Case Report

Bispectral index guided sedation during drug-induced sleep endoscopy: A clinical study towards standardized airway assessment in obstructive sleep apnea

Aruna Manaswini Murugesan[1]*, P. Sasikumar[2], K. Senthil Kumar[3]

[1]Junior Consultant – Department of Anaesthesiology, Kauvery Hospital, Cantonment, Trichy, Tamil Nadu
[2]Senior Consultant Anaesthesiologist, Kauvery Hospital, Cantonment, Trichy, Tamil Nadu
[3]Head of Department – Anaesthesiology and Toxicology, Kauvery Hospital, Cantonment, Trichy, Tamil Nadu
*Correspondence

Citation: P Aruna Manaswini Murugesan, P. Sasikumar, K. Senthil Kumar. Bispectral index guided sedation during drug-induced sleep endoscopy: A clinical study towards standardized airway as-sessment in obstructive sleep apnea. Kauverian Med J. 2026;3(6):59-64.

Academic Editor: Dr. Venkita S. Suresh

ISSN: 2584-1572 (Online)

Abstract

Background: Drug-Induced Sleep Endoscopy (DISE) identifies the anatomical level and pattern of airway obstruction in Obstructive Sleep Apnea (OSA). Variations in sedation depth may influence airway findings and recovery. This quality improvement study evaluated whether Bispectral Index (BIS) guided sedation improves procedural consistency and recovery outcomes during DISE.

Methods: A prospective clinical audit compared, Conventional DISE using clinical assessment of sedation with/against DISE performed using Target-Controlled Infusion (TCI) of Injection Propofol guided by BIS monitoring. A BIS range of 65–75 was maintained. Endpoints included total sedative consumption, additional bolus requirement, number of agents per case, airway collapse patterns, recovery time (modified Aldrete score $\geqslant$9), and respiratory adverse events.

Results: After implementation of BIS monitoring, total sedative consumption and additional bolus requirements decreased. Fewer cases require multiple sedative agents. Airway collapse patterns were more consistent, and recovery time was shorter in the BIS-guided phase.

Conclusion: BIS-guided sedation during DISE improves procedural consistency and recovery characteristics. Objective monitoring may enhance reliability of airway evaluation in OSA.

Keywords: Obstructive Sleep Apnea; Sleep Endoscopy; DISE; Bispectral index; BIS; Anesthesia Monitoring; Propofol; Target controlled infusion; TCI; Electroencephalography; Conscious Sedation; Airway Obstruction.

1. Introduction

Obstructive Sleep Apnea (OSA) is characterized by recurrent upper airway collapse during sleep, leading to intermittent hypoxemia and sleep fragmentation.[1] It is associated with cardiovascular and metabolic morbidity. Continuous Positive Airway Pressure (CPAP) remains first-line therapy; however, frequent intolerance necessitates alternative strategies, including surgery. Drug-Induced Sleep Endoscopy (DISE), described by Croft and Pringle[2] enables dynamic visualization of airway obstruction under pharmacologically induced sleep. The VOTE classification system standardizes description of collapse patterns.[3] Accurate interpretation requires a sedation state that resembles natural sleep without excessive hypnotic depth. Sedation influences upper airway tone and collapsibility. [4] Clinical titrations of sedatives may not reliably reflect cortical hypnotic state. The Bispectral Index (BIS), an electroencephalography-derived parameter, provides an objective measure of hypnotic depth.[5] This article assessed the impact of BIS guided sedation on sedation control, airway evaluation, and recovery during DISE.

Table 1: Comparison of sedative agents used in DISE

Agent	Advantages	Limitations / Concerns
Propofol	Short sleep onset latency; High success rate for DISE observation. [6,7]	Requires careful titration to avoid oversedation
Midazolam	Airway collapsibility similar to natural sleep	Risk of respiratory depression, especially when combined with opioids
Dexmedetomidine	Preserves airway tone; Lower risk of respiratory depression8	May alter collapse patterns; Not recommended as first-line agent for DISE

2. Materials and Methods

2.1. Study Design

A prospective clinical study was conducted in the Department of Anesthesiology at Kauvery Hospital. The audit comprised a baseline phase and a post-implementation phase following introduction of BIS monitoring.

