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Original Research Article

COMPARATIVE EVALUATION OF POSTOPERATIVE COGNITIVE RECOVERY AND RESPIRATORY EVENTS AFTER DESFLURANE VS SEVOFLURANE IN ELDERLY PATIENTS: A DOUBLE-BLIND RANDOMIZED TRIAL

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ABSTRACT

Background: Elderly patients undergoing surgery are at high risk of postoperative cognitive dysfunction and respiratory complications. The choice of anesthetic agent may influence recovery outcomes. The objective is to comparatively evaluate postoperative cognitive recovery and respiratory events after desflurane vs sevoflurane in elderly patients.

Materials and Methods: The present study included 100 elderly patients undergoing elective surgery. Patients were randomized to receive either desflurane or sevoflurane anaesthesia. Cognitive function was assessed using the Mental State Examination (MSE) at 1, 5, and 24 hours postoperatively. Respiratory events, such as laryngospasm, bronchospasm, and desaturation, were also evaluated.

Results: The study found no significant difference in MSE scores between the desflurane and sevoflurane groups at 1, 5, and 24 hours postoperatively. Additionally, there was no significant difference in the incidence of postoperative respiratory complications between the two groups.

Conclusion: Desflurane and sevoflurane anaesthesia resulted in similar postoperative cognitive recovery and respiratory outcomes in elderly patients. Both agents appear to be suitable choices for elderly patients undergoing surgery.

Keywords: Desflurane; Sevoflurane; Postoperative cognitive dysfunction; Anaesthesia; Mental State Examination (MSE).

INTRODUCTION

Despite advances in anaesthesia and surgery, elderly patients continue to experience higher rates of postoperative morbidity and mortality. Among these, postoperative neurocognitive disturbances, including delirium and cognitive dysfunction, are among the most frequent and impactful.[1,2] Postoperative cognitive impairment is characterized by deficits in memory, concentration, and orientation, with a reported incidence of up to 44–61% in elderly patients undergoing orthopedic procedures.[3,4] These complications delay functional recovery, prolong hospital stay, and increase healthcare burden. The etiology of postoperative cognitive dysfunction (POCD) is multifactorial, with implicated factors including advanced age, pre-existing low cognitive reserve, perioperative hypoxia, hypotension, alcohol use, and anaesthetic choice.[4]

The selection of anaesthetic agents is therefore a crucial determinant of recovery in geriatric patients. Volatile anaesthetics such as sevoflurane and desflurane, both characterized by low blood–gas partition coefficients (0.69 and 0.42, respectively), allow for rapid emergence compared with traditional inhalational agents.[5] This property is particularly desirable in the elderly, where rapid recovery of consciousness, airway reflexes, and cognitive

function can reduce complications and facilitate earlier mobilization or discharge.[6]

Validated psychometric instruments such as the Mini-Mental State Examination (MMSE), Confusion Assessment Method (CAM), and Confusion Assessment Method–Severity (CAM-S) have been used to evaluate postoperative cognitive recovery.[6,7] Yet, many of these tools are time-intensive and may not be practical in the immediate perioperative period. The Mental State Examination (MSE) provides a simple and feasible means of assessing recovery of consciousness, orientation, memory, and perception in elderly patients.

Given the ongoing debate regarding the comparative effects of desflurane and sevoflurane on postoperative cognitive recovery, particularly in the elderly, this prospective, double-blind, randomized trial was undertaken. Present study was conducted to comparatively evaluate postoperative cognitive recovery and respiratory events after desflurane vs sevoflurane in elderly patients.

MATERIALS AND METHODS

The present was a prospective, double-blinded, randomized controlled trial conducted in the Department of Anaesthesiology, Pain, Palliative and Critical Care, Institute of Medical Sciences and SUM Hospital, Bhubaneswar. The study period spanned 18 months, from December 2022 to June 2024. Patients aged >65 years, of either sex, belonging to ASA grade I or II, with BMI <35 kg/m², and posted for elective surgeries of 2–3 hours duration under general anaesthesia were eligible.

Exclusion Criteria

ASA grade III/IV, refusal to participate, neurological or psychiatric illness, history of substance abuse, surgery exceeding 3 hours, and inability to understand English/Hindi/Odia or lack of elementary education. 100 patients were randomized into two groups (n=50 each) using a computer-generated random number table. Allocation concealment was maintained with opaque sealed envelopes. Both participants and investigators were blinded, while the attending anaesthesiologist (not part of the study) conducted anaesthesia management.

