SSR Institute of International Journal of Life Sciences
ISSN (O): 2581-8740 | ISSN (P): 2581-8732
Thejasvi *et al*., 2025
crossref doi: 10.21276/SSR-IIJLS.2025.11.2.36

Original Article

open access

Comparison of Dexmedetomidine and Propofol on Explicit Memory During General Anaesthesia

Thejasvi BR[1], Arpitha R[2], Preethi C[3], Dayananda VP[4]*

[1]IDCCM Fellow, Department of Anaesthesia, Bhagwan Mahaveer Jain Hospital, Vasanthnagar Bangalore, India
[2]Assistant Professor, Department of Anaesthesia, Kempegowda Institute of Medical Sciences, Bangalore, India
[3]Fellow in Trauma Anaesthesia and Critical Care, Department of Anaesthesia, Govt. Medical College, Srinagar, India
[4]Professor, Department of Anaesthesia, Bangalore Medical College and Research Institute, Karnataka, India

***Address for Correspondence:** Dr. Dayananda VP, Professor, Department of Anaesthesia, Bangalore Medical College and Research Institute, Karnataka, India
E-mail: tejasvi2694@gmail.com

Received: 09 Nov 2024/ Revised: 27 Dec 2024/ Accepted: 12 Jan 2025

ABSTRACT

Background: Awareness under general anesthesia, characterized by the explicit recall of intraoperative events, affects approximately 1–2 per 1,000 patients. Propofol, a commonly used intravenous anesthetic, is favored for its rapid onset and titratability, effectively reducing intraoperative awareness. Dexmedetomidine, a highly selective alpha-2 adrenergic agonist with sedative, anxiolytic, and opioid-sparing properties, offers minimal respiratory depression and is emerging as a potential anesthetic adjuvant. However, its role in suppressing explicit memory remains underexplored.

Methods: This prospective, randomized, double-blinded study included 60 patients (ASA I–II), undergoing surgeries of less than two hours under general anesthesia at hospitals affiliated with Bangalore Medical College and Research Institute between February 2021 and August 2022. Patients were randomly divided into two groups:

Group A (Propofol): Bolus 1 mg/kg over 10 minutes, followed by infusion at 50 mcg/kg/min.

Group B (Dexmedetomidine): Bolus 1 mcg/kg over 10 minutes, followed by infusion at 0.5 mcg/kg/hr.

General anesthesia techniques were standardized across both groups. Randomization was performed using computer-generated codes, sealed in opaque envelopes. Drug administration and outcome recording were done by separate anesthetists to maintain blinding.

Results: Both agents significantly reduced intraoperative awareness; however, dexmedetomidine demonstrated superior efficacy in suppressing explicit memory compared to propofol.

Conclusion: Dexmedetomidine infusion at 0.5 mcg/kg/hr is more effective than propofol at 50 mcg/kg/min in reducing explicit intraoperative memory, supporting its potential as a valuable anesthetic adjunct.

Key-words: Dexmedetomidine, Explicit Memory, General Anaesthesia, Propofol

INTRODUCTION

In clinical anesthesiology, the term "awareness" refers to both explicit episodic memory and consciousness. When a patient consciously recalls events that occurred during the administration of an anesthetic, this is referred to as awareness, which is a synonym for conscious perception [1]. Under anesthesia, awareness is required but insufficient for the formation of memory. Only when awareness is accompanied by memory processes in the medial temporal lobe and other locations that create and maintain a representation that may be later rebuilt does conscious recall take place [2]. The presence of an anesthetic medicine does not guarantee that memory will coexist with awareness. Patients who receive a small dose of propofol or midazolam and have a coherent conversation that they later cannot recall, or patients who emerge from general anesthesia and obey orders to show that extubation can proceed safely but later are

How to cite this article
Thejasvi BR, Arpitha R, Preethi C, Dayananda VP. Comparison of Dexmedetomidine and Propofol on Explicit Memory During General Anaesthesia. SSR Inst Int J Life Sci., 2025; 11(2): 7235-7239.

Access this article online
https://iijls.com/

doi: 10.21276/SSR-IIJLS.2025.11.2.36

unable to recall anything related to this conscious event, are clear examples of the evidence that supports this statement in everyday anesthetic practice [3]. Thus, anesthetic drugs likely affect memory independently of awareness, forming a basis for studying their specific impact on memory functions [4].

