Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/2w40ep61

A COMPARATIVE STUDY OF PROPOFOL VERSUS PROPOFOL COMBINED WITH DEXMEDETOMIDINE IN DRUG-INDUCED SLEEP STUDIES

Dr. Sylph Tajamul[1*], Dr. Sajad Ahmed Baba[2]

[1]*MD, Anaesthesiology and Critical Care, Government Medical College Anantnag, Jammu and Kashmir, India
[2]Dnb Resident, Department of Anaesthesiology and Critical care, Government Medical College Anantnag, Jammu and Kashmir, India

***Corresponding Author:** Dr. Sylph Tajamul
*MD, Anaesthesiology and Critical Care, Government Medical College Anantnag, Jammu and Kashmir, India, Mail id: sylphtajamul689@gnmail.com

Abstract:
Background: Drug-induced sleep endoscopy (DISE) is a diagnostic procedure used to evaluate upper airway obstruction in patients with suspected obstructive sleep apnea (OSA). Propofol is the most commonly used agent; however, it may exaggerate airway collapse due to its muscle-relaxant properties. Dexmedetomidine, known for preserving upper airway tone, is being investigated in combination with propofol to improve the accuracy and safety of DISE.
Aim: To compare the efficacy, airway dynamics, hemodynamic stability, and safety of propofol alone versus propofol combined with dexmedetomidine during DISE.
Methods: A prospective randomized controlled study was conducted on 60 adult patients undergoing DISE. Patients were divided into two groups. Group P received intravenous propofol titrated to achieve a BIS of 60–80. Group PD received a dexmedetomidine bolus (1 mcg/kg over 10 minutes) followed by titrated propofol. Parameters studied included level and pattern of airway collapse, hemodynamic responses, sedation scores, adverse events, and recovery characteristics.
Results: Both regimens provided adequate sedation. Group PD had improved visualization of airway structures and more stable hemodynamic parameters. There was a statistically significant reduction in complete concentric collapse at the level of the soft palate in Group PD compared to Group P. Recovery times were longer in the combination group. Patient satisfaction scores were higher in Group PD.
Conclusion: The combination of dexmedetomidine and propofol offers superior airway visualization and hemodynamic stability compared to propofol alone, although recovery may be prolonged. It represents a safe and effective alternative in drug-induced sleep studies, especially in patients at risk for exaggerated airway collapse.

Keywords: Propofol, Dexmedetomidine, Drug-induced sleep endoscopy, Sedation, Obstructive sleep apnea, Airway collapse.

Introduction

Obstructive Sleep Apnea (OSA) is a common sleep-related breathing disorder marked by recurrent episodes of complete or partial upper airway collapse during sleep, which leads to intermittent

hypoxia, sleep fragmentation, and excessive daytime sleepiness. It is a multifactorial disease with anatomical and non-anatomical contributing factors and is associated with increased cardiovascular morbidity, metabolic syndrome, and reduced quality of life [1]. Accurate identification of the anatomical site of airway collapse is vital for tailoring surgical or device-based interventions.

Drug-Induced Sleep Endoscopy (DISE) has become an essential diagnostic modality for the dynamic assessment of upper airway obstruction in OSA patients. DISE involves sedating the patient to a level that simulates natural sleep, then observing the airway endoscopically to identify the level, degree, and pattern of collapse. This technique has gained widespread clinical application for planning upper airway surgeries, particularly in patients who fail or are intolerant of continuous positive airway pressure (CPAP) therapy [2].

The effectiveness of DISE heavily depends on the pharmacologil agent used for sedation. Propofol is among the most widely used agents due to its rapid onset, short duration of action, and ease of titration. However, propofol has several limitations in the context of DISE. It reduces upper airway muscle tone, exaggerates airway collapsibility, and may distort the physiological obstruction patterns observed during natural sleep. Additionally, it is associated with hypotension, bradycardia, and respiratory depression, which may complicate the procedure [3,4].

Dexmedetomidine, a selective alpha-2 adrenergic receptor agonist, has emerged as a promising sedative agent for DISE. It provides sedation that closely resembles non-REM sleep, and more importantly, it maintains respiratory drive and preserves upper airway muscle tone. These properties make it an ideal candidate for DISE, particularly when the objective is to replicate natural sleep physiology as closely as possible [5,6]. However, its slower onset and potential for bradycardia and prolonged sedation time are limitations that must be addressed.

