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Original Research

Evaluation of Postoperative Cognitive Dysfunction and Its Risk Factors in Elderly Patients Undergoing Elective Non-Cardiac Surgery: A Prospective Observational Study

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Abstract

Objectives: This study aimed to evaluate the incidence, course, and potential risk factors of postoperative cognitive dysfunction (POCD) in elderly patients undergoing elective non-cardiac surgery.
Methods: A prospective observational study was conducted on 35 patients aged 60 years and older who underwent elective non-cardiac surgery under general or regional anesthesia. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA) test preoperatively, at 24 hours, and on postoperative day 30. Demographic characteristics, comorbidities, perioperative events, and anesthesia-related factors were recorded.
Results: The mean preoperative MoCA score was 20.9±3.2, which decreased significantly to 18.0±2.6 at 24 hours (p<0.001) and improved to 22.7±2.7 by postoperative day 30 (p<0.001). The incidence of cognitive dysfunction (MoCA <21) was 42.9% preoperatively, 85.7% at 24 hours, and 20.0% at day 30. No significant associations were found between POCD and comorbidities, anesthesia type, intraoperative hypotension, bleeding, transfusion, or narcotic use (p>0.05). However, preoperative cognitive performance was lower among patients with lower education levels, and postoperative day-30 scores were significantly lower among smokers (p=0.043).
Conclusion: POCD was common in the early postoperative period but largely resolved by day 30. Smoking and low educational level were associated with poorer cognitive outcomes. Larger multicenter studies are needed to further clarify risk factors and long-term neurocognitive trajectories in elderly surgical patients.
Keywords: Cognitive dysfunction, general anesthesia, MoCA test, regional anesthesia

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The global and national demographic shift toward an aging population has resulted in a marked increase in individuals aged 60 years and older, both worldwide and in Türkiye. According to the World Health Organization, between 2015 and 2050, the proportion of the world's population over 60 years is expected to nearly double, rising from 12% to 22%.[1]

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Cognition refers to the mental processes involved in perception, memory, and information processing that enable individuals to acquire knowledge, solve problems, and plan actions. Cognitive dysfunction denotes the impairment of these processes.[2] Despite advances in surgical techniques, anesthetic management, and intensive care, a substantial proportion of elderly patients still experience postoperative declines in cognitive performance.

Postoperative cognitive dysfunction (POCD) is a specific neurocognitive disorder that occurs following surgery and anesthesia, characterized by impairments in selective attention, alertness, perception, learning, memory, executive functions, verbal and language skills, affect regulation, visuospatial ability, and psychomotor performance. Although POCD can occur across all age groups, its prevalence is particularly high—ranging from 20% to 40%—among patients aged 60 years and older.[3,4]

While advanced age is a major risk factor, the underlying mechanisms of POCD remain incompletely understood, and multiple perioperative and patient-related factors are implicated. Reported risk factors include the use of opioids, volatile anesthetics, and adjunct drugs during anesthesia; low educational level; coronary artery disease; cerebrovascular disease; chronic kidney disease; alcohol dependence; pre-existing cognitive impairment; and surgical factors such as site, magnitude, and history of previous operations.[3,5–7]

The present study aimed to evaluate the incidence and progression of postoperative cognitive dysfunction, as well as to identify potential risk factors, in patients aged 60 years and older undergoing elective non-cardiac surgery.

Methods

Study Design and Ethical Approval

This study was approved by the Clinical Research Ethics Committee University of Health Sciences, Şişli Hamidiye Etfal Training and Research Hospital (Date: 08.08.2017, Decision no: 1649), was conducted in accordance with the Declaration of Helsinki, and written informed consent was obtained from all participants. It was designed as a prospective observational study conducted between March 2017 and September 2017. The primary objective was to evaluate postoperative cognitive dysfunction (POCD) and identify perioperative risk factors associated with its development in elderly patients undergoing non-cardiac surgery.

Participants and Eligibility Criteria

Patients aged 60 years or older with an ASA physical status of I–III who were scheduled for elective non-cardiac surgery under general or regional anesthesia were included. Exclusion criteria were ASA class IV or higher, a diagnosis of Alzheimer's disease or dementia, and refusal to participate in the study. All participants had completed at least five years of formal education.

