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Risk factors related to delayed post-anesthetic awakening in the elderly operated by elective video laparoscopic surgery

Abstract

In all surgical procedures, the organism presents different physiological alterations that expose the patient to a series of difficulties that, if not taken into account, can cause very severe complications in the post-anesthetic awakening of elderly patients. A longitudinal prospective cohort study was carried out on elderly people who underwent laparoscopic video surgery at the general provincial hospital "Carlos Manuel de Céspedes de Bayamo, from the Cauto region during the period from January 1, 2019 (,) to December 31, 2019. December 2021; with the aim to identify the risk factors related to a delay in post- anesthetic awakening. It was established that the exposed cohort consisted of 39 elderly people with delayed post-anesthetic awakening in the study period who met the inclusion criteria. The magnitude of the associations was estimated by calculating the relative risks (RR) of delay. There is an association between patient-dependent risk factors: smoking, obesity, presence of comorbidities and use of chronic pharmacological therapy, with a delay in post-anesthetic awakening in the elderly. The duration of the intervention, fasting time greater than 12 hours and hypoglycemia were the factors dependent on the surgical-anesthetic act associated with a delay in post-anesthetic awakening in the elderly.

Keywords: delayed awakening after anesthesia, risk factors, old man, elective laparoscopic video surgery

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Introduction

According to the World Health Organization (WHO) Global Health Estimate, tens of millions of patients undergo general anesthesia (GA) worldwide each year.[1] Interestingly, despite a large number of studies on the subject, there is still no clear picture of the basis of the neurobiological mechanisms of GA. This fascinating puzzle, however, is gradually being completed. It is beginning to be understood, for example, that induction and recovery (anesthetic recovery, RA) are non-specular processes.[2,3] The final stage of GA characterized by progression from the patient's unconscious state to full wakefulness and restoration of consciousness has a precise neurobiology that differs greatly from the induction phase.[1] For most patients, this occurs shortly after the end of anesthesia, but when it is delayed, it presents a diagnostic challenge and potentially a serious event.[4] The most frequent causes associated with the prolonged awakening are the residual effects of premedication (antiemetics, anxiolytics), intravenous and inhaled anesthetics during surgery.[4,5] Others have been included, such as hypothermia, hypoglycemia, severe hyperglycemia, electrolyte imbalances such as hypernatremia and hyponatremia in the perioperative period, which may influence the duration of the AR. Patient-related factors are also involved, such as the use of CNS drugs, severe hypothyroidism, liver disease, hypoalbuminemia, and kidney diseases such as uremia. Inadequate ventilation technique may involve hyperventilation/hypoventilation with an impact on recovery times through hypocapnia and cerebral vasoconstriction (hyperventilation) or CO_2 narcosis (hypoventilation).[1,4,6,7]

There are few publications on the delay in the recovery of consciousness after general anesthesia. There is no set time threshold for the expected return of consciousness. Therefore, it is vital that each patient must be individually assessed to determine if the time required to regain consciousness is outside of what would normally be expected in similar patients.[1,4]

On the other hand, in Cuba, the Granma province and especially the "Carlos Manuel de Céspedes" general provincial hospital in Bayamo, studies on the subject are insufficient, making it necessary to identify the risk factors related to a delay in post- anesthetic awakening in elderly operated by elective laparoscopic video surgery.

Methods

A longitudinal prospective cohort study was carried out on elderly people who underwent laparoscopic video surgery at the general provincial hospital "Carlos Manuel de Céspedes de Bayamo, from the Cauto region during the period from January 1, 2019 to December 31, 2019. December 2021. Starting from 181 elderly patients electively operated on in the aforementioned period in the video laparoscopic surgery room at the institution where the research is carried out; it was established that the exposed cohort consisted of 39 elderly people with delayed post-anesthetic awakening in the study period and who met the inclusion criteria (altered state of consciousness, characterized by difficulty thinking adequately and altered memory; delirium; obtundation, stupor, in which the patient only responds to painful stimuli, and coma). Patients who were not willing to collaborate with the study, with psychiatric or terminal illnesses, and those who died during the intraoperative period were excluded.

