World Journal of Gastrointestinal Surgery

World J Gastrointest Surg 2024 July 27; 16(7): 1956-2364





Published by Baishideng Publishing Group Inc

WJG S

World Journal of Gastrointestinal Surgery

Contents

Monthly Volume 16 Number 7 July 27, 2024

EDITORIAL

- 1956 Unveiling the potential of electrocautery-enhanced lumen-apposing metal stents in endoscopic ultrasound-guided biliary drainage Chisthi MM
- 1960 Minimally invasive pelvic exenteration for primary or recurrent locally advanced rectal cancer: A glimpse into the future

Kehagias D, Lampropoulos C, Kehagias I

- 1965 Endoscopic submucosal dissection for early gastric cancer: A major challenge for the west Schlottmann F
- 1969 Impact of immunotherapy on liver metastasis Fu Z, Wang MW, Liu YH, Jiao Y
- 1973 Occurrence and prevention of incisional hernia following laparoscopic colorectal surgery Wu XW, Yang DQ, Wang MW, Jiao Y
- 1981 Role of endoscopic-ultrasound-guided biliary drainage with electrocautery-enhanced lumen-apposing metal stent for palliation of malignant biliary obstruction

Deliwala SS, Qayed E

REVIEW

1986 Pancreatic pseudocyst: The past, the present, and the future

Koo JG, Liau MYQ, Kryvoruchko IA, Habeeb TA, Chia C, Shelat VG

ORIGINAL ARTICLE

Case Control Study

2003 Diagnostic significance of serum levels of serum amyloid A, procalcitonin, and high-mobility group box 1 in identifying necrotising enterocolitis in newborns

Guo LM, Jiang ZH, Liu HZ, Zhang L

Retrospective Cohort Study

2012 Clinical efficacy and safety of double-channel anastomosis and tubular gastroesophageal anastomosis in gastrectomy

Liu BY, Wu S, Xu Y

2023 Application of radioactive iodine-125 microparticles in hepatocellular carcinoma with portal vein embolus Meng P, Ma JP, Huang XF, Zhang KL



Contents	5

R

letros	pective	Study	,
	peccive	ocua j	1

2031 Reproducibility study of intravoxel incoherent motion and apparent diffusion coefficient parameters in normal pancreas

Liu X, Wang YF, Qi XH, Zhang ZL, Pan JY, Fan XL, Du Y, Zhai YM, Wang Q

- 2040 Weight regain after intragastric balloon for pre-surgical weight loss Abbitt D, Choy K, Kovar A, Jones TS, Wikiel KJ, Jones EL
- 2047 Retrospective analysis based on a clinical grading system for patients with hepatic hemangioma: A single center experience

Zhou CM, Cao J, Chen SK, Tuxun T, Apaer S, Wu J, Zhao JM, Wen H

2054 Spleen volume is associated with overt hepatic encephalopathy after transjugular intrahepatic portosystemic shunt in patients with portal hypertension

Zhao CJ, Ren C, Yuan Z, Bai GH, Li JY, Gao L, Li JH, Duan ZQ, Feng DP, Zhang H

2065 Evaluation of the clinical effects of atropine in combination with remifentanil in children undergoing surgery for acute appendicitis

Li YJ, Chen YY, Lin XL, Zhang WZ

2073 The combined detection of carcinoembryonic antigen, carcinogenic antigen 125, and carcinogenic antigen 19-9 in colorectal cancer patients

Gong LZ, Wang QW, Zhu JW

2080 Clinical efficacy of laparoscopic cholecystectomy plus cholangioscopy for the treatment of cholecystolithiasis combined with choledocholithiasis

Liu CH, Chen ZW, Yu Z, Liu HY, Pan JS, Qiu SS

2088 Association between operative position and postoperative nausea and vomiting in patients undergoing laparoscopic sleeve gastrectomy

Li ZP, Song YC, Li YL, Guo D, Chen D, Li Y

2096 Preoperative albumin-bilirubin score predicts short-term outcomes and long-term prognosis in colorectal cancer patients undergoing radical surgery

Diao YH, Shu XP, Tan C, Wang LJ, Cheng Y

2106 Association of preoperative antiviral treatment with incidences of post-hepatectomy liver failure in hepatitis B virus-related hepatocellular carcinoma

Wang X, Lin ZY, Zhou Y, Zhong Q, Li ZR, Lin XX, Hu MG, He KL

2119 Effect of rapid rehabilitation nursing on improving clinical outcomes in postoperative patients with colorectal cancer

Song JY, Cao J, Mao J, Wang JL

2127 Interaction between the albumin-bilirubin score and nutritional risk index in the prediction of posthepatectomy liver failure