Sample Size Calculation

The primary endpoint was the within-patient change in Montreal Cognitive Assessment (MoCA) test from preoperative assessment to 24 hours postoperatively. Based on variability reported in elderly surgical cohorts, a clinically meaningful mean difference of 2.0 MoCA points and a standard deviation of paired differences of 4.2 were assumed, with two-sided α =0.05 and power =0.80. This calculation indicated that 35 patients were required.[8]

Cognitive Assessment and Blinding

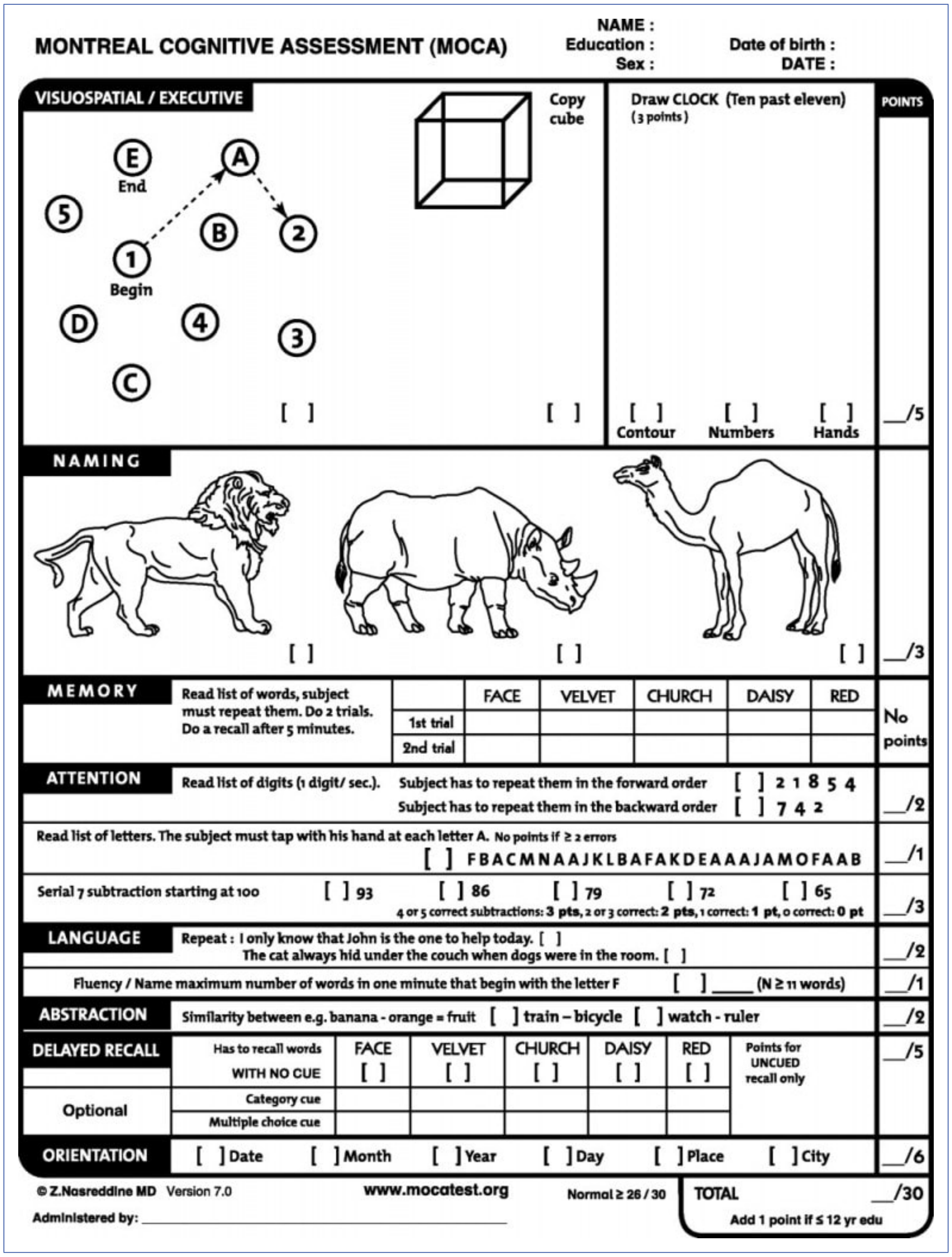
Cognitive function was assessed using the MoCA test (Fig. 1). The MoCA test was administered preoperatively, and then at 24 hours and 30 days postoperatively by an independent anesthesiologist who was blinded to the patients' perioperative data and not involved in anesthesia management or data analysis. This approach ensured unbiased evaluation of cognitive performance throughout the study.