The sample size was correlated with the statistical package EpiInfo version 2002 for Windows. All the patients in the study who were announced for video laparoscopic surgery by the general surgeon underwent a questioning, physical examination, and an anesthesia sheet was filled out; the informed consent was explained to them and filled out; and later the follow-up was carried out until 8 hours after the surgical intervention, where it was identified whether or not the patient showed a delay in anesthetic recovery. Mantel's Chi Square test was used to assess the association between the variables. The magnitude of the associations was estimated by calculating the relative risks s (RR) of delay. Point and confidence interval (95%) estimates of the RRs were obtained.

Results

Table 1 explains the result of the univariate statistical analysis performed to identify the possible association between the risk factors related to the patient with a delay in awakening after anesthesia in the elderly who underwent elective video laparoscopic surgery, when these hypothetical variables were manifested in isolation in the sample studied. The presence of comorbidities quintupled the risk of delayed awakening after anesthesia, obtaining a RR value significantly greater than 1 (RR 5.27; 95% CI: 2.50-11.10; p=0.0000). Smoking was related to the delay in awakening after anesthesia, obtaining a RR value significantly greater than 1 (RR 4.14; 95% CI: 2.06-8.33; p=0.0000), so that there was a four times greater probability of retardation in the elderly with this toxic habit than those without it. Similar results were obtained concerning the use of chronic pharmacological therapy (RR 4.09; 95% CI: 1.88-8.91; p=0.0002).

The presence of obesity in the elderly doubled the risk of delayed awakening after anesthesia in the elderly by obtaining a RR value greater than 1 (RR 2.50; 95% CI: 1.33-4.70; p=0. 0052), statistically significant results when applying the Chi square test. In the present investigation, alcoholism as a toxic habit (RR 1.69); age greater than or equal to 75 years (RR 1.46) and male sex (RR 1.43), although they had a RR value greater than 1, were not considered statistically significant risk factors when p values >0 were obtained. .05.

When the duration of surgery was greater than 60 minutes, the risk of delayed awakening after anesthesia increased fivefold, obtaining a RR value significantly greater than 1 (RR 5.14; 95% CI: 2.56-10.33; p= 0.0000), results shown in Table 2. The elderly who fasted for more than 12 hours (RR 2.69) and with hypoglycemia during the surgical act (RR 2.65) presented twice the risk of presenting a delay in post-anesthetic awakening, statistically significant results, when applying the Chi square test (Table 2). In the present study, hypothermia during surgery (RR 1.07) and exhaled $CO_{2\,levels}$ (RR 1.04) were not statistically significant risk factors for delayed post-anesthesia awakening in the elderly who underwent surgery elective laparoscopic video, when obtaining values of p>0.05.

When the logistic regression model (Table 3) was fitted to the data, to assess the independent value of the different risk factors, the number of factors was reduced to seven, where it was observed that the risk factor with the highest Independence was the presence of comorbidities followed by the duration of surgery, and smoking, all significantly (p= 0.000).

Table 1 Risk factors related to the patient. Univariate analysis

FR		with late awakening		no late wake up		Total		RR	CI (95%)	p
		Not	%	Not	%	Not	%			
Age	≥75 years	21	11.6	63	34.81	84	46.41	1.46	0.77-2.74	0.3028
	<75 years	18	9.94	79	43.65	97	53.59			
Sex	Male	20	11.05	60	33.15	80	44.2	1.43	0.76-2.69	0.3274
	Feminine	19	10.5	82	45.3	101	55.8			
Obesity	Yes	19	10.5	39	21.55	58	32.04	2.5	1.33-4.70	0.0052
	Not	20	11.05	103	56.91	123	67.96			
smoking	Yes	28	15.47	54	29.83	82	45.3	4.14	2.06-8.33	0
	Not	11	6.08	88	48.62	99	54.7			
Alcoholism	Yes	19	10.5	51	28.18	70	38.67	1.69	0.90-3.17	0.1337
	Not	20	11.05	91	50.28	111	61.33			
Comorbidity	Yes	30	16.57	55	30.39	85	46.96	5.27	2:50-11:10	0
	Not	9	4.97	87	48.07	96	53.04			
chronic therapy	Yes	31	17.13	69	38.12	100	55.25	4.09	1.88-8.91	0.0002
	Not	8	4.42	73	40.33	81	44.75			

Table 2 Risk factors dependent on the surgical-anesthetic act. Univariate analysis