2.2. Baseline Phase

During conventional DISE, sedation was titrated using clinical indicators including responsiveness, eyelash reflex, respiratory pattern, and haemodynamic parameters.

Collected data included:

- Total sedative dose.
- Additional bolus requirement.
- Number of sedative agents used.
- Airway visualization adequacy.
- Recovery time (modified Aldrete score ≥9).

- Respiratory adverse events.

2.3. BIS-Guided Phase

BIS monitoring was introduced as an objective depth-of-sedation tool. [2] A target BIS range of 65–75 was maintained to approximate natural sleep.

The standardized protocol included:

- Propofol via Target-Controlled Infusion.
- Continuous BIS monitoring.
- Titration to maintain BIS 65–75.
- Avoidance of additional sedatives unless clinically indicated.

2.4. Audit Endpoints

Primary endpoints were:

- Total sedative consumption.
- Additional bolus requirement.
- Number of agents per case.
- Airway collapse pattern consistency.
- Recovery time.
- Respiratory adverse events.

3. Results

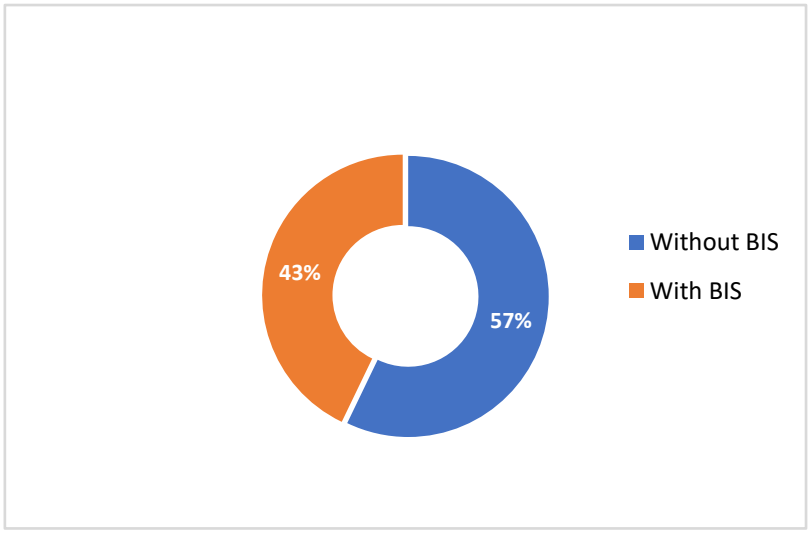

Fig (1): Total number of cases studied -14

4. Sedative Use

During the baseline phase, sedative dosing varied, and multiple agents were used in several cases. After BIS implementation, total sedative consumption decreased, additional bolus use was reduced, and fewer cases required more than one sedative agent. (Fig 2).

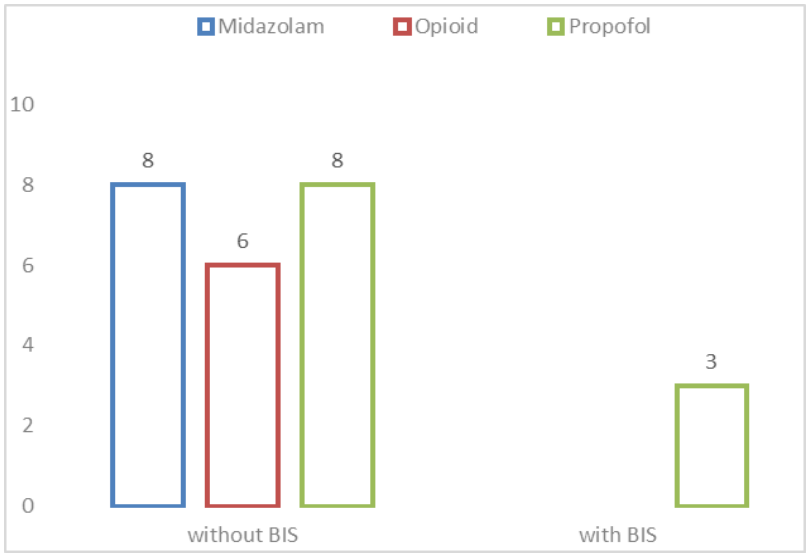

Fig (2): Supplemental Bolus Requirements

5. Recovery

Recovery time to modified Aldrete score ≥9 exceeded 15 mins and less predictable during conventional sedation. In the BIS-guided phase, recovery time was consistently less than 15 mins. (Fig 3).