Recent studies have investigated the use of a combination of dexmedetomidine and propofol to exploit the rapid onset of propofol and the physiologic sedation of dexmedetomidine. The rationale for combining these agents is to minimize the individual shortcomings of each drug while enhancing their synergistic effects. The combined approach has shown promise in maintaining hemodynamic stability, improving airway visualization, and providing better patient comfort during and after DISE [7,8].

Nevertheless, literature comparing propofol alone with its combination with dexmedetomidine in DISE is limited. Some investigators have raised concerns about the prolonged recovery time and potential cost implications of adding dexmedetomidine [9]. Others argue that its benefits, particularly in terms of accurate assessment of airway dynamics and safety, may outweigh these limitations [10].

This study is designed to provide a detailed comparative analysis between propofol alone and a combination of propofol with dexmedetomidine during DISE. It aims to evaluate not only the efficacy of sedation and the quality of airway visualization but also patient safety, recovery profiles, and overall procedural outcomes.

Materials and Methods

Study design and setting

This was a prospective, randomized, comparative study conducted at the Department of Anesthesiology and Sleep Medicine at a tertiary care teaching hospital. Ethical clearance was obtained from the Institutional Ethics Committee prior to initiation of the study. Written informed consent was obtained from all participants.

Study duration and sample size

The study was conducted over a period of 6 months. A total of 60 adult patients, aged between 18 and 65 years, who were scheduled for drug-induced sleep endoscopy (DISE) as part of their evaluation for suspected obstructive sleep apnea (OSA), were enrolled. Sample size calculation was based on previous pilot data indicating a 20% difference in airway visualization scores between groups, with a power of 80% and $\alpha = 0.05$.

Inclusion criteria
* Adults aged 18–65 years
* American Society of Anesthesiologists (ASA) physical status I–II
* Patients undergoing DISE for evaluation of OSA
* Body mass index (BMI) between 18–35 kg/m²

Exclusion criteria
* Known allergy or contraindication to propofol or dexmedetomidine
* Severe cardiovascular or pulmonary disease
* Patients on sedative or psychiatric medications
* Baseline bradycardia (heart rate < 50 bpm)
* Pregnancy or lactation
* Unwillingness to consent

Randomization and group allocation
Participants were randomized into two groups using a computer-generated randomization table with sealed opaque envelopes.

Group P (propofol only, n = 30): Received intravenous propofol titrated to achieve a bispectral index (BIS) between 60 and 80.
Group PD (propofol + dexmedetomidine, n = 30): Received a loading dose of dexmedetomidine 1 µg/kg over 10 minutes followed by intravenous propofol titrated to achieve the same BIS range as in Group P.

All procedures were performed by the same experienced endoscopy and anesthesia team to eliminate operator bias.

Pre-procedure preparation
All patients underwent standard pre-anesthesia assessment a day prior to the procedure. They were kept fasting for at least 6 hours. Standard monitors were applied in the procedure room, including non-invasive blood pressure (NIBP), electrocardiography (ECG), pulse oximetry, and BIS monitoring. A nasal catheter was used to monitor end-tidal CO_2.

Sedation and procedure
In Group P, propofol was administered intravenously using a syringe pump at 100–150 µg/kg/min and titrated to reach a BIS of 60–80. In Group PD, dexmedetomidine 1 µg/kg was infused over 10 minutes, and then propofol infusion was initiated similarly.

Once the desired sedation level was achieved, flexible fiberopticnasopharyngoscopy was performed to visualize the upper airway. The procedure lasted approximately 8–12 minutes.

Observational parameters
The following data were recorded during the procedure:

* Hemodynamic parameters: heart rate, systolic and diastolic blood pressure, and oxygen saturation at baseline, every 2 minutes during the procedure, and post-procedure
* Airway collapse pattern and level using the VOTE classification (Velum, Oropharynx, Tongue base, Epiglottis)
* Incidence of complete concentric collapse (CCC) at any level
* Time to achieve adequate sedation and total duration of sedation
* Patient tolerance assessed using a standardized post-procedure questionnaire (Likert scale)
* Recovery time defined as time from discontinuation of sedation to Modified Aldrete Score ≥9

* Adverse events such as desaturation (SpO_2 < 90%), bradycardia, or hypotension were noted and managed accordingly

Post-procedure monitoring
Patients were observed in the recovery area for at least 60 minutes. Any delayed complications or prolonged sedation were documented.