FR		with late awakening		no late wake up		Total		RR	CI (95%)	p
		Not	%	Not	%	Not	%			
Surgery duration ≥60min	Yes	28	15.47	47	25.97	75	41.44	5.14	2.56-10.33	0
	Not	eleven	6.08	95	52.49	106	58.56			
Expired CO_2 level	Yes	fifteen	8.29	53	29.28	68	37.57	1.04	0.55-2.00	0.9855
	Not	24	13.26	89	49.17	113	62.43			
fasting time	Yes	19	10.5	37	20.44	56	30.94	2.69	1.43-5.05	0.0024
	Not	twenty	11.05	105	58.01	125	69.06			
Hypothermia	Yes	eleven	6.08	38	20.99	49	27.07	1.07	0.53-2.15	0.9817
	Not	28	15.47	104	57.46	132	72.93			
hypoglycemia	Yes	17	9.39	32	17.68	49	27.07	2.65	1.42-5.00	0
	Not	22	12.15	110	60.77	132	72.93			

Table 3 Risk factors for delayed awakening after anesthesia in the elderly who underwent elective video laparoscopic surgery. Multivariate analysis

	B.	I KNOW	p	HR	95% Confidence Interval	
variables					lower	Higher
Comorbidities	0.508	0.157	0.001	1,661	1,221	2,261
Surgery duration	0.493	0.168	0.003	1,638	1,117	2,278
smoking	0.483	0.127	0,000	1,620	1,263	2,079
Use of chronic drug therapy	0.371	0.153	0.025	1,376	1,037	1,799

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Table Continued...

	B.	I KNOW	p	HR	95% Confidence Interval	
fasting time	0.288	0.102	0.04	1,313	1,666	1,991
hypoglycemia	0.259	0.114	0.023	1,272	1,617	1,965
Obesity	0.246	0.168	0.006	1,224	1,501	1,869

Discussion

In the present investigation, age greater than or equal to 75 years was not a risk factor for delayed awakening after anesthesia, unlike what was reported by Misal et al.,[4] and Thomas et al.,[8] which may be related to the fact that Consulted studies establish 60 years as the cut-off age, making comparisons between the elderly and young adults, and in the present investigation only the elderly were included. The male sex was not a statistically significant risk factor for delayed awakening after anesthesia, contrary to what was reported by Thomas et al.,[8] which may be related to the size of the sample, and the type of condition reported by those included in the study the study. Obesity, in the present study, became a risk factor for delayed awakening after anesthesia, similar to that reported by Cascella et al.,[1] Misal et al.,[4] and Thomas et al.[8] This may be related to the fact that obesity with increased fat mass requires higher doses of the drug to reach the same maximum plasma concentration as a person of standard size.[1,8]

According to Thomas et al.,[8] body composition may play an important role in the speed of recovery after general anesthesia. Most drug doses should be given based on lean body weight, but increased body fat in the obese may mean that relatively higher doses must be given to achieve the same maximum plasma concentration compared to an individual with less body fat. This results predominantly from the redistribution of lipid-soluble anesthetic agents into body fat. Various studies comment on the association of toxic habits with delayed recovery from anesthesia.[1,2,4,5] Smoking can also increase carboxyhemoglobin in the blood, causing the dissociation curve for oxidized hemoglobin to shift to the left, and the tighter combination of Hb and oxygen makes it more difficult for tissues to use oxygen. oxygen, which leads to delayed anesthetic recovery.[9-11]

Cascella et al.[1] report that pre-existing heart and lung diseases require adjustments in anesthetic doses to avoid late awakening. Significant lung disease decreases the ability to wash out inhaled agents. Similarly, congestive heart failure and decreased cardiac output prolong sleepiness. These same authors suggest that renal or hepatic disease may prolong the action of anesthetic agents depending on hepatic metabolism or renal excretion.[1,2,5] There is reduced clearance of nondepolarizing muscle relaxants such as pancuronium and vecuronium in renal failure. Thomas et al.,[8] about the effect of other non-anesthetic drugs (cimetidine, ranitidine, antihistamines, antiemetics and anti-nausea, among others), report that they may be capable of causing delayed awakening, either due to their sedative effect, their interaction with anesthetics, protein binding or competitiveness.