Data Collection

During the preoperative assessment, demographic and clinical characteristics—including age, gender, educational and occupational status, comorbidities (diabetes mellitus, hypertension, chronic kidney disease, coronary artery disease, cerebrovascular disease, peripheral vascular disease), smoking and alcohol history, previous surgeries, and Metabolic Equivalent of Task (MET) scores—were recorded (Appendix 1).

Anesthesia Procedures

In the operating room, standard monitoring included ECG, SpO_2, noninvasive blood pressure, temperature probe, and Bispectral Index (BIS) monitoring for patients receiving general anesthesia. Induction was achieved with propofol (1.5–2 mg/kg) and fentanyl (1–2 µg/kg), and rocuronium (0.6 mg/kg) was administered when intubation was required. In patients who did not require muscle relaxation, a laryngeal mask airway (LMA) was used. Maintenance was achieved with sevoflurane in a 50% oxygen and 50% air mixture, maintaining BIS values between 40 and 60. For spinal anesthesia, 0.5% bupivacaine (0.2–0.3 mg/kg) was injected into the subarachnoid space under sterile conditions in the sitting or lateral decubitus position. Hemodynamic parameters were continuously monitored throughout surgery. Hypotension was defined as a ≥20% reduction in mean arterial pressure and treated with ephedrine (5 mg IV). Oxygen saturation was maintained above 90%, with any de-



MONTREAL COGNITIVE ASSESSMENT (MOCA)

NAME :
Education :
Sex :
Date of birth :
DATE :

VISUOSPATIAL / EXECUTIVE

Copy cube

Draw CLOCK (Ten past eleven) (3 points)

POINTS

E End, A, 5, B, 2, 1 Begin, D, 4, 3, C

[ ] [ ] [ ] Contour [ ] Numbers [ ] Hands __/5

NAMING

[ ] [ ] [ ] __/3

MEMORY

Read list of words, subject must repeat them. Do 2 trials. Do a recall after 5 minutes.

	FACE	VELVET	CHURCH	DAISY	RED
1st trial					
2nd trial					

No points

ATTENTION

Read list of digits (1 digit/ sec.). Subject has to repeat them in the forward order [ ] 2 1 8 5 4
Subject has to repeat them in the backward order [ ] 7 4 2 __/2

Read list of letters. The subject must tap with his hand at each letter A. No points if ≥ 2 errors
[ ] FBACMNAAJKLBAFAKDEAAAJAMOFAAB __/1

Serial 7 subtraction starting at 100 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65
4 or 5 correct subtractions: **3 pts**, 2 or 3 correct: **2 pts**, 1 correct: **1 pt**, 0 correct: **0 pt** __/3

LANGUAGE

Repeat : I only know that John is the one to help today. [ ]
The cat always hid under the couch when dogs were in the room. [ ] __/2

Fluency / Name maximum number of words in one minute that begin with the letter F [ ] ____ (N ≥ 11 words) __/1

ABSTRACTION

Similarity between e.g. banana - orange = fruit [ ] train – bicycle [ ] watch - ruler __/2

DELAYED RECALL

		FACE	VELVET	CHURCH	DAISY	RED	
	Has to recall words WITH NO CUE	[ ]	[ ]	[ ]	[ ]	[ ]	Points for UNCUED recall only
Optional	Category cue						
	Multiple choice cue						

__/5

ORIENTATION

[ ] Date [ ] Month [ ] Year [ ] Day [ ] Place [ ] City __/6

© Z.Nasreddine MD Version 7.0 www.mocatest.org Normal ≥ 26 / 30 TOTAL __/30

Administered by: ____________

Add 1 point if ≤ 12 yr edu

Figure 1. Montreal cognitive assesment test.

saturation recorded as hypoxia. Hypothermia was prevented using active warming devices. Intraoperative parameters—including bleeding, blood transfusion requirement, narcotic use, duration of surgery, anesthesia method, and anesthesia duration—were documented. Intubated patients were assessed using the Aldrete Recovery Score (ARS), and those scoring ≥9 were transferred to the ward.