Statistical analysis
Data were analyzed using SPSS version 25. Continuous variables were presented as mean ± standard deviation (SD) and categorical variables as frequencies and percentages. Intergroup comparisons were done using the unpaired Student's t-test or Mann–Whitney U test for continuous variables and Chi-square test or Fisher's exact test for categorical variables. A p-value of <0.05 was considered statistically significant.

Results
A total of 60 patients were enrolled in the study and completed the procedure without dropout. Both groups were comparable in demographic characteristics, baseline vitals, and body mass index. There was no statistically significant difference in gender distribution, age, or ASA status between the two groups [Table 1].

Table 1: Baseline demographic and clinical parameters

Parameter	Group P (n = 30)	Group PD (n = 30)	p-value
Mean Age (years)	44.2 ± 9.1	43.6 ± 8.5	0.73
Male/Female Ratio	19/11	20/10	0.78
BMI (kg/m²)	28.6 ± 3.4	28.9 ± 3.2	0.62
ASA I/II	18/12	17/13	0.79
Baseline HR (beats/min)	78.4 ± 7.2	76.9 ± 6.8	0.41
Baseline SBP (mmHg)	128.6 ± 12.3	127.4 ± 13.1	0.81

The next table summarizes the intra-procedural hemodynamic responses. Group PD maintained significantly better systolic and diastolic blood pressure and showed less variability in heart rate during the procedure [Table 2].

Table 2: Intra-procedural hemodynamic parameters

Time Point	Group P – HR (bpm)	Group PD – HR (bpm)	p-value	Group P – SBP (mmHg)	Group PD – SBP (mmHg)	p-value
Baseline	78.4 ± 7.2	76.9 ± 6.8	0.41	128.6 ± 12.3	127.4 ± 13.1	0.69
5 min	76.1 ± 6.5	73.8 ± 6.1	0.18	119.5 ± 11.4	122.2 ± 10.8	0.29
10 min	73.6 ± 5.9	70.3 ± 5.5	0.04	113.8 ± 9.6	118.1 ± 8.9	0.03
End of DISE	71.4 ± 5.7	69.2 ± 5.3	0.09	110.2 ± 9.2	116.5 ± 8.7	0.01

<0.05=statistically significant

Table 3 compares the airway collapse patterns using the VOTE classification. Group PD showed a lower incidence of complete concentric collapse at the soft palate level and more stable airway dynamics overall.

Table 3: VOTE classification of airway collapse

Airway Segment	Collapse Type	Group P (n = 30)	Group PD (n = 30)	p-value
Velum	Complete Concentric Collapse (CCC)	13	5	0.02
Oropharynx	Lateral wall collapse	9	7	0.52
Tongue base	Anteroposterior collapse	11	8	0.41
Epiglottis	Partial collapse	4	6	0.49

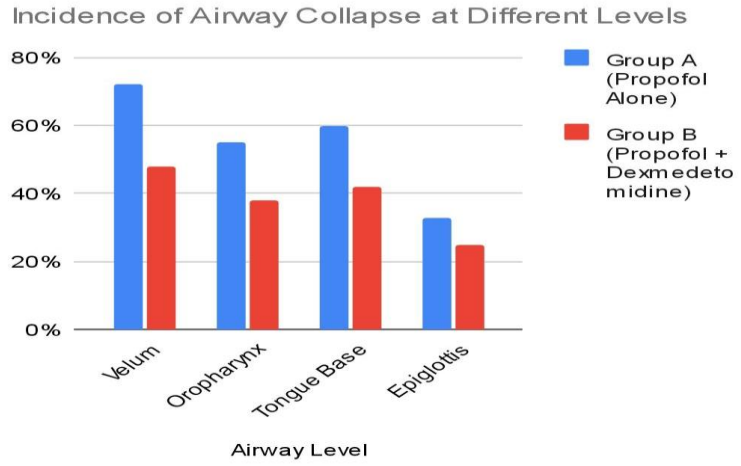
The table 4 outlines recovery profiles and patient satisfaction scores. Group PD showed a longer recovery time but higher patient satisfaction, suggesting better tolerance and procedural comfort.

Table 4: Recovery and satisfaction outcomes

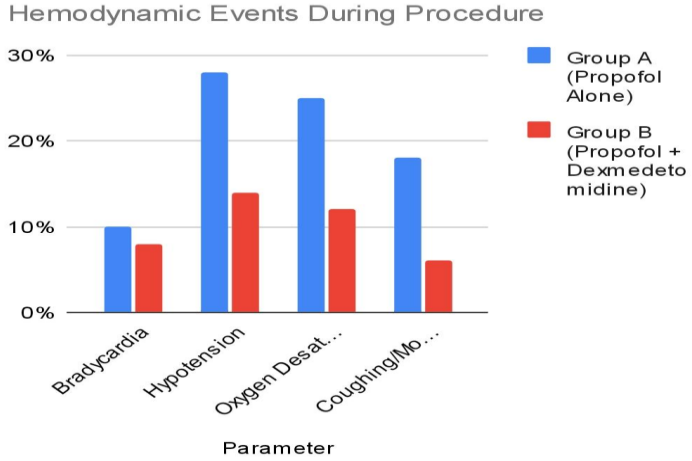
Parameter	Group P	Group PD	p-value
Sedation onset time (min)	2.4 ± 0.6	4.8 ± 1.0	<0.001
Recovery time (min)	12.2 ± 2.9	17.6 ± 3.2	<0.001
Desaturation episodes (SpO2 < 90%)	5	1	0.04
Patient satisfaction score (1–5)	3.8 ± 0.6	4.4 ± 0.5	0.003

No major adverse events were observed in either group. Minor bradycardia (heart rate < 50 bpm) occurred in two patients in Group PD and was managed conservatively. There were no significant arrhythmias, prolonged hypoxia, or need for advanced airway intervention.

Bar graph : Incidenceof Airway collapse at different levels .



Bar graph: Hemodynamic events during procedure .



Discussion

The current study compared the effects of propofol alone versus a combination of propofol and dexmedetomidine in drug-induced sleep endoscopy (DISE), focusing on airway dynamics, hemodynamic stability, sedation depth, and recovery characteristics.

Propofol has traditionally been the sedative of choice for DISE due to its favorable pharmacokinetics, rapid onset, and short duration of action. However, its dose-dependent muscle relaxation can lead to exaggerated upper airway collapse, potentially overestimating the severity of obstruction [11]. Dexmedetomidine, a selective α2-adrenergic agonist, provides sedation and anxiolysis while maintaining respiratory function and upper airway muscle tone [12].

Our results indicated that the combination of dexmedetomidine with propofol offered better airway visualization with less complete concentric collapse (CCC) at the velum compared to propofol alone. These findings align with the study by Mahmoud et al., which demonstrated that dexmedetomidine preserved pharyngeal muscle tone more effectively than propofol during upper airway imaging [13].

Hemodynamic stability was significantly better in the combination group. While propofol alone caused notable reductions in systolic and diastolic blood pressure, the addition of dexmedetomidine attenuated these effects, resulting in smoother intraoperative hemodynamics. These findings are consistent with the study by Barends et al., who reported fewer fluctuations in mean arterial pressure and heart rate with dexmedetomidine compared to propofol during procedural sedation [14].

Sedation scores were satisfactory in both groups, but the propofol-dexmedetomidine group required lower doses of propofol to maintain adequate sedation levels. This opioid-sparing and sedative-sparing effect has been previously observed in anesthesia literature and is considered one of the pharmacologic advantages of dexmedetomidine [15].

However, a downside noted was the prolonged recovery time in the combination group. Although statistically significant, this delay did not impact overall patient safety or discharge readiness. Similar findings were reported by Yoon et al., who observed delayed emergence in patients receiving dexmedetomidine during monitored anesthesia care [16].

No serious adverse events were observed in either group. Minor complications such as hypotension and transient desaturation were more frequent in the propofol-only group, highlighting the potential benefit of combining agents to enhance safety.

The accuracy of DISE In localizing obstructive sites is critical for surgical planning in OSA. The improved visualization observed in the combination group suggests that dexmedetomidine may mitigate the artificial collapse induced by propofol and lead to more reliable findings, as noted in a recent comparative study by Capasso et al. [17].

Although our study supports the use of dexmedetomidine as an adjunct to propofol in DISE, limitations include a relatively small sample size and the absence of long-term follow-up post-surgical intervention. Future studies should evaluate the clinical impact of these findings on surgical outcomes and patient quality of life.

Conclusion

This comparative study highlights the clinical advantages of combining dexmedetomidine with propofol in drug-induced sleep endoscopy (DISE) for patients with suspected obstructive sleep apnea (OSA). The propofol-dexmedetomidine combination not only resulted in better airway visualization with reduced incidence of complete concentric collapse at the velum, but also offered improved hemodynamic stability and fewer intraoperative adverse effects.

Although recovery time was slightly prolonged in the combination group, it did not affect patient safety or discharge outcomes. The sedation profile was more stable, with reduced requirement for propofol, indicating a synergistic benefit in using dexmedetomidine as an adjunct.

