Anesthesia Techniques and Safety Considerations for Drug-Induced Sleep Endoscopy in Obstructive Sleep Apnea Patients: A Comprehensive Study

Dr Sunit Saxena
MBBS, MD (Anaesthesiology)
HOD Anaesthesia and OT
Manipal Hospital
Jaipur
Dr Bhavya Sinha
Third Year PG Student
DNB Anaesthesia
Manipal Hospital
Jaipur

Abstract: Introduction- Sleep endoscopy, also known as drug-induced sleep endoscopy (DISE), is a diagnostic tool for evaluating upper airway obstruction in patients with obstructive sleep apnea (OSA). Anesthesia is pivotal in achieving a controlled sedative state that mimics natural sleep, ensuring patient safety and effective visualization of the airway dynamics. This comprehensive study reviews anesthesia techniques and safety considerations for DISE, focusing on optimizing patient outcomes.

Methods- The study was conducted over one year with 100 patients clinically diagnosed with OSA. Exclusions included patients with neurological conditions, severe cardiac issues, and active nasal infections. Pre-procedure assessments included pre-anesthesia evaluations, blood tests, and imaging. Anesthesia was administered using propofol titration, employing the Schnider model to achieve a snoring-apnea cycle. Standardized protocols were followed for patient positioning, monitoring, and sedation depth.

Results- Propofol, administered in titrated doses, facilitated a controlled sedative state in all cases, allowing effective visualization of airway collapse. Moderate sedation was achieved in most patients, with minimal adverse events. Complications such as airway obstruction and respiratory depression were rare and managed promptly with established protocols.

Discussion- The study highlights the role of anesthetic agents such as propofol in achieving optimal sedation for DISE, ensuring airway patency and accurate diagnostic outcomes. Key considerations for anesthesiologists include precise drug titration, comprehensive patient monitoring, and readiness to manage potential complications like hypoxemia or aspiration.

*Author, Email- sunit1958@yahoo.co.in

Conclusion- Anesthesia for sleep endoscopy is critical for the safety and success of the procedure. Adhering to evidence-based sedation protocols, tailored to individual patient profiles, enhances the diagnostic utility of DISE while minimizing risks. This study underscores the importance of anesthetic expertise in managing OSA through sleep endoscopy.

Keywords:
Sleep endoscopy, obstructive sleep apnea, drug-induced sleep endoscopy, anesthesia, propofol, airway management, sedation protocols.

Introduction

Sleep endoscopy, also known as drug-induced sleep endoscopy (DISE), is a diagnostic procedure used to evaluate the upper airway during sleep in patients with obstructive sleep apnea (OSA).[1] This technique allows clinicians to visualize airway collapse patterns, providing vital information for tailoring appropriate treatment options such as surgery, CPAP therapy, or other interventions. Given that DISE requires the patient to be under sedation to simulate sleep, anaesthesia plays a critical role in the procedure.[2] This article will explore the types of anaesthesia used, the considerations for anaesthesiologists, and the safety protocols involved in sleep endoscopy.

Review of Literature

Drug-induced sleep endoscopy (DISE) is a diagnostic procedure used primarily to assess upper airway obstruction in patients with obstructive sleep apnea (OSA). It is particularly helpful for understanding the complex airway dynamics that contribute to OSA, which often cannot be fully appreciated with conventional sleep studies or imaging.[3]
Anesthesia is an essential component of sleep endoscopy as it helps achieve a controlled and reversible state of sleep that mimics natural sleep while maintaining airway patency. The goal is to induce a state that allows for safe evaluation of the upper airway without the patient experiencing discomfort or distress.[4] Unlike natural sleep, where the patient is conscious of their breathing and airway protection mechanisms, anesthesia ensures that the patient is relaxed and unconscious during the procedure.[5]
The primary objective of the anaesthesia is to:

- Ensure that the patient is adequately sedated.
- Maintain airway safety.
- Avoid excessive sedation or over-sedation, which could lead to complications such as airway obstruction or hypoxaemia.

Typically, sleep endoscopy is conducted using a combination of sedative and anesthetic agents to achieve a level of sedation that simulates natural sleep without compromising the patient's safety.

Types of Anesthesia for Sleep Endoscopy [6,7,8,9]
Moderate Sedation (Conscious Sedation): In many cases, moderate sedation is used for sleep endoscopy, where the patient remains responsive to verbal commands but is in a deeply relaxed state. Agents such as benzodiazepines (e.g., midazolam) and opioids (e.g., fentanyl) are often administered intravenously. This level of sedation allows the patient to maintain some level of airway reflexes, making it easier for the anaesthesiologist to manage the airway if needed.

Deep Sedation: For more complex cases or when more control over the patient's airway is needed, deep sedation may be administered. Drugs like propofol or dexmedetomidine are commonly used for deeper sedation. Propofol provides a quick onset and short duration of action, allowing for rapid titration and recovery. Deep sedation is particularly useful in patients with severe OSA, as it enables a more profound relaxation of the muscles involved in airway obstruction. However, deep sedation requires careful monitoring due to the risk of respiratory depression.

General Anesthesia: In some instances, general anesthesia may be required, especially when moderate or deep sedation is insufficient for a clear view of the airway or when airway protection is paramount. General anesthesia involves the complete loss of consciousness and the need for controlled airway management through endotracheal intubation or supraglottic devices.

Local Anesthesia: In some cases, local anesthesia may be used in combination with sedation to reduce discomfort. Topical local anesthetics are applied to the nasal passages, pharynx, and larynx to prevent gagging and pain while allowing the clinician to manipulate instruments through the upper airway.

Considerations for Anaesthetists [10,11]
Airway Management: Given the inherent risk of airway obstruction in patients with OSA, airway management is a primary concern during sleep endoscopy. Anesthesiologists must be prepared to manage the

airway appropriately, including having equipment for airway support (e.g., laryngeal mask airways, endotracheal tubes) readily available. The choice of sedation depth depends on the patient's anatomy and the complexity of their airway obstruction.

Monitoring: Continuous monitoring is essential to ensure patient safety during the procedure. Standard monitoring includes pulse oximetry, capnography, electrocardiography (ECG), and blood pressure measurement. Monitoring of respiratory function is critical to detect early signs of hypoventilation or hypoxemia. In patients receiving deeper sedation or general anesthesia, more invasive monitoring such as arterial blood gas (ABG) analysis may be required.

Drug Selection and Titration**:** The choice of sedative or anesthetic agent depends on several factors, including the patient's medical history, the severity of their OSA, and any comorbid conditions (e.g., cardiovascular disease, obesity). Anesthesiologists must titrate the drugs carefully to avoid over-sedation, which can result in complications such as airway collapse and desaturation.

Patient Positioning: Proper positioning of the patient is important to facilitate airway assessment. Typically, patients are placed in a supine position during the procedure. For some patients, adjusting the head position may help relieve airway obstruction or provide better visualization during endoscopy.

Risks and Safety Considerations [10,11]
While sleep endoscopy is generally considered safe, it is not without risk. The potential risks associated with anesthesia for sleep endoscopy include:
Airway Obstruction: Particularly in patients with severe OSA, there is a risk of airway collapse under sedation. Monitoring and appropriate management techniques are essential to mitigate this risk.
Respiratory Depression: Over-sedation or excessive doses of anesthetics can lead to respiratory depression, which requires immediate intervