research advocates that the combination of Methylprednisolone with other drugs has better effects. Research by Liu WY [43] indicates that the use of Methylprednisolone alone can effectively intervene in PONV symptoms in patients under general anesthesia. The combination of Methylprednisolone with ramosetron can significantly prevent PONV, reducing the incidence and severity of PONV within 24 h postoperatively and significantly increasing patient satisfaction, making it a safe and effective treatment option. Xi M [44] emphasize that the application of Methylprednisolone in combination with Tropisetron 15 min before the end of surgery can significantly reduce the incidence of PONV in patients undergoing gynecological day surgery under general anesthesia and has a significant preventive effect on both acute and delayed vomiting. Jin Y [45] compared the effectiveness of Methylprednisolone and Methylprednisolone in preventing PONV after cesarean section and found that Methylprednisolone intervention had better effects in preventing postoperative nausea and vomiting, with fewer adverse reactions and lower drug side effects, suggesting the promotion of Methylprednisolone intervention for PONV prevention.

Medical coping modes on the PONV

The results of the univariate analysis of general information and multivariate Logistic regression analysis in this study show that being female, having a history of motion sickness, and a history of PONV are independent risk factors affecting the occurrence of PONV after thoracoscopic lung cancer surgery under general anesthesia. This is consistent with the high-risk factors for adult PONV in the "Fourth Consensus Guidelines for the Management of Postoperative Nausea and Vomiting" [20]. Although PONV is well prevented and treated, its global incidence can still be as high as 30% [46]. Facing the occurrence of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia, while it cannot be completely eliminated, preventive measures can be taken by intervening in high-risk factors, including pharmacological and non-pharmacological treatments. Pharmacological treatments include preventive administration of dopamine receptor antagonists, 5-HT3 receptor antagonists, anticholinergics, antihistamines, corticosteroids, opioid receptor antagonists, neurokinin-1 (NK-1) receptor antagonists, and propofol; non-pharmacological treatments include acupoint stimulation, perioperative intravenous fluid replenishment, aromatherapy, oral ginger, music therapy, patient education and visitation, etc [47, 48]. With ongoing research into the mechanisms and risk factors of PONV, scientific predictive models can be established to reduce its incidence, improve postoperative comfort, promote rapid recovery, and enhance patient quality of life. For nursing staff, it is essential to thoroughly assess patients for potential risk factors that could lead to PONV preoperatively and to promptly relay this information to the attending physician and anesthesiologist. Additionally, they should actively help patients understand possible non-pharmacological interventions, explore multimodal analgesia intraoperatively, ensure strict handover between the operating room and ward postoperatively, and apply comprehensive preventive measures early to reduce the occurrence of PONV and promote patient recovery.

Limitations

This study has limitations, being restricted to a single-center with a small sample size, and the extrapolation of the data might be limited. Additionally, there was a higher proportion of females in the PONV group compared to the non-PONV group. This gender imbalance could influence the generalizability of our findings. Future research should involve larger, multi-center studies to better identify potential high-risk factors and implement

targeted preventive strategies early to improve patients' perioperative quality of life.

Conclusion

In summary, being female, having a history of motion sickness, and a history of PONV are identified as independent risk factors for the occurrence of PONV in patients undergoing thoracoscopic lung cancer surgery under general anesthesia, while the intraoperative use of Penehyclidine hydrochloride and Methylprednisolone are protective factors.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12893-024-02614-w.

Supplementary Material 1

Author contributions

Yu Ling: Conceptualization, Methodology, Statistic analysis, Writing - Original Dong Ying: Resources, Supervision, Project administration, Writing - Review & Editing. Shi Shuo: Investigation, Statistic analysis Liu Xin: Statistic analysis, Visualization Wang Meiling: Investigation, Methodology, ResourcesJiang Guichun: Conceptualization, Methodology, Statistic analysis, Writing - Original.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Liaoning Cancer Hospital & Institute and conducted in accordance with the standards of the National Research Council. Written informed consent was obtained from all participants, and all subjects were informed and agreed to participate in the study.

Consent for publication

Written informed consent was obtained from the patient for publication of this study and any accompanying images. A copy of the written consent is available for review by the Editor of this journal.

Competing interests

The authors declare no competing interests.

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