The bispectral index (BIS) is the monitor that has been used in clinical practice the most out of all those that are available to evaluate consciousness of anesthesia. A dimensionless number between 0 and 100 is shown on the monitor; lower values indicate deeper anesthesia [5]. Many patients could also be reluctant to share their experiences unless specifically requested. Therefore, the best way to evaluate intraoperative consciousness is to use a modified BRICE questionnaire to conduct formal postoperative interviews with patients [6]. Because propofol, a bisubstituted phenol, has a rapid onset and offset, it is used as an intravenous general anesthetic for titrable sedation and hypnosis. The incidence of consciousness has been demonstrated to be decreased by a continuous infusion of the typical rate of propofol [7].

The sedative analgesic dexmedetomidine, a highly selective alpha-2 agonist, is authorized for usage. It is a virtually ideal adjuvant for anesthesia because of its sedative, anxiolytic, sympatholytic, opioid, and general anesthetic-sparing qualities with little respiratory depression [8]. But since there isn't much, if any, published on it as an anesthetic, more research is necessary [9]. The study's primary goal was to compare the effects of intraoperative anesthesia with dexmedetomidine and propofol on explicit memory [10].

MATERIALS AND METHODS

Place of study- This prospective, randomized, double-blind controlled trial was conducted on 60 patients undergoing elective surgeries at hospitals affiliated with Bangalore Medical College and Research Institute, Bangalore from February 2021 to August 2022. The patients were randomly divided into two groups, with 30 patients in each group.

Inclusion Criteria

- Patient willing to give informed consent
- ASA grade I and II
- Patients scheduled for elective surgery under general anaesthesia
- Patients age between 18-60 years.

Exclusion Criteria

- Patient not willing to give informed consent
- Patients known to have allergy or hypersensitivity to dexmedetomidine and propofol.
- Sugeries exceeding 2 hours
- Patients with heart rate less than 50/min.

Methodology- After obtaining approval and clearance from the institutional ethics committee, 60 patients who met the inclusion criteria and provided informed consent were included in this prospective, randomized, double-blind controlled trial. The study was conducted over 18 months at hospitals affiliated with Bangalore Medical College and Research Institute. The patients were randomly assigned into two groups, A and B, using random numbers generated by www.randomization.com. Allocation concealment was achieved through the sealed envelope method, with 30 patients in each group. Group A was the study group, while Group B was the control group.

Group A received a bolus dose of IV Propofol (1 mg/kg for 10 minutes) followed by an infusion at 50 mcg/kg/min. Group B received a bolus dose of IV Dexmedetomidine (1 mcg/kg) followed by an infusion at 0.5 mcg/kg/hr. On the day of surgery, all patients were shifted to the preoperative area 2 hours before the scheduled surgery time. Standard monitors, including pulse oximetry, non-invasive blood pressure, and electrocardiogram (ECG), were attached, and baseline hemodynamic parameters were recorded in the preoperative room. IV Ringer's lactate solution (10 ml/kg) was administered as the maintenance fluid through the peripheral venous cannula.

In the operating room, general anesthesia techniques were standardized for both groups. Routine bedside monitors and $ETCO_2$ were attached, and continuous monitoring was performed. Hemodynamic parameters such as heart rate (HR), mean arterial pressure (MAP), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were recorded every 3 minutes until anesthesia induction, and then at 5-minute intervals for 30 minutes, followed by 15-minute intervals until the end of surgery.

doi: 10.21276/SSR-IIJLS.2025.11.2.36

Statistical Analysis- Data were analyzed using SPSS version 22.0. Demographic variables were compared using the Chi-square test for categorical data and independent t-tests for continuous data. Repeated measures ANOVA was used to compare hemodynamic parameters within and between the two groups, with pairwise comparisons adjusted using the Bonferroni correction. A p-value of<0.05 was considered statistically significant.

RESULTS

Sex distribution between the two groups was statistically comparable, with no significant difference observed (p=1), as shown in Table 1. Both Group A and Group B had an equal distribution of male and female patients.

Table 1: Sex Distribution Between Two Groups

Sex	Group A	Group B	Total	p value
Female	14 (46.67%)	14(46.67%)	28(46.67%)	1
Male	16 (53.33%)	16(53.33%)	32(53.33%)	
Total	30 (100%)	30(100%)	60(100%)	

Patients in both groups were aged between 36 and 58 years. The age distribution was statistically comparable, with no significant difference observed between the groups (p = 0.553), as shown in Table 2.

Table 2: Age Distribution Between Two Groups

Age group	Group A	Group B	Total	p-value
36 to 40	3 (10%)	7(23.33%)	10(16.67%)	0.553
41 to 45	7 (23.33%)	5(16.67%)	12(20%)	
46 to 50	9 (30%)	9(30%)	18(30%)	
51 to 55	5 (16.67%)	6(20%)	11(18.33%)	
56 to 58	6 (20%)	3(10%)	9(15%)	
Total	30 (100%)	30(100%)	60(100%)	

The mean(sd) Age(yrs.) across Group A and Group B groups were 47.97(±5.98) and 46.63(±6.28) respectively and the difference between the means was not statistically significant with a p-value of 0.403 (Independent T-test) (Table 3).