Qin FF, Deng FL, Huang CT, Lin SL, Huang H, Nong JJ, Wei MJ



Conton	World Journal of Gastrointestinal St	
conten	Monthly Volume 16 Number 7 July 27, 2024	
2135	Effectiveness of magnetic resonance imaging and spiral computed tomography in the staging and treatment prognosis of colorectal cancer	
	Bai LN, Zhang LX	
2145	Correlation between abdominal computed tomography signs and postoperative prognosis for patients with colorectal cancer	
	Yang SM, Liu JM, Wen RP, Qian YD, He JB, Sun JS	
2157	Study on the occurrence and influencing factors of gastrointestinal symptoms in hemodialysis patients with uremia	
	Yuan D, Wang XQ, Shao F, Zhou JJ, Li ZX	
2167	"Hepatic hilum area priority, liver posterior first": An optimized strategy in laparoscopic resection for type III-IV hilar cholangiocarcinoma	
	Hu XS, Wang Y, Pan HT, Zhu C, Chen SL, Zhou S, Liu HC, Pang Q, Jin H	
2175	Impact of nutritional support on immunity, nutrition, inflammation, and outcomes in elderly gastric cancer patients after surgery	
	Chen XW, Guo XC, Cheng F	
2183	Therapeutic effects of Buzhong Yiqi decoction in patients with spleen and stomach qi deficiency after routine surgery and chemotherapy for colorectal cancer	
	Hu Q, Chen XP, Tang ZJ, Zhu XY, Liu C	
2194	Influencing factors and risk prediction model for emergence agitation after general anesthesia for primary liver cancer	
	Song SS, Lin L, Li L, Han XD	
2202	Potential applications of single-incision laparoscopic totally preperitoneal hernioplasty	
	Wang XJ, Fei T, Xiang XH, Wang Q, Zhou EC	
2211	Clinical significance of preoperative nutritional status in elderly gastric cancer patients undergoing radical gastrectomy: A single-center retrospective study	
	Zhao XN, Lu J, He HY, Ge SJ	
2221	Establishment and validation of a predictive model for peripherally inserted central catheter-related thrombosis in patients with liver cancer	
	Chen XF, Wu HJ, Li T, Liu JB, Zhou WJ, Guo Q	
	Observational Study	
2232	Effect of information-motivation-behavioral skills model based perioperative nursing on pain in patients with gallstones	
	Ma L, Yu Y, Zhao BJ, Yu YN, Li Y	
2242	Postoperative body weight change and its influencing factors in patients with gastric cancer	
	Li Y, Huang LH, Zhu HD, He P, Li BB, Wen LJ	
2255	Cost burden following esophagectomy: A single centre observational study	
	Buchholz V, Lee DK, Liu DS, Aly A, Barnett SA, Hazard R, Le P, Kioussis B, Muralidharan V, Weinberg L	



Contents

World Journal of Gastrointestinal Surgery

Monthly Volume 16 Number 7 July 27, 2024

Randomized Controlled Trial

2270 Effectiveness of colonoscopy, immune fecal occult blood testing, and risk-graded screening strategies in colorectal cancer screening

Xu M, Yang JY, Meng T

Clinical and Translational Research

2281 Construction of prognostic markers for gastric cancer and comprehensive analysis of pyroptosis-related long non-coding RNAs

Wang Y, Li D, Xun J, Wu Y, Wang HL

Basic Study

Yangyin Huowei mixture alleviates chronic atrophic gastritis by inhibiting the IL-10/JAK1/STAT3 2296 pathway

Xie SS, Zhi Y, Shao CM, Zeng BF

2308 Impacts of different pancreatic resection ranges on endocrine function in Suncus murinus Li RJ, Yang T, Zeng YH, Natsuyama Y, Ren K, Li J, Nagakawa Y, Yi SQ

SYSTEMATIC REVIEWS

2319 Impact of frailty on postoperative outcomes after hepatectomy: A systematic review and meta-analysis Lv YJ, Xu GX, Lan JR

CASE REPORT

2329 Multidisciplinary management of ulcerative colitis complicated by immune checkpoint inhibitorassociated colitis with life-threatening gastrointestinal hemorrhage: A case report

Hong N, Wang B, Zhou HC, Wu ZX, Fang HY, Song GQ, Yu Y

- 2337 Sequential bowel necrosis and large gastric ulcer in a patient with a ruptured femoral artery: A case report Wang P, Wang TG, Yu AY
- 2343 Colon signet-ring cell carcinoma with chylous ascites caused by immunosuppressants following liver transplantation: A case report

Li Y, Tai Y, Wu H

2351 Misdiagnosis of hemangioma of left triangular ligament of the liver as gastric submucosal stromal tumor: Two case reports

Wang JJ, Zhang FM, Chen W, Zhu HT, Gui NL, Li AQ, Chen HT

LETTER TO THE EDITOR

2358 Revolutionizing palliative care: Electrocautery-enhanced lumen-apposing metal stents in endoscopicultrasound-guided biliary drainage for malignant obstructions

Onteddu NKR, Mareddy NSR, Vulasala SSR, Onteddu J, Virarkar M



Conton		World Journal of Gastrointestinal Surgery
Conten	Mont	hly Volume 16 Number 7 July 27, 2024
2362	Preservation of superior rectal artery in laparoscopic co constipation?	electomy: The best choice for slow transit
	Liu YL, Liu WC	

Contents

World Journal of Gastrointestinal Surgery

Monthly Volume 16 Number 7 July 27, 2024

ABOUT COVER

Peer Reviewer of World Journal of Gastrointestinal Surgery, Hideki Aoki, MD, PhD, Chief Doctor, Surgeon, Department of Surgery, Iwakuni Clinical Center, Iwakuni 740-8510, Japan. aoki.hideki.hy@mail.hosp.go.jp

AIMS AND SCOPE

The primary aim of World Journal of Gastrointestinal Surgery (WJGS, World J Gastrointest Surg) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, etc.