Other investigators have suggested that prior ingestion of opioids and benzodiazepines or nonanesthetic drugs that affect cognitive function, such as tranquilizers, antihypertensives, anticholinergics, clonidine, antihistamines, penicillin-derived antibiotics, amphotericin B, immunosuppressants, lidocaine, and alcohol will potentiate the effects. Anesthetic drugs and CNS depressants will delay exit from anesthesia.[1,2,5] Prolonged duration of anesthesia increases recovery time from anesthesia due to tissue uptake depending on the concentration used and drug solubility;[1,7,12] which justifies why in the present investigation it became a risk factor; similar to what was reported by Cascella et al.,[5] Misal et al.,[4] and Thomas et al.[8]

Fasting time was a risk factor for delayed awakening after anesthesia in this study, similar to that reported by Zhang et al.[9] which may be related to the hypoglycemia that usually appears. Hypoglycemia is one of the most feared complications encountered in diabetic patients undergoing surgery. Because general anesthesia masks cognitive dysfunction and clinical signs of hypoglycemia such as sweating and tachycardia, severe and prolonged hypoglycemia can have serious brain effects.[13,14] Although hypoglycemia may cause delayed postanesthetic recovery primarily in individuals with a history of poorly controlled diabetes, starvation, or alcohol use, hypoglycemia-related delayed anesthetic recovery has also been reported in nondiabetic patients. Even severe hyperglycemia can prolong the time to wake up from anesthesia. Causes osmotic diuresis and dehydration.[1,2,5]

Conclusion

It is concluded in the present study that there is an association between the risk factors dependent on the patient (smoking, obesity, presence of comorbidities and use of chronic pharmacological therapy) and those dependent on the surgical-anesthetic act (the duration of the intervention, the time of fasting greater than 12 hours and hypoglycemia) with delayed awakening after anesthesia in the elderly.

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None.

Conflicts of Interest

None.

References

1. Cascella M, Bimonte S, Di Napoli R. Delayed Emergence from Anesthesia: What We Know and How We Act. *Local Reg Anesth*. 2020;13:195–206.
2. Cascella M, Bimonte S, Muzio MR. Towards a better understanding of anesthesia emergence mechanisms: Research and clinical implications. *World J Methodol*. 2018;8(2):9–16.
3. Tarnal V, Vlisides PE, Mashour GA. The Neurobiology of Anesthetic Emergence. *J Neurosurg Anesthesiol*. 2016;28(3):250–255.
4. Misal US, Joshi SA, Shaikh MM. Delayed recovery from anesthesia: A postgraduate educational review. *Anesth Essays Res*. 2016;10(2):164–172.
5. Cascella M, Bimonte S, Amruthraj NJ. Awareness during emergence from anesthesia: features and future research directions. *World J Clin Cases*. 2020;8(2):245–254.
6. Kelz MB, García PS, Mashour GA. Escape From Oblivion: Neural Mechanisms of Emergence From General Anesthesia. *Anesth Analg*. 2019;128(4):726–736.
7. Staheli B, Rondeau B. Anesthetic Considerations In The Geriatric Population. [Updated 2022 Jun 5]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022.
8. Thomas E, Martin F, Pollard B. Delayed recovery of consciousness after general anaesthesia. *BJA Educ*. 2020;20(5):173–179.

9. Zhang Guohui BN, Pan Bingbing, Tan Dan BN, et al. Risk factors of delayed recovery from general anesthesia in patients undergoing radical biliary surgery: What can we prevent. *Medicine*. 2021;100(32):p e26773.
10. Carrick MA, Robson JM, Thomas C. Smoking and anaesthesia. *BJA Educ*. 2019;19(1):1–6.
11. Samantaray A. Smoking and Anesthesia: Implications during the perioperative period. *J Clin Sci Res*. 2018;7:75–79.
12. Guirola Leon SL. Causes of prolonged awakening in adult patients undergoing general anesthesia in elective surgical procedures. Thesis. San Carlos University of Guatemala. February 2015.
13. Han H, Lai J, Yan C, et al. Development and validation of a prediction model of perioperative hypoglycemia risk in patients with type 2 diabetes undergoing elective surgery. *BMC Surg*. 2022;22:167.
14. Yuan SJ, Shen J. Increased Preoperative Glucose Variability Is Associated with Adverse Perioperative Outcomes Following Orthopedic Surgery in Patients with Type 2 Diabetes Mellitus. *CURR MED SCI*. 2020;40:523–529.

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