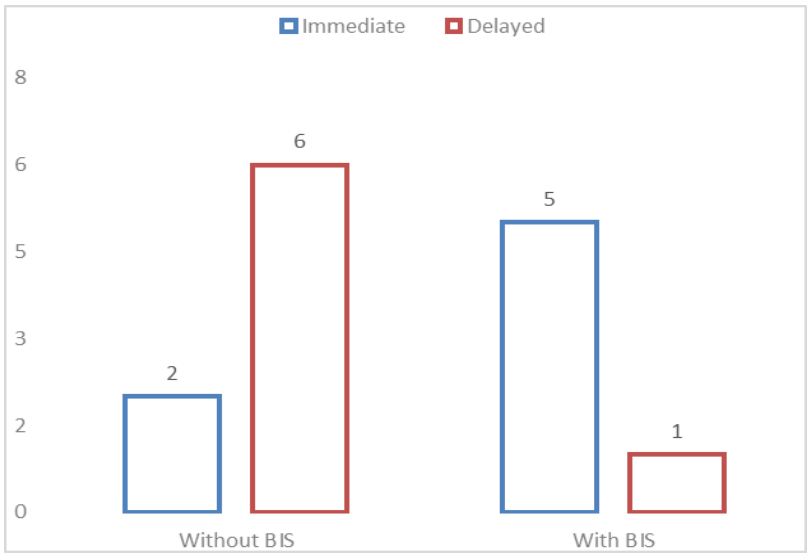

Fig (3): Recovery Characteristics

6. Airway Management

During baseline phase, the need for active airway management was frequent, totaling 12 interventions. Following implementation of BIS monitoring, the requirement of these

manoeuvres was considerably reduced, with one single instance noted for each intervention type. No case in either phase required intubation. (Fig 4).

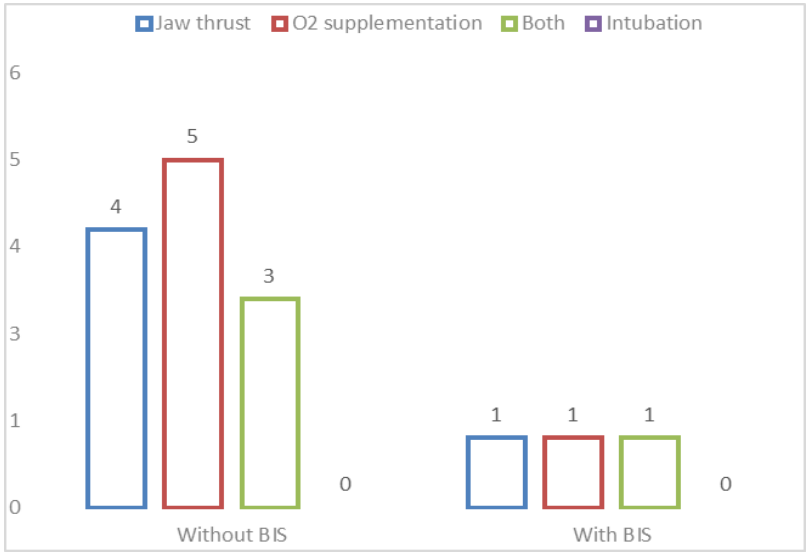

Fig (4): Requirement for airway management interventions. (O2: Oxygen; BIS: Bispectral Index)

7. Discussion

This study demonstrates that BIS monitoring during Drug-Induced Sleep Endoscopy improves sedation control and recovery characteristics. Introduction of objective hypnotic depth monitoring was associated with reduced sedative variability and improved procedural consistency. DISE requires a sedation level that approximates natural sleep without deep anesthesia. Sedation depth influences upper airway muscle tone and collapse patterns. [6] Clinical signs alone may not accurately represent cortical hypnosis, potentially affecting airway interventions. BIS provides a quantitative index of hypnotic depth derived from electroencephalography.[10] Maintaining values between 65 and 75 enabled controlled titration and reduced reliance on subjective assessment. This may explain the observed reduction in sedative adjustments and improved procedural uniformity. Because DISE findings guide therapeutic decisions, minimizing sedation-related fluctuations which is clinically important. Controlling hypnotic depth helps ensure that airway findings reflect underlying anatomy rather than pharmacologic variability.