Postoperative Follow-Up

The MoCA test was repeated at the 24th postoperative hour and on the 30th postoperative day, both administered by the same blinded anesthesiologist. Patients who failed to attend the 30-day follow-up were excluded from analysis. All perioperative data collection was performed by a fourth-year anesthesiology resident, while cognitive testing was conducted independently to maintain objectivity and minimize observer bias.

Statistical Analysis

SPSS 15.0 for Windows was used for statistical analysis. Descriptive statistics were given as mean, standard deviation, minimum, and maximum for numerical variables. The comparisons of the numerical variables in the two independent groups were performed with Student's t-test when the normal distribution condition was provided. Mann Whitney U test was used for the abnormal distribution. One-Way ANOVA Test and Kruskal Wallis test were used for multiple groups. Chi-Square Analysis tested the ratio of categorical variables between groups. Spearman Correlation Analysis examined the relationships between the numerical variables because the parametric test condition was not provided. Statistical significance was accepted as p<0.05.

Results

A total of 42 patients were initially enrolled in the study. Seven patients were excluded because they did not meet the inclusion criteria, and the final analysis was conducted with 35 patients who completed all study assessments. The demographic data and general characteristics of these patients are presented in Table 1. The comparison of cognitive test scores across three time points demonstrated significant postoperative changes. The mean preoperative MoCA score was 20.9±3.2 (range: 15–26). At 24 hours postoperatively, the mean score declined to 18.0±2.6, indicating a transient decrease in cognitive performance (p<0.001). By postoperative day 30, cognitive scores significantly improved to 22.7±2.7 (range: 16–28), exceeding preoperative levels (p<0.001) (Table 2). The incidence of cognitive dysfunction, defined as a MoCA score below 21, showed marked variation across the study periods. Preoperatively, 42.9% of patients exhibited cognitive impairment. At 24 hours postoperatively, the rate of cognitive dysfunction increased significantly to 85.7%, indicating a substantial transient decline in cognitive performance. By postoperative day 30, the incidence decreased to 20.0%, reflecting a significant recovery compared with the early postoperative period (p<0.001) (Table 3). No statistically significant correlation was found between age or duration of surgery and cognitive test scores (p>0.05). Similarly, there were no significant differences in cognitive test scores according to gender, diabetes mellitus, hypertension, chronic kidney disease, coronary artery disease, cerebrovascular disease, alcohol consumption, or history of previous surgeries at either preoperative or postoperative measurements (p>0.05). Preoperative cognitive test scores of patients with primary and secondary school education were significantly lower than those of university graduates (p=0.017 and p=0.022, respectively). The mean postoperative day 30 cognitive test score was significantly lower in smokers than in non-smokers (p=0.043) (Table 4). No significant relationship was found between perioperative complications (such as hypotension, bleeding, blood transfusion, or narcotic use) and postoperative cognitive

Table 1. The demographic data and general characteristics of the patients

	Mean ± SD	Min-Max
Age	70.5±8.5	60-90
	n	**%**
Gender		
Male	26	74.3
Female	9	25.7
Education level		
Primary school	16	45.7
Secondary school	6	17.1
High school	4	11.4
University	9	25.7
Concomitant disease		
Diabetes mellitus	13	37.1
Hypertension	20	57.1
Chronic Renal disease	8	22.9
Coroner Artery disease	10	28.6
History of Cerebrovascular disease	3	8.6
Vascular disease	1	2.9
Use of alcohol	8	22.9
Smoking	7	20.0
History of surgery		
Once	11	31.4
Twice	8	22.9
More than twice	12	34.3
None	4	11.4
Peroperative		
Hypotension	14	40.0
Hypoxia	1	2.9
Hypothermia	0	0.0
Bleeding	5	14.3
Blood transfusion	5	14.3
Narcotic use	27	77.1
Anesthesia method		
General anesthesia	28	80.0
Regional anesthesia	7	20.0
METs score		
<4 MET	6	17.1
4-7 MET	26	74.3
8-10 MET	3	8.6

MET: Metabolic Equivalent of task; SD: Standard deviation; Repeated measures ANOVA and Bonferroni post-hoc test were used to compare cognitive test scores between time points. p<0.05 was considered statistically significant.

Table 2. Cognitive test scores of patients

	Mean±SD	Min-Max
Preoperative cognitive test scores	20.9±3.2	15-26
Postoperative cognitive test scores at 24 hour	18.0±2.6	16-25
Postoperative cognitive test scores at 30 day	22.7±2.7	16-28
p	<0.001	

SD: Standard Deviation; Repeated measures ANOVA with Bonferroni correction was used to compare preoperative and postoperative cognitive test scores. *p*<0.05 was considered statistically significant.