- Group S (n=50): Received Sevoflurane
- Group D (n=50): Received Desflurane

Ethical clearance was obtained from the Institutional Ethics Committee, IMS & SUM Hospital, Bhubaneswar (Ref. No. IEC/IMS.SH/SOA/2022/470). Written informed consent was obtained from all participants. Confidentiality was ensured, and participants were free to withdraw at any stage without affecting their clinical care.

All patients underwent a thorough pre-anaesthetic evaluation. No sedative premedication was given. Patients were kept nil per oral after 10 p.m. the day before surgery. Standard monitors (NIBP, ECG, SpO_2) were attached, baseline vitals were recorded, and an 18G IV cannula was secured with Ringer's lactate infusion.

Baseline cognitive assessment was performed using the Mental Scoring Examination (MSE), a 15-point screening test assessing appearance, orientation, registration, attention, recall, naming, repetition, and command-following. Scores were categorized as normal (>12), mild (10–12), moderate (8–10), or severe (<8). Anaesthesia was induced with Fentanyl 2 µg/kg and Propofol titrated dose, followed by intubation with Cis-atracurium 0.2 mg/kg. Anaesthesia was maintained with either Sevoflurane 2% or Desflurane 6% in oxygen-air mixture (1:1) using low-flow closed circuit. Depth of anaesthesia was titrated with BIS monitoring (target 50–60). Muscle relaxation was maintained with intermittent Cis-atracurium, and analgesia with bolus Fentanyl. Ventilation was adjusted to maintain $EtCO_2$ 35–40 mmHg. Haemodynamics were maintained within 20% of baseline.

At skin closure, inhalational agents were discontinued, and extubation was performed after spontaneous efforts resumed. Emergence characteristics were recorded, including time to eye opening, response to verbal commands, and extubation time. Postoperative monitoring included HR, NIBP, SpO_2 at regular intervals. MSE scores were reassessed at 1, 5, and 24 hours postoperatively. Analgesia was provided with IV Tramadol and Paracetamol; PONV prophylaxis with Ondansetron.

Data were entered into Microsoft Excel and analyzed using IBM SPSS version 26. Continuous variables were expressed as mean ± SD or median (IQR), and categorical variables as frequency (%). Intergroup comparisons were performed using Independent t-test, Wilcoxon test, or Chi-square test, as appropriate. A P value <0.05 was considered statistically significant.

RESULTS

Total 100 patients were admitted for different surgical procedures. From which 5 patients were operated open meshplasty, 4 patients were MRM, 5 patients lipoma excision, 4 patients laparoscopic hydatid cyst excision, 62 patients lap cholecystectomy, 5 patients lap appendicectomy, 5 patients IPOM and 10 patients were operated excision and biopsy [Figure 1].

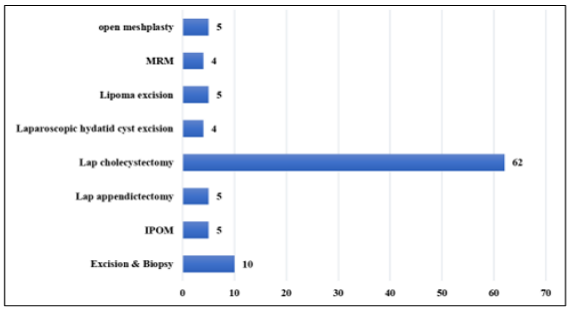

Figure 1: Surgical procedures

Postoperative complications like laryngospasm, bronchospasm and desaturation between the two groups were compared, which was shown only 2 patients in group D had laryngospasm and there was no incidence of bronchospasm or desaturation in between the two groups. After applying chi-square test p >0.05 (p= 0.247). Hence, no significant difference in postoperative complications found in between two groups [Table 1].

Comparison of MSE score preoperatively shown 14.96±0.70 in group S and 14.41±0.70 in group D where P value was 0.83 which was statistically insignificant. Similarly, at 1hour, 5 hours and 24 hours after surgery, the MSE score was11.68±0.79,12.77±0.52 and 13.52±0.95 in group S and11.44±0.64,12.54±0.39and 13.28±0.33in group D. P value was >0.05 which was statistically insignificant. Hence, we observed that recovery of cognitive function during the study period was also comparable between two groups [Table 2].