INDEXING/ABSTRACTING

The WJGS is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Current Contents/Clinical Medicine, Journal Citation Reports/Science Edition, PubMed, PubMed Central, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The 2024 Edition of Journal Citation Reports® cites the 2023 journal impact factor (JIF) for WJGS as 1.8; JIF without journal self cites: 1.7; 5-year JIF: 1.9; JIF Rank: 123/290 in surgery; JIF Quartile: Q2; and 5-year JIF Quartile: Q3.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: Zi-Hang Xu; Production Department Director: Xiang Li; Cover Editor: Jia-Ru Fan.

NAME OF JOURNAL	INSTRUCTIONS TO AUTHORS
World Journal of Gastrointestinal Surgery	https://www.wjgnet.com/bpg/gerinfo/204
ISSN	GUIDELINES FOR ETHICS DOCUMENTS
ISSN 1948-9366 (online)	https://www.wjgnet.com/bpg/GerInfo/287
LAUNCH DATE	GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH
November 30, 2009	https://www.wjgnet.com/bpg/gerinfo/240
FREQUENCY	PUBLICATION ETHICS
Monthly	https://www.wjgnet.com/bpg/GerInfo/288
EDITORS-IN-CHIEF Peter Schemmer	PUBLICATION MISCONDUCT https://www.wjgnet.com/bpg/gerinfo/208
EDITORIAL BOARD MEMBERS	ARTICLE PROCESSING CHARGE
https://www.wjgnet.com/1948-9366/editorialboard.htm	https://www.wjgnet.com/bpg/gerinfo/242
PUBLICATION DATE	STEPS FOR SUBMITTING MANUSCRIPTS
July 27, 2024	https://www.wjgnet.com/bpg/GerInfo/239
COPYRIGHT	ONLINE SUBMISSION
© 2024 Baishideng Publishing Group Inc	https://www.f6publishing.com

© 2024 Baishideng Publishing Group Inc. All rights reserved. 7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA E-mail: office@baishideng.com https://www.wjgnet.com



S WĴ

World Journal of Gastrointestinal Surgery

Submit a Manuscript: https://www.f6publishing.com

World J Gastrointest Surg 2024 July 27; 16(7): 2194-2201

DOI: 10.4240/wjgs.v16.i7.2194

ISSN 1948-9366 (online)

ORIGINAL ARTICLE

Retrospective Study Influencing factors and risk prediction model for emergence agitation after general anesthesia for primary liver cancer

Shu-Shu Song, Li Lin, Li Li, Xiao-Dong Han

Specialty type: Anesthesiology

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's classification

Scientific Quality: Grade C Novelty: Grade B Creativity or Innovation: Grade B Scientific Significance: Grade B

P-Reviewer: Arun S, India

Received: April 10, 2024 Revised: May 16, 2024 Accepted: June 13, 2024 Published online: July 27, 2024 Processing time: 102 Days and 22.2 Hours



Shu-Shu Song, Li Lin, Li Li, Xiao-Dong Han, Department of Anesthesia and Surgery, Wenzhou Central Hospital, Wenzhou 325099, Zhejiang Province, China

Corresponding author: Xiao-Dong Han, MM, Chief Physician, Department of Anesthesia and Surgery, Wenzhou Central Hospital, No. 252 Baili East Road, Lucheng District, Wenzhou 325099, Zhejiang Province, China. hxd1980115@sina.com

Abstract

BACKGROUND

General anesthesia is commonly used in the surgical management of gastrointestinal tumors; however, it can lead to emergence agitation (EA). EA is a common complication associated with general anesthesia, often characterized by behaviors, such as crying, struggling, and involuntary limb movements in patients. If treatment is delayed, there is a risk of incision cracking and bleeding, which can significantly affect surgical outcomes. Therefore, having a proper understanding of the factors influencing the occurrence of EA and implementing early preventive measures may reduce the incidence of agitation during the recovery phase from general anesthesia, which is beneficial for improving patient prognosis.

AIM

To analyze influencing factors and develop a risk prediction model for EA occurrence following general anesthesia for primary liver cancer.

METHODS

Retrospective analysis of clinical data from 200 patients who underwent hepatoma resection under general anesthesia at Wenzhou Central Hospital (January 2020 to December 2023) was conducted. Post-surgery, the Richmond Agitation-Sedation Scale was used to evaluate EA presence, noting EA incidence after general anesthesia. Patients were categorized by EA presence postoperatively, and the influencing factors were analyzed using logistic regression. A nomogram-based risk prediction model was constructed and evaluated for differentiation and fit using receiver operating characteristics and calibration curves.

RESULTS

EA occurred in 51 (25.5%) patients. Multivariate analysis identified advanced age, American Society of Anesthesiologists (ASA) grade III, indwelling catheter use, and postoperative pain as risk factors for EA (P < 0.05). Conversely, postoperative analgesia was a protective factor against EA (P < 0.05). The area under the curve



WJGS https://www.wjgnet.com

of the nomogram was 0.972 [95% confidence interval (CI): 0.947-0.997] for the training set and 0.979 (95%CI: 0.951-1.000) for the test set. Hosmer-Lemeshow test showed a good fit (γ^2 = 5.483, P = 0.705), and calibration curves showed agreement between predicted and actual EA incidence.

CONCLUSION

Age, ASA grade, catheter use, postoperative pain, and analgesia significantly influence EA occurrence. A nomogram constructed using these factors demonstrates strong predictive accuracy.

Key Words: Primary hepatocellular carcinoma resection; General anesthesia; Emergence agitation; Risk factors; Forecast; Nomograph

©The Author(s) 2024. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: In this study, we retrospectively analyzed clinical data from 200 patients with primary liver cancer undergoing general anesthesia. The aim was to identify key factors influencing postoperative emergence agitation (EA) occurrence and to construct a risk prediction model. The findings revealed advanced age, American Society of Anesthesiologists grade III, indwelling catheter, and postoperative pain as risk factors for EA, whereas postoperative analgesia emerged as a protective factor. Successful construction of a nomogram risk prediction model demonstrated good predictive efficacy, offering a practical tool for the clinical evaluation and prevention of EA.

Citation: Song SS, Lin L, Li L, Han XD. Influencing factors and risk prediction model for emergence agitation after general anesthesia for primary liver cancer. World J Gastrointest Surg 2024; 16(7): 2194-2201 URL: https://www.wjgnet.com/1948-9366/full/v16/i7/2194.htm DOI: https://dx.doi.org/10.4240/wjgs.v16.i7.2194

INTRODUCTION

General anesthesia involves the administration of narcotic drugs to temporarily suppress the central nervous system, leading to reversible loss of consciousness, sensation, and reflexes[1]. Emergence agitation (EA) refers to a transient state of consciousness and behavior separation during the transition from anesthesia to full consciousness. It is a common postoperative complication in patients undergoing general anesthesia[2], with an incidence of 17.09%-24.80% [3]. The symptoms of EA mainly manifest as emotional agitation, restlessness, and disorientation[4]. Prolonged agitation may result in hazardous behaviors, such as self-removal of masks and catheters, resulting in hypoxia, falls, bleeding from surgical incisions, and limb injuries, which compromises surgical outcomes and patient safety. Primary liver cancer ranks fifth globally and third in Asia-Pacific cancer-related deaths[5], with surgery being the foremost treatment option[6]. Hepatocellular carcinoma resection, characterized by prolonged operation time, extensive drug use, and large wound area, predisposes patients to higher EA risk. Thus, early identification of EA risk factors in patients with primary liver cancer after surgery is crucial for timely intervention. Currently, clinical factors influencing EA remain unclear and may be related to factors such as catheter irritation, pain, or drugs[7]. In view of this, our study aimed to analyze factors influencing the occurrence of EA in patients with primary liver cancer after surgery and construct a risk prediction model to aid the prevention of EA in this population.

MATERIALS AND METHODS

Research object

Two hundred patients who underwent hepatic cancer resection under general anesthesia and were admitted to Wenzhou Central Hospital between January 2020 and December 2023 were selected for the study. Inclusion criteria were as follows: (1) Mentally normal and able to cooperate before anesthesia; (2) No contraindications to anesthesia and no history of allergy to anesthetic drugs; and (3) Age \geq 18 years old. Exclusion criteria were: (1) Incomplete medical records; (2) Transfer to the intensive care unit after surgery; and (3) Renal failure. The study was approved by the Institutional Review Board of Wenzhou Central Hospital, and the need for informed consent was waived.

Diagnostic criteria

The occurrence of EA was evaluated using the Richmond Agitation-Sedation Scale[8]. The scale is divided into 10 sedation levels, with a score of 4 to -5 indicating the patient's level of consciousness from "aggressive" to "unconscious". Coma was -5 points; severe sedation -4 points; moderate sedation -3 points; light sedation -2 points; drowsy -1 point; awake and calm 0 points; restless and anxious 1 point; agitated anxiety 2 points, very agitated 3 points; and aggressive 4 points. A score of ≥ 1 was considered indicative of EA.



Research method

Demographic information including, sex, age, duration of surgery, duration of anesthesia, American Society of Anesthesiologists (ASA)[9] classification, indwelling catheter use, postoperative analgesia, time to recovery, and postoperative pain, were collected. Postoperative pain was assessed using the Digital Pain Rating Scale[10], ranging from 0 to 10 points, where a higher score indicated stronger pain sensation.

Statistical analysis

Statistical analysis was performed using SPSS 23.0 and R software. Measurement information, such as age, was expressed as mean ± SD, and a *t*-test was used for group comparison. Count data, such as sex, were expressed as cases (%), and comparisons were made using the chi-square test. Logistic regression analysis was used to analyze influencing factors, with P < 0.05 considered statistically significant. Column line graphs were constructed using R software, and their performance was assessed using the area under the curve (AUC) of the receiver operating characteristic (ROC) curves and calibration curves of the subjects' work characteristics.