Table 3: Age, Weight, and Duration of Surgery Between Two Groups

Groups	Group A(n=30)	Group B (n=30)	p-value
Age (yrs)	47.97(±5.98)	46.63(±6.28)	0.403
Weight (Kg)	56.03(±6.79)	53.07(±7.75)	0.120
Duration Of Surgery (Min)	102.33(±9.54)	91(±16.21)	<0.01

Heart rate reduced from the baseline in both the groups after bolus dose which was statistically significant and was variable post-induction, which was stabilised after 60 min of induction and postoperatively reduced compared to the baseline values which was statistically significant with p-value <0.01 (Table 4).

There was a reduction in systolic blood pressure in both groups following the bolus dose, with variations observed intraoperatively. It was stabilized postoperatively, and the change was statistically significant (Table 5).

doi: 10.21276/SSR-IIJLS.2025.11.2.36

Table 4: Post Operative Comparision of Herat Rate Between Two Groups at Different Time Intervals

Time Interval	Group A (Mean±SD)	Group B (Mean±SD)	p-value
HR_PO_immediate	78.33(±5.09)	68.87(±4.38)	<0.01
HR_PO_4hrs	75.93(±4.45)	64.33(±4.96)	<0.01
HR_PO_8hrs	73.6(±3.98)	67.5(±7.08)	<0.01
HR_PO_12hrs	71.8(±3.8)	84.53(±3.12)	<0.01

Table 5: Comparision of post operative systolic blood pressure

Time Interval	Group A (Mean±SD)	Group B (Mean±SD)	p-value
SBP_PO_immediate	125.67(±4.9)	120.53(±5.75)	<0.01
SBP_PO_4hrs	122.63(±4.69)	120.07(±3.22)	0.016
SBP_PO_8hrs	120.27(±3.47)	122(±2.83)	0.038
SBP_PO_12hrs	118.87(±3.09)	120.93(±3.14)	0.013

There was a significant reduction in mean arterial pressure in both groups following the bolus dose, which varied intraoperatively and stabilized postoperatively (Table 6).

Table 6: Comparision of Post Operative Mean Arterial Pressure

Time Interval	Group A (Mean±SD)	Group B (Mean±SD)	p-value
MAP_PO_immediate	93.73(±3.17)	90.33(±3.9)	<0.01
MAP_PO_4hrs	91.7(±3.04)	90.07(±2.05)	0.018
MAP_PO_8hrs	90.27(±2.2)	91.37(±1.85)	0.040
MAP_PO_12hrs	89.27(±2.08)	90.63(±2.11)	0.014

DISCUSSION

It is believed that awareness is an unfavorable consequence or side effect of anesthesia, often marking a distressing and incapacitating event in the patient's life. In clinical anesthesiology, the term describes individuals who can recall or retain memory of surgical procedures [11]. Explicit memory, in contrast, is defined as the conscious recollection of information. To assess the depth of anesthesia and reduce the risk of awareness, devices such as those produced by Aspect Medical Systems compute and display the BIS, which is derived from EEG signals. BIS integrates both power and phase information from EEG and was empirically validated to differentiate sedation levels in patients administered opioids and hypnotics [12].

The U.S. FDA authorized the first BIS monitor and electrode sensor in the mid-1990s, with approval for the awareness indication granted in 2003. Current VISTA BIS monitors use algorithm versions 4.0 or 4.1, outputting a dimensionless index ranging from 0 to 100. A BIS value between 40 and 60 is considered indicative of a low probability of awareness during general anesthesia [13].

Accidental awareness during general anesthesia (AAGA), also referred to as anesthesia-induced consciousness or intraoperative awareness, is a rare but significant complication wherein patients experience varying levels of consciousness during surgery. Though most such events are painless, patients may report dream-like states or vague auditory memories. However, in certain cases, this experience can lead to serious psychological sequelae such as depression or post-traumatic stress disorder [14].