Table 3. Incidence of cognitive dysfunction at different time points

Cognitive test score <21	**n**	**%**
Preoperative cognitive dysfunction	15	42.9
Postoperative cognitive dysfunction at 24 hour	30	85.7
Postoperative cognitive dysfunction at 30 day	7	20.0
p	<0.001	

McNemar's test was used to compare the incidence of cognitive dysfunction between time points. p<0.05 was considered statistically significant.

test scores at either 24 hours or 30 days. The mean cognitive test scores at all three time points showed no statistically significant difference according to the MET score groups or the type of anesthesia administered (p>0.05) (Table 5).

Discussion

In the postoperative period, deterioration in one or more cognitive domains such as attention, concentration, executive function, short- and long-term memory, visuospatial ability, and psychomotor speed is defined as POCD.[9] The exact threshold of impairment and the specific areas affected remain a matter of debate. POCD may become apparent within days or weeks after surgery.[3,10,11] The Montreal Cognitive Assessment (MoCA) test was introduced in 2005 as a brief cognitive screening tool with high sensitivity and specificity.[12] It evaluates visuospatial and executive functions, language, attention, delayed recall, and abstraction abilities, and it is preferred for detecting mild cognitive impairment.[13] The MoCA total score comprises 30 points across six domains: memory, executive functioning, attention, language, visuospatial ability, and orientation.[14] Therefore, we preferred to use the MoCA test in our study. POCD is commonly reported after surgery in adult patients. In most studies, patients were evaluated within one week postoperatively and again after three months. The reported incidence in individuals aged 60 years and above ranges from 17% to 43%.[4,10,15] Previous studies have shown that POCD occurs in 10–54% of patients within the first few weeks after surgery, in 12–17% at three months, and in approximately 3% at twelve months.[16] Regardless of the type of anesthesia and duration of surgery, POCD was detected in 12% of the patients on day 3 and in 7.5% of the patients at one month after the surgery.[8] According to literature reports, the incidence of cognitive dysfunction one week after surgery in general anesthesia patients aged 40 to 65 is approximately 19%, while in elderly patients aged 65 to 81, it is higher, reaching around 25.8%.[11] In our study, patients were evaluated at 30 days postoperatively, and the incidence of POCD was 20%, consistent with the literature. Advanced age is a well-known and independent risk factor for POCD.[3,11,17,18] In the international ISPOCD 1 study, POCD was observed in 28% of patients during the first postoperative week and in 9.9% at three months among individuals aged 60 years or older who underwent non-cardiac surgery.[3,19] A meta-analysis summarizing outcomes associated with POCD, including 20 studies, reported a mean patient age of 66±5.37 years.[10] Based on these findings, patients aged 60 years and older were included in our study. POCD was observed at 24 hours postoperatively and showed improvement by postoperative day 30. In advanced age, hypertension is a well-known risk factor for cognitive impairment. Özlülerden et al.[6] examined patients above 65 years of age. Although the neurocognitive test scores on the first postoperative day were low in hypertensive patients, they did not find any difference in terms of POCD between normotensive and non-normotensive patients. In a meta-analysis on the risk of hypertension and POCD, the risk of POCD increased by 27%.[20] It has been found that cerebral vascular disease is the basis of the increased risk of cognitive disorder seen in patients with hypertension. Diabetes was reported to be a risk factor for developing POCD.[21-23] In a meta-analysis, Feinkohl I et al.[24] showed that patients with diabetes had a 1.26-fold higher risk of POCD than patients without diabetes. In another study, Lachmann et al.[21] reported that diabetes increased the risk of POCD by 1.84 times in a study including 1034 patients. Kotekar et al.[8] showed that there was no relationship between diabetes mellitus and ischemic heart disease and POCD in a study of 200 patients. In our study, 57.1% of patients had hypertension, 37.1% had diabetes mellitus, 22.9% had chronic kidney disease, and 28.6% had coronary artery disease. Although transient cognitive dysfunction was observed at 24 hours postoperatively in patients with comorbidities, this improved by day 30. Thus, the presence of comorbidities did not appear to be a major risk factor for POCD. Low educational level or illiteracy has also been associated with POCD.[3,16,17] Feinkohl et al.[25] analyzed 15 studies with 5104 patients above 18 years of age in their meta-analysis.

Table 4. Comparison of cognitive test scores according to demographic and clinical variables

		Preop cognitive test score		Postop cognitive test score at 24 hour		Postop cognitive test score at 30 day	
		Mean±SD	Median	Mean±SD	Median	Mean±SD	Median
Gender	Male	20.5±3.1	21	18.2±2.7	17	22.6±2.9	23
	Female	22.1±3.7	22	17.4±1.9	16	23.0±2.0	24
	p	0.215		0.538		0.691	
Education level	Primary school	20.0±3.2	21	18.7±3.0	18	22.0±2.5	22
	Secondary school	19.2±2.4	19	18.8±2.5	19	22.0±4.1	23
	High school	21.0±3.2	22	17.3±1.9	17	23.0±1.4	23
	University	23.8±2.3	24	16.7±1.4	16	24.2±2.0	25
	p	0.012		0.157		0.225	
Diabetes mellitus	Present	22.2±2.7	23	17.6±2.7	16	23.0±2.4	22
	Absent	20.2±3.4	21	18.3±2.5	18	22.5±2.9	24
	p	0.090		0.242		0.604	
Hypertension	Present	21.1±3.2	21	17.6±1.9	17	22.5±2.8	22
	Absent	20.7±3.3	21	18.6±3.2	17	22.9±2.6	23
	p	0.746		0.429		0.645	
Chronic renal disease	Present	21.5±3.2	22	17.4±2.5	16	23.9±3.1	25
	Absent	20.8±3.3	21	18.2±2.6	17	22.3±2.5	22
	p	0.588		0.291		0.159	
Coronary artery disease	Present	21.2±3.5	21	17.2±1.5	17	21.9±2.7	22
	Absent	20.8±3.2	21	18.4±2.8	17	23.0±2.7	24
	p	0.772		0.376		0.282	
History of cerebrovascular disease	Present	23.7±2.1	23	16.0±0.0	16	24.7±3.5	25
	Absent	20.7±3.2	21	18.2±2.6	17	22.5±2.6	23
	p	-		-		-	
Use of alcohol	Present	22.9±2.2	23	17.9±3.2	16	24.1±2.0	25
	Absent	20.4±3.3	20	18.1±2.4	17	22.3±2.8	22
	p	0.054		0.469		0.086	
Smoking	Present	19.6±2.7	20	18.7±3.0	18	20.9±1.6	21
	Absent	21.3±3.3	21	17.9±2.5	16	23.1±2.7	24
	p	0.216		0.258		0.043	
History of surgery	Once	20.7±3.1	21	18.6±2.8	19	22.4±2.6	21
	Twice	20.4±3.3	21	19.5±3.0	20	23.4±1.9	24
	More than twice	21.8±2.9	23	16.9±1.8	16	23.1±3.2	23
	None	20.3±5.1	20	16.8±1.0	17	21.0±2.8	20
	p	0.765		0.094		0.493	

SD: Standard Deviation. Independent samples t-test and one-way ANOVA were used where appropriate. $p<0.05$ was considered statistically significant.

They found that older patients and patients with higher levels of education had a lower risk of POCD compared to patients with lower levels of education. In another study, it was reported that patients with a higher education level than the high school level had a lower frequency of POCD compared to those with lower education levels.[8] According to

Table 5. Relationship between perioperative factors and cognitive test scores

		Preop cognitive test score Mean±SD	Postop cognitive test score at 24 hour Mean±SD	Postop cognitive test score at 30 day Mean±SD
Perop hypotension	Present	22.0±3.1	18.3±3.1	22.0±1.9
	Absent	20.2±3.2	17.9±2.2	21.8±2.8
	p	0.117	0.972	0.61
Perop bleeding	Present	20.8±2.6	18.8±3.7	22.2±2.3
	Absent	21.0±3.4	17.9±2.4	22.8±2.8
	p	0.917	0.691	0.670
Perop blood transfusion	Present	22.0±3.4	17.0±1.4	22.6±2.6
	Absent	20.8±3.2	18.2±2.7	22.7±2.8
	p	0.440	0.358	0.481
Perop narcotic use	Present	20.8±3.2	18.1±2.7	22.7±2.6
	Absent	21.4±3.7	17.8±2.1	22.8±3.3
	p	0.675	0.852	0.940