RESULTS

Clinical characteristics

A total of 200 patients were included in this study, 51 of whom developed EA postoperatively, resulting in an incidence rate of 25.5%. The EA group comprised 51 patients who experienced EA after surgery, whereas the remaining patients were categorized into the group without EA. As shown in Table 1, significant differences were observed between the two groups in terms of age, operation time, anesthesia duration, ASA grade, indwelling catheter use, postoperative analgesia, and postoperative pain (P < 0.05).

Multi-factor analysis of EA occurrence

Variables showing statistical significance in the univariate analysis were considered independent variables, with the occurrence of restlessness during the recovery period after general anesthesia deemed the dependent variable (yes = 1, no = 0). Table 2 displays the variable assignment tables. Results revealed that old age, ASA class III status, indwelling catheter use, and postoperative pain were independent risk factors for EA. Additionally, postoperative analgesia was found to provide protection against EA, as shown in Table 3.

Construction of EA nomogram after operation

Using a sample of 140 patients from the training set, the five factors influencing EA were incorporated into a risk assessment model for EA after general anesthesia for primary liver cancer, represented as a column graph (Figure 1). To further verify the predictive efficiency of the model, ROC curves were plotted for both the training and test sets (Figure 2A and B). The model demonstrated high predictive accuracy in both sets, with an AUC of 0.972 [95% confidence interval (CI): 0.947-0.997] for the training set and 0.979 (95% CI: 0.951-1.000) for the test set. The Hosmer-Lemeshow test showed an excellent fit (χ^2 = 5.483, *P* = 0.705), and the calibration curve (Figure 2C and D) revealed good agreement between the predicted probability and the actual incidence of EA in both the training and test sets.

DISCUSSION

Patients undergoing general anesthesia pass through three stages: Light anesthesia, non-anesthesia, and awakening during the recovery of normal physiological functions after surgery. During this process, protective physiological reflexes gradually return. However, some abnormal changes may occur, with the most significant neurological manifestation being EA[11]. Patients with EA often exhibit ambiguous consciousness, drowsiness, failure to follow instructions, involuntary movements, extreme disorientation, restlessness, and other agitations. If left untreated, EA can lead to complications such as increased internal bleeding, cerebrovascular disease, myocardial infarction, endangerment of suture lines, and in severe cases, surgical failure, pipeline dislodgement, falls, and other accidental injuries[12]. These consequences not only pose a serious threat to medical safety but also endanger patients' lives and health, leading to potential disputes between doctors and patients. Currently, the clinical factors contributing to EA are not fully understood. General anesthetic drugs are believed to exert varying degrees of inhibition on the central nervous system, leading to the emergence of reflex confrontation and an abnormal state of consciousness[13,14]. The results of this study indicate a postoperative EA incidence of 25.5%. A study by Kang et al[15] reported a postoperative EA incidence of 14.1% among 1950 adult patients operated under general anesthesia, while Abitağaoğlu et al[16] observed a 15.4% incidence among 102 postoperative patients. The relatively high incidence observed in our study suggests that EA remains a significant concern in postoperative patients recovering from general anesthesia. Discrepancies with other studies may stem from differences in population inclusion criteria, age demographics, and geographical variations. This study identified potential influencing factors, revealing postoperative analgesia as a protective factor against EA, while old age, indurating catheter use, ASA grade III, and postoperative pain emerged as risk factors. The incidence of EA increased with age, possibly due to abnormal melatonin secretion. Melatonin, an amine hormone secreted by the pineal glands of both mammals and humans, decreases with age, leading to dysfunctions that hinder postoperative recovery and increase EA incidence^[17]. Some scholars also believe^[18] that older people may have poorer physical fitness and lower pain



WJGS | https://www.wjgnet.com

Table 1 Comparison of general information between the two groups, n (%)				
Factor	EA group (<i>n</i> = 51)	Non-EA group (<i>n</i> = 149)	χ²/t	P value
Gender				
Female	22 (43.14)	67 (44.97)	0.051	0.821
Male	29 (56.86)	82 (55.03)		
Age (years)	55.67 ± 7.46	50.23 ± 6.15	-5.145	< 0.001
Smoking history				
No	24 (47.06)	76 (51.01)	0.237	0.626
Yes	27 (52.94)	73 (48.99)		
Drinking history				
No	25 (49.02)	85 (57.05)	0.989	0.320
Yes	26 (50.98)	64 (42.95)		
Hypertension				
No	32 (62.75)	106 (71.14)	1.252	0.263
Yes	19 (37.25)	43 (28.86)		
Diabetes				
No	34 (66.67)	109 (73.15)	0.785	0.376
Yes	17 (33.33)	40 (26.85)		
ASA grade				
Ι	11 (21.57)	70 (46.98)	21.096	< 0.001
П	18 (35.29)	58 (38.93)		
III	22 (43.14)	21 (14.09)		
Indwelling catheter				
No	18 (35.29)	104 (69.80)	19.014	< 0.001
Yes	33 (64.71)	45 (30.20)		
Postoperative analgesia				
No	33 (64.71)	55 (36.91)	11.911	0.001
Yes	18 (35.29)	94 (63.09)		
Operation time (minute)	302.76 ± 65.51	264.38 ± 61.81	-3.770	< 0.001
Anesthesia time (minute)	348.14 ± 65.09	313.48 ± 62.24	-3.392	< 0.001
Awakening time (minute)	42.62 ± 3.58	41.91 ± 3.87	-1.129	0.260
Postoperative pain (scores)	4.43 ± 1.20	2.60 ± 0.76	-10.201	< 0.001