Medications commonly used in anesthesia show varied influence on BIS. While propofol and midazolam tend to reduce BIS values consistently, ketamine does not alter BIS despite its excitatory EEG effects. Nitrous oxide, up to 70% concentration, has minimal BIS effect, whereas etomidate may paradoxically raise BIS scores due to increased muscle activity during induction [15]. Since its clinical introduction in 1985, propofol (2,6-diisopropylphenol) has gained popularity due to its favorable profile, including limited side effects, rapid induction and recovery, and reliable sedative-hypnotic action [15]. In contrast, dexmedetomidine, a highly

crossref doi: 10.21276/SSR-IIJLS.2025.11.2.36

selective alpha-2 adrenergic agonist with a selectivity ratio of 1600:1 for alpha-2 versus alpha-1 receptors (and 220:1 versus clonidine), provides sedation, anxiolysis, sympatholysis, and analgesia with minimal respiratory depression, making it a valuable adjuvant in anesthesia [16].

CONCLUSIONS

The patients in both groups were comparable in terms of age, gender, weight, and duration of the operation. The safety profiles of the two medications were found to be almost identical, indicating that both can be used safely in patients undergoing general anesthesia. When compared to propofol, the intraoperative infusion of dexmedetomidine at a dose of 0.5 mcg/kg/hr significantly reduced intraoperative awareness, maintained an adequate depth of anesthesia, improved hemodynamic stability, and facilitated a smooth awakening. Therefore, dexmedetomidine can be considered a viable and effective adjunct to general anesthesia, with the potential to enhance the anesthetic experience for patients.

CONTRIBUTION OF AUTHORS

Research concept- Thejasvi BR, Arpitha R
Research design- Arpitha R, Preethi C
Supervision- Dayananda VP
Materials- Thejasvi BR, Arpitha R
Data collection- Arpitha R, Preethi C
Data analysis and Interpretation- Dayananda VP
Literature search- Arpitha R, Preethi C
Writing article- Thejasvi BR, Arpitha R
Critical review- Dayananda VP
Article editing- Thejasvi BR, Arpitha R
Final approval- Dayananda VP

REFERENCES

[1] Mashour GA. Consciousness and the anesthesiologist: The modern history of anesthetic awareness. Anesthesiol., 2011; 114(5): 1218–31.
[2] Sanders RD, Tononi G, Laureys S, Sleigh JW. Unresponsiveness≠unconsciousness. Anesthesiol., 2012; 116(4): 946–59.
[3] Ghoneim MM. Awareness during anesthesia. Anesthesiol., 2000; 92(2): 597–602.
[4] Lepouse C, Lautner CA, Liu L, Gomis P, Leon A. Emergence delirium in adults in the post-anaesthesia care unit. Br J Anaesth., 2006; 96(6): 747–53.
[5] Rampil IJ. A primer for EEG signal processing in anesthesia. Anesthesiol., 1998; 89(4): 980–1002.
[6] Avidan MS, Jacobsohn E, Glick D, et al. Prevention of intraoperative awareness in a high-risk surgical population. N Engl J Med., 2011; 365(7): 591–600.
[7] Leslie K, Short TG. Low-dose propofol reduces the incidence of awareness during general anesthesia. Anesth Analg., 1997; 85(4): 724–30.
[8] Venn RM, Grounds RM. Comparison between dexmedetomidine and propofol for sedation in the intensive care unit: Patient and clinician perceptions. Br J Anaesth., 2001; 87(5): 684–690.
[9] Belleville JP, Ward DS, Bloor BC, Maze M. Effects of intravenous dexmedetomidine in humans. Anesthesiol., 1992; 77(6): 1125–33.
[10] Hashiguchi Y, Hasegawa-Moriyama M, Ogawa T, Kurihara K, Kanmura Y. Effects of dexmedetomidine on explicit memory during general anesthesia. J Anesth., 2015; 29(1): 33–39.
[11] Sebel PS, Bowdle TA, Ghoneim MM, et al. The incidence of awareness during anesthesia: A multicenter United States study. Anesth Analg., 2004; 99(3): 833–39.
[12] Rampil IJ. A primer for EEG signal processing in anesthesia. Anesthesiol., 1998; 89(4): 980–1002.
[13] Johansen JW. Update on bispectral index monitoring. Best Pract Res Clin Anaesthesiol., 2006; 20(1): 81–99.
[14] Pandit JJ, Cook TM, Jonker WR, O'Sullivan E. A national survey of anaesthetists (NAP5 baseline) to estimate an annual incidence of accidental awareness during general anaesthesia in the UK. Anaesth., 2013; 68(4): 343–53.
[15] Dutta S, Karol MD, Cohen T. Effect of etomidate on BIS and comparison with propofol. J Clin Anesth., 2001; 13(4): 236–41.
[16] Kamibayashi T, Maze M. Clinical uses of alpha2-adrenergic agonists. Anesthesiol., 2000; 93(5): 1345–49.