Improved recovery characteristics observed after BIS implementation are consistent with evidence that BIS guided anesthesia reduces anesthetic exposure and facilitates emergence[11] Although BIS monitoring requires additional resources, its integration into DISE practice appears feasible and may enhance procedural reliability. Further, controlled studies are needed to confirm optimal BIS targets specific to upper airway evaluation.

8. Limitations

This was a single-center study without randomization. Sample size was limited, and long-term clinical outcomes were not assessed. BIS values may be influenced by electrical interference or patient-specific EEG characteristics.[11].

9. Conclusion

BIS-guided sedation during Drug-Induced Sleep Endoscopy improves sedation control, enhances consistency of airway assessment, and shortens recovery time. Objective depth monitoring may support standardized evaluation of patients with Obstructive Sleep Apnea.

References

[1] Berry RB, Brooks R, Gamaldo CE, Harding SM, Lloyd RM, Quan SF, et al. The AASM manual for the scoring of sleep and associated events: Rules, terminology and technical specifications. Darien (IL): American Academy of Sleep Medicine; 2012.

[2] Croft CB, Pringle M. Sleep nasendoscopy: A technique of assessment in snorers. Clin Otolaryngol Allied Sci. 1991;16(5):504-509. doi:10.1111/j.1365-2273. 1991.tb01053.x

[3] Kezirian EJ, Hohenhorst W, de Vries N. Drug-induced sleep endoscopy: The VOTE classification. Eur Arch Otorhinolaryngol. 2011;268(8):1233-1236. doi:10.1007/s00405-011-1633-8

[4] Hillman DR, Platt PR, Eastwood PR. The upper airway during anaesthesia. Br J Anaesth. 2003;91(1):31-39. doi:10.1093/bja/aeg120

[5] Johansen JW, Sebel PS. Development and clinical application of electroencephalographic bispectrum monitoring. Anesthesiology. 2000;93(5):1336-1344. doi:10.1097/00000542-200011000-00033

[6] Vanlersberghe C, Camu F. Propofol. Handb Exp Pharmacol. 2008;(182):227-252. doi:10.1007/978-3-540-74806-9_11

[7] Rabelo FA, Küpper DS, Sander HH, Fernandes RMF, Valera FCP, Demarzo SE. Propofol-induced sleep: Polysomnographic evaluation of patients with obstructive sleep apnea and controls. Laryngoscope. 2010;120(3):625-630. doi:10.1002/lary.20765

[8] Mahmoud M, Jung D, Salisbury S, McAuliffe J, Gunter J, Patwari P, et al. Effect of dexmedetomidine on upper airway collapsibility in children with obstructive sleep apnea. Anesthesiology. 2009;111(4):821-828. doi:10.1097/ALN.0b013e3181b76094

[9] Yoon BW, Hong JM, Hong SL, Kwon SH, Cho KS, Kim HY, et al. A comparison of dexmedetomidine and propofol sedation during drug-induced sleep endoscopy in patients with obstructive sleep apnea. Laryngoscope. 2016;126(3):763-767. doi:10.1002/lary.25572

[10] Punjasawadwong Y, Boonjeungmonkol N, Phongchiewboon A. Bispectral index for improving anaesthetic delivery and postoperative recovery. Cochrane Database Syst Rev. 2014;(6):CD003843. doi: 10.1002/14651858.CD003843.pub3

[11] Bruhn J, Myles PS, Sneyd R, Struys MMRF. Depth of anaesthesia monitoring: What's available, what's validated and what's next? Br J Anaesth. 2006;97(1):85-94. doi:10.1093/bja/ael120