EA: Emergence agitation; ASA: American Society of Anesthesiologists.

tolerance than younger people. Similarly, due to reduced physical function, these patient populations often lack confidence in treatment and are prone to anxiety, thereby contributing to an increased occurrence of EA. Indwelling catheter use was associated with an elevated EA risk, potentially due to unconscious urethral mucosal injury during surgery and subsequent pain and discomfort during recovery[19]. The ASA grade is also a risk factor for EA. Patients with higher ASA grades are more susceptible to fluctuations in respiration, circulation, and the internal environment during anesthesia and surgery[20]. In addition, patients with higher ASA grades often require larger doses of anesthesia, which can lead to excessive anesthetic drug levels in the body. This can inhibit the cardiovascular system, resulting in an increased risk of EA for various reasons[21]. The incidence of EA notably rises in patients experiencing intense postoperative pain. This is primarily because pain, discomfort, and other stimuli can trigger defensive reflexes, resulting in an increased incidence of EA[22-24]. Healthcare professionals can alleviate patients' fear of pain through psychological support, effective communication, and other methods. Additionally, they can provide personalized analgesic intervention based on patients' individual conditions. The results of this study showed that postoperative analgesia serves as a protective factor against EA. A study by Yang *et al*[25] further supports this, indicating that postoperative analgesia

Table 2 Assignment table of factors affecting emergence agitation in patients after general anesthesia

Factor	Assign
Age	Original input
Operation time	Original input
Anesthesia time	Original input
ASA grade	0 = I, $1 = II$, $2 = III$
Indwelling catheter	0 = No, 1 = Yes
Postoperative analgesia	0 = No, 1 = Yes
Postoperative pain	Original input

ASA: American Society of Anesthesiologists.

Table 3 Logistic regression analysis of emergence agitation-related factors					
Factor	В	SE	Wald	P value	OR value (95%CI)
Age	0.202	0.065	9.693	0.002	1.224 (1.078-1.391)
Operation time (minute)	0.010	0.006	3.065	0.080	1.011 (0.999-1.022)
Anesthesia time (minute)	-0.003	0.005	0.259	0.611	0.997 (0.987-1.008)
ASA grade (Class I as reference)	-	-	6.180	0.045	-
П	0.076	0.813	0.009	0.925	1.079 (0.219-5.309)
ш	2.165	0.937	5.338	0.021	8.713 (1.389-54.671)
Indwelling catheter	1.529	0.730	4.388	0.036	4.613 (1.103-19.290)
Postoperative analgesia	-3.516	1.009	12.145	< 0.001	0.030 (0.004-0.215)
Postoperative pain	4.144	0.989	17.543	< 0.001	63.079 (9.070-438.679)

SE: Standard error; OR: Odds ratio; CI: Confidence interval; ASA: American Society of Anesthesiologists.



Figure 1 Nomogram prediction model. This is a column graph illustrating the integration of five factors influencing emergence agitation (EA) into a risk assessment model for EA following general anesthesia for primary liver cancer. The graph was constructed using data from a sample of 140 patients from the training set. ASA: American Society of Anesthesiologists.

Baisbideng® WJGS https://www.wjgnet.com



Figure 2 Receiver operating characteristic and calibration curve analysis. A and B: It displays receiver operating characteristic curves plotted to further validate the predictive efficiency of the model. The curves represent both the training and test sets; C and D: The calibration curve illustrates the agreement between the predicted probability and the actual incidence of emergence agitation in both the training and test sets. A and C are training set, B and D are test set. AUC: Area under the curve.

significantly reduces the incidence of postoperative EA among patients undergoing general anesthesia. This underscores the importance of postoperative analgesia as a protective measure against EA occurrence. The study has some limitations worth noting. Firstly, its focus solely on patients undergoing general anesthesia may overlook factors relevant to other anesthesia types. Secondly, as a retrospective analysis conducted in a single center, the findings may not be fully generalizable to broader patient populations. Additionally, although the sample size was adequate, larger multicenter studies could offer more robust insights. The complexity of risk factors and reliance on retrospective data pose further limitations, alongside the study's primary reliance on EA as the outcome measure, potentially neglecting other clinical endpoints. Furthermore, limited follow-up post-discharge restricts understanding of long-term complications. Addressing these limitations in future research could advance our understanding and improve preventive strategies for EA.