SD: Standard deviation; Independent samples t-test was used to compare cognitive test scores between groups. $p<0.05$ was considered statistically significant.

the education level in our study, 45.7% of the patients in our study were primary school graduates, 17.1% were secondary school graduates, 11.4% were high school graduates, and 25.7% were university graduates. The cognitive dysfunction rate we found in the preoperative period was 42%. In our study, preoperative cognitive dysfunction was more common among patients with lower education levels; however, education level was not a significant postoperative risk factor. We believe this may be related to lower cooperation during testing. Further studies are needed to identify factors that may mitigate POCD risk in this population. Alcohol abuse and mood disorders have been reported as risk factors for POCD.[11,16] Hudetz et al.[26] showed that patients with a history of alcohol dependence had more cognitive impairment after surgery. A prospective study involving 382 patients aged over 60 years demonstrated that preoperative smoking history was associated with a decreased risk of early POCD.[27] In our study, 22.9% of patients reported alcohol use and 20% were smokers. POCD was more common at postoperative day 30 among smokers. Clinicians and patients often consider regional anesthesia to be safer and less likely to cause cognitive impairment than general anesthesia. In elderly patients, general anesthesia has been associated with a relatively higher incidence of postoperative cognitive dysfunction (POCD) compared with spinal anesthesia.[28] Xie et al.[29], in a study involving 168 patients undergoing hip fracture surgery, reported that regional anesthesia reduced the incidence of delayed neurocognitive recovery compared with general anesthesia. In another study evaluating cognitive performance following general versus regional anesthesia in 200 patients undergoing non-cardiac surgery, no significant difference was observed in the incidence of POCD between the two techniques.[8] Similarly, other studies have found no statistically significant difference in POCD incidence after general or regional anesthesia.[29-31] In our study, we did not reach a significant conclusion regarding the relationship between anesthesia type (general or regional) and POCD. Since the earliest studies investigating POCD, factors contributing to cerebral hypoperfusion have been emphasized.[9,32] Hypotension is among the most common and straightforward causes of cerebral hypoperfusion. Feng et al.[33], in a meta-analysis of randomized controlled trials, reported no significant association between intraoperative hypotension and the incidence of POCD. Zhu et al.[34], in a study involving 313 patients who underwent total hip replacement, found that perioperative blood transfusion was associated with a higher rate of POCD and a longer-lasting adverse effect on neurological outcomes. Although multiple studies have examined these associations, there remains no clear consensus.[34] In our study, we also found no significant relationship between perioperative complications, intraoperative narcotic use, and the development of POCD.

Limitations

This study has several limitations. First, it was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. Second, although the study was prospectively designed, unmeasured confounding factors—such as intraoperative depth of anesthesia, perioperative inflammation, or postoperative pain control—may have influenced cognitive outcomes. Third, the follow-up period was limited to 30 days, preventing assessment of long-term cognitive recovery or persistent dysfunction. Finally, cognitive evaluation was performed using only the MoCA test; incorporating additional neuropsychological assessments could have provided a more comprehensive evaluation of postoperative cognitive function. Future multicenter studies with larger sample sizes and extended follow-up periods are warranted to confirm and expand upon these findings.

Conclusion

In this study, we found that smoking and a low level of education were associated with an increased risk of developing postoperative cognitive dysfunction in patients aged 60 years and older undergoing elective non-cardiac surgery. We believe that a more comprehensive, multicenter evaluation of the adverse effects of smoking on cognitive function should be conducted to better clarify its clinical impact and underlying mechanisms.

Disclosures

Ethics Committee Approval: This study was approved by the Clinical Research Ethics Committee University of Health Sciences, Şişli Hamidiye Etfal Training and Research Hospital (Date: 08.08.2017, Decision no: 1649).

Informed Consent: Written informed consent was obtained.

Conflict of Interest: None declared.

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1 MET	Eating, dressing Using the toilet Indoor walking 3,2-4,8 km/hour 200- 400m walking	4 MET	Climbing stairs, uphill slope Walk on the straight road at a speed of 4.6 km/h Short run Heavy housework, sweeping carpet, moving furniture Light sports, single-play basketball, a couples tennis match, dance, golf

4 MET Light work, removing dust/dishwashing

>10 METS = Excellent,

7-10 METS = Moderate

4-7 METS = Bad

Appendix 1. Metabolic Equivalent of Task (MET)