Table 1: Postoperative complications in between two groups of patients

Complications	Group S	Group D	P Value
Laryngospasm	0	2	0.247
Bronchospasm	0	0	-
Desaturation	0	0	-

Table 2: Comparison of MSE score during the study period in both group patients.

MSE Score	Group S	Group D	P Value
Preoperative	14.96±0.70	14.41±0.70	0.83
after 1 hour of surgery	11.68±0.79	11.44±0.64	0.18
after 5 hours of surgery	12.77±0.52	12.54±0.39	0.51
after 24 hours of surgery	13.52±0.95	13.28±0.33	0.91

DISCUSSION

In this study, cognitive function was assessed using the Mental State Examination (MSE) score, which evaluates appearance, behavior, speech, mood, thoughts, perception, and judgment. The MSE was chosen over the Mini-Mental State Examination (MMSE) as it is simpler, reliable, and more feasible for elderly surgical patients who may not cooperate with lengthy questionnaires.[8] Postoperatively, MSE scores at 1 hour, 5 hours, and 24 hours were comparable between the Sevoflurane and Desflurane groups, with no statistically significant differences (p > 0.05), indicating similar recovery of cognitive function in both groups.

Our findings are consistent with those of Chen et al., who demonstrated faster emergence from anaesthesia with Desflurane (6.3 ± 2.4 min) compared to Sevoflurane (8.0 ± 2.8 min) and shorter PACU stay (213 ± 66 min vs. 241 ± 87 min), but no significant differences in postoperative MMSE scores at 1, 3, 6, and 24 hours.[9] Similarly, Werner JG et al. reported more rapid emergence with Desflurane, but cognitive recovery remained comparable between agents.[10]

Jadhav PK, in a study on 50 patients aged >65 years, found that MMSE scores were <27 in all patients at 1 hour. By 3 hours, cognitive recovery was better with Sevoflurane, though both groups recovered by 6 hours, with only one case of POCD in the Sevoflurane group. The authors concluded that Desflurane favored faster recovery, while Sevoflurane showed slightly better preservation of cognitive function.[11] Meineke et al. also demonstrated a transient MMSE decline post-anaesthesia, greater with Sevoflurane (-2.5; -3.3 to -1.8) than Desflurane (-1.3; -2.2 to -0.5; p = 0.03), though both groups returned to baseline by 6 hours, indicating clinically insignificant differences.[12] In our study, anaesthesia depth was monitored with BIS, and results similarly showed comparable cognitive recovery between both agents.

Other supporting evidence comes from Kuzminskaite V et al., who reported no significant difference in POCD incidence (1.22%) or cognitive outcomes between Desflurane and Sevoflurane in elderly patients undergoing minor thyroid surgery.[13] Likewise, Saha M. et al. found earlier recovery with Desflurane in laparoscopic cholecystectomy patients in terms of verbal response, airway reflexes, and cognitive recovery, consistent with our observations.[14]

Regarding safety outcomes, Zucco L. et al. noted no significant difference in postoperative respiratory complications between Desflurane and Sevoflurane (OR 0.99; 95% CI 0.94–1.04; p = 0.598), which aligns with the lack of major postoperative complications in our study.[15]

Overall, our findings suggest that while Desflurane may provide slightly faster emergence, both Desflurane and Sevoflurane offer comparable postoperative cognitive recovery profiles, supporting their safe and effective use in elderly surgical patients.

CONCLUSION

In the present study, postoperative complications such as laryngospasm, bronchospasm, and desaturation showed no significant difference between the Sevoflurane (Group S) and Desflurane (Group D) groups (p=0.247). Cognitive function assessed using the Mental State Examination (MSE) score demonstrated comparable recovery patterns in both groups at 1, 5, and 24 hours postoperatively,

with no statistically significant differences ($p>0.05$). These findings indicate that both agents are safe and effective in elderly patients, with a similar impact on postoperative cognitive recovery. Although earlier studies have reported marginally faster emergence with Desflurane, our results, consistent with multiple published trials, suggest that the recovery of cognitive function remains comparable between the two agents. Thus, Sevoflurane and Desflurane may be considered equally suitable for maintenance of anaesthesia in elderly surgical patients without significant differences in postoperative cognitive outcomes.

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