CONCLUSION

In conclusion, age, indwelling catheter use, ASA grade, and postoperative pain significantly affect the occurrence of EA. Therefore, clinical attention should be directed towards these factors, and appropriate prevention and control measures should be implemented. In addition, postoperative analgesia serves as a protective factor against EA. Hence, tailored analgesia programs can be offered based on the individual clinical circumstances of the patients. Future studies should explore the comprehensive understanding of EA in patients undergoing general anesthesia, focusing on refining preventive strategies and improving patient outcomes. Investigations into additional influencing factors, long-term complications, and the efficacy of personalized analgesic interventions could further enhance EA management and patient care.

WJGS https://www.wjgnet.com

FOOTNOTES

Author contributions: Song SS and Han XD designed this research and analyzed the data; Lin L and Li L collected clinical data; Song SS, Lin L, and Li L wrote the manuscript; Han XD reviewed the manuscript; and all authors have read and approved the final manuscript.

Institutional review board statement: The study was reviewed and approved by the Institutional Review Board of Wenzhou Central Hospital (Approval No. L2024-02-030).

Informed consent statement: The ethics committee granted an exemption from obtaining informed consent because this is a retrospective study that does not involve patient privacy.

Conflict-of-interest statement: The authors declare no conflict of interest.

Data sharing statement: Anonymous datasets can be obtained from the corresponding author upon request.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: https://creativecommons.org/Licenses/by-nc/4.0/

Country of origin: China

ORCID number: Shu-Shu Song 0009-0005-2828-162X; Li Lin 0000-0001-8491-6187; Li Li 0000-0002-1527-7980; Xiao-Dong Han 0000-0002-1734-2061.

S-Editor: Chen YL L-Editor: A P-Editor: Zhang XD

REFERENCES

- Rogobete AF, Sandesc D. General Anesthesia as a Multimodal Individualized Clinical Concept. Medicina (Kaunas) 2022; 58 [PMID: 35888675 DOI: 10.3390/medicina58070956]
- Lee S, Sohn JY, Hwang IE, Lee HJ, Yoon S, Bahk JH, Kim BR. Effect of a repeated verbal reminder of orientation on emergence agitation 2 after general anaesthesia for minimally invasive abdominal surgery: a randomised controlled trial. Br J Anaesth 2023; 130: 439-445 [PMID: 36697272 DOI: 10.1016/j.bja.2022.12.009]
- 3 Lee SJ, Sung TY. Emergence agitation: current knowledge and unresolved questions. Korean J Anesthesiol 2020; 73: 471-485 [PMID: 32209961 DOI: 10.4097/kja.20097]
- Bağcaz A, Ayhan A. Emergence Agitation with Earthquake-Related Traumatic Stress Symptoms After Intravenous Sedation. Turk Psikiyatri 4 Derg 2023; 34: 136-139 [PMID: 37357901 DOI: 10.5080/u27347]
- Shi JF, Cao M, Wang Y, Bai FZ, Lei L, Peng J, Feletto E, Canfell K, Qu C, Chen W. Is it possible to halve the incidence of liver cancer in 5 China by 2050? Int J Cancer 2021; 148: 1051-1065 [PMID: 32997794 DOI: 10.1002/ijc.33313]
- Orcutt ST, Anaya DA. Liver Resection and Surgical Strategies for Management of Primary Liver Cancer. Cancer Control 2018; 25: 6 1073274817744621 [PMID: 29327594 DOI: 10.1177/1073274817744621]
- Wang N, Hao J, Zhang J, Du J, Luo Z. Risk factors for emergence agitation during the awakening period in elderly patients after total joint 7 arthroplasty: a retrospective cohort study. BMJ Open 2023; 13: e068284 [PMID: 37164475 DOI: 10.1136/bmjopen-2022-068284]
- 8 Medlej K. Calculated decisions: Richmond Agitation-Sedation Scale (RASS). Emerg Med Pract 2021; 23: CD3-CD4 [PMID: 33729737]
- Apfelbaum JL, Connis RT. The American Society of Anesthesiologists Practice Parameter Methodology. Anesthesiology 2019; 130: 367-384 9 [PMID: 30724774 DOI: 10.1097/ALN.00000000002551]
- 10 Thong ISK, Jensen MP, Miró J, Tan G. The validity of pain intensity measures: what do the NRS, VAS, VRS, and FPS-R measure? Scand J Pain 2018; 18: 99-107 [PMID: 29794282 DOI: 10.1515/sjpain-2018-0012]
- Tolly B, Waly A, Peterson G, Erbes CR, Prielipp RC, Apostolidou I. Adult Emergence Agitation: A Veteran-Focused Narrative Review. 11 Anesth Analg 2021; 132: 353-364 [PMID: 33177329 DOI: 10.1213/ANE.000000000005211]
- Talih G, Yüksek A, Şahin E. Evaluation of emergence agitation after general anaesthesia in rhinoplasty patients: Inhalation anaesthesia versus 12 total intravenous anaesthesia. Am J Otolaryngol 2020; 41: 102387 [PMID: 31926597 DOI: 10.1016/j.amjoto.2020.102387]
- Wei B, Feng Y, Chen W, Ren D, Xiao D, Chen B. Risk factors for emergence agitation in adults after general anesthesia: A systematic review 13 and meta-analysis. Acta Anaesthesiol Scand 2021; 65: 719-729 [PMID: 33370461 DOI: 10.1111/aas.13774]
- 14 Shen QH, Xu-Shen, Lai L, Chen YJ, Liu K, Sun LJ. The effect of magnesium sulfate on emergence agitation in children undergoing general anesthesia: A systematic review and meta-analysis. J Clin Anesth 2022; 78: 110669 [PMID: 35151145 DOI: 10.1016/j.jclinane.2022.110669]
- Kang X, Lin K, Tang H, Tang X, Bao F, Gan S, Zhu S. Risk Factors for Emergence Agitation in Adults Undergoing Thoracoscopic Lung 15 Surgery: A Case-Control Study of 1,950 Patients. J Cardiothorac Vasc Anesth 2020; 34: 2403-2409 [PMID: 32418835 DOI: 10.1053/j.jvca.2020.02.046]
- Abitağaoğlu S, Köksal C, Alagöz S, Karip CS, Arı DE. Effect of ketamine on emergence agitation following septoplasty: a randomized 16 clinical trial. Braz J Anesthesiol 2021; 71: 381-386 [PMID: 33762196 DOI: 10.1016/j.bjane.2020.12.027]
- Zhang D, Jia X, Lin D, Ma J. Melatonin or its analogs as premedication to prevent emergence agitation in children: a systematic review and 17 meta-analysis. BMC Anesthesiol 2023; 23: 392 [PMID: 38037000 DOI: 10.1186/s12871-023-02356-x]



WJGS | https://www.wjgnet.com

- Li XL, Xu WF, Wang LL, Wu YF, Ma HP. Analysis on the Incidence and Risk Factors of Emergence Agitation in Patients with Gastric Cancer 18 after Laparoscopic Surgery in Anesthesia Recovery Room. Xiandai Shengwuyixue Jinzhan 2022; 22: 2879-2882, 2964 [DOI: 10.13241/j.cnki.pmb.2022.15.015]
- 19 Zhang M, Hu XW, Li R, Jia JX, Zhang Q. Analysis of Restlessness and its Influencing Factors in Patients after General Anesthesia. Xiandai Shengwuyixue Jinzhan 2022; 22: 397-400 [DOI: 10.13241/j.cnki.pmb.2022.02.039]
- Mahanna-Gabrielli E, Schenning KJ, Eriksson LI, Browndyke JN, Wright CB, Culley DJ, Evered L, Scott DA, Wang NY, Brown CH 4th, Oh 20 E, Purdon P, Inouye S, Berger M, Whittington RA, Price CC, Deiner S. State of the clinical science of perioperative brain health: report from the American Society of Anesthesiologists Brain Health Initiative Summit 2018. Br J Anaesth 2019; 123: 464-478 [PMID: 31439308 DOI: 10.1016/j.bja.2019.07.004]
- Mevorach L, Forookhi A, Farcomeni A, Romagnoli S, Bilotta F. Perioperative risk factors associated with increased incidence of 21 postoperative delirium: systematic review, meta-analysis, and Grading of Recommendations Assessment, Development, and Evaluation system report of clinical literature. Br J Anaesth 2023; 130: e254-e262 [PMID: 35810005 DOI: 10.1016/j.bja.2022.05.032]
- Yu H, Sun X, Li P, Deng X. Prevalence and risk factors of emergence agitation among pediatric patients undergo ophthalmic and ENT 22 Surgery: a cross-sectional study. BMC Pediatr 2023; 23: 598 [PMID: 37996779 DOI: 10.1186/s12887-023-04434-y]
- 23 Barreto ACTP, Rangel da Rocha Paschoal AC, Barbosa Farias C, Gomes Nogueira Borges PS, Gonelli Albanez da Cunha Andrade R, de Orange FA. [Risk factors associated with anesthesia emergence delirium in children undergoing outpatient surgery]. Braz J Anesthesiol 2018; 68: 162-167 [PMID: 29224711 DOI: 10.1016/j.bjan.2017.11.002]
- El-Sherbiny SM, Kamal RA, Sadik N, Elshahat A. Effect of Dexmedetomidine in Sub-Tenon's Block on Emergence Agitation in Pediatric 24 Strabismus Surgery under Sevoflurane Anesthesia. Anesth Essays Res 2022; 16: 160-166 [PMID: 36249154 DOI: 10.4103/aer.aer 99 22]
- Yang X, Hu Z, Peng F, Chen G, Zhou Y, Yang Q, Yang X, Wang M. Effects of Dexmedetomidine on Emergence Agitation and Recovery 25 Quality Among Children Undergoing Surgery Under General Anesthesia: A Meta-Analysis of Randomized Controlled Trials. Front Pediatr 2020; 8: 580226 [PMID: 33304867 DOI: 10.3389/fped.2020.580226]



WJGS | https://www.wjgnet.com



Published by Baishideng Publishing Group Inc 7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA Telephone: +1-925-3991568 E-mail: office@baishideng.com Help Desk: https://www.f6publishing.com/helpdesk https://www.wjgnet.com