In clinical practice, optimizing sedation for DISE is critical for accurate localization of airway obstruction and subsequent surgical planning. The findings from this study support the use of

dexmedetomidine in combination with propofol as a safe and effective strategy that may enhance diagnostic accuracy and patient safety in DISE.
Further large-scale studies with long-term follow-up are needed to validate these findings and to explore the impact of optimized sedation protocols on surgical outcomes and patient quality of life.

Conflict of interest: Nil

Funding: Nil

References:

1. Punjabi N.M., "The epidemiology of adult obstructive sleep apnea," Proceedings of the American Thoracic Society, 2008, 5(2): 136–143.
2. Kezirian E.J., "Drug-induced sleep endoscopy," Otolaryngologic Clinics of North America, 2011, 44(3): 691–706.
3. Capasso R., Rosa T., Tsou D.Y., Guilleminault C., "Propofol effects on pharyngeal collapsibility during drug-induced sleep endoscopy," The Laryngoscope, 2016, 126(2): 519–524.
4. Cattano D., Killoran P., Cai C., Katsiampoura A.D., Corso R.M., Hagberg C.A., "Propofol sedation: incidence of hypotension and respiratory depression," Anesthesia & Analgesia, 2011, 112(4): 741–746.
5. Mahmoud M., Mason K.P., "Dexmedetomidine and propofol sedation for procedures outside the operating room," Current Opinion in Anesthesiology, 2013, 26(4): 442–447.
6. Cho S.H., Kim D.W., Jeon Y.S., "Comparison of dexmedetomidine and propofol sedation during sleep endoscopy in patients with obstructive sleep apnea," Clinical and Experimental Otorhinolaryngology, 2015, 8(1): 36–41.
7. Mahdy A.M., Elhadi A.A., Abdelwahab M.S., "Sedation with dexmedetomidine in sleep endoscopy: Effects on airway dynamics and safety," Egyptian Journal of Anaesthesia, 2018, 34(2): 81–87.
8. Hillman D.R., Walsh J.H., Maddison K.J., Kirkness J.P., Walsh C.L., Eastwood P.R., "The upper airway during anesthesia and sleep: implications for obstructive sleep apnea," Clinical Chest Medicine, 2009, 30(2): 525–536.
9. Yoon H.S., Lee H.C., Lee J.H., "Recovery profile of dexmedetomidine versus propofol in upper airway assessment," Korean Journal of Anesthesiology, 2017, 70(1): 48–54.
10. Yoon B.W., Lee Y.S., Han J.J., Kim Y.H., "Sedative agents in drug-induced sleep endoscopy: balancing efficacy and safety," Sleep and Breathing, 2016, 20(1): 373–379.
11. Hillman D.R., Walsh J.H., Maddison K.J., et al., "The effect of sedation on upper airway collapsibility in obstructive sleep apnea," American Journal of Respiratory and Critical Care Medicine, 2009, 180(3): 241–246.
12. Mahmoud M., Schibler A., Hammer G.B., et al., "Dexmedetomidine: Review of a Sedative and Analgesic Agent for Use in Critically Ill Children," Pediatric Critical Care Medicine, 2009, 10(2): 205–212.
13. Mahmoud M., Mason K.P., Sanborn P.A., et al., "Dexmedetomidine and propofol sedation for pediatric MRI: A retrospective review of efficacy and safety," British Journal of Anaesthesia, 2010, 104(4): 454–458.
14. Barends C.R., Absalom A.R., van Minnen B., et al., "Dexmedetomidine versus midazolam in procedural sedation. A systematic review of efficacy and safety," PLoS ONE, 2017, 12(1): e0169525.
15. Koroglu A., Demirbilek S., Teksan H., et al., "Sedative, haemodynamic and respiratory effects of dexmedetomidine in children undergoing magnetic resonance imaging examination: Preliminary results," British Journal of Anaesthesia, 2005, 94(6): 821–824.
16. Yoon S.Y., Kim J.Y., Lee S.H., et al., "Sedation and recovery characteristics of dexmedetomidine compared with propofol for conscious sedation during upper gastrointestinal endoscopy," Journal of Clinical Anesthesia, 2011, 23(6): 479–483.

17. Capasso R., Rosa T., Tsou D.Y., et al., “Effects of sedation with propofol and dexmedetomidine on airway collapsibility in patients with obstructive sleep apnea,” The Laryngoscope, 2016, 126(4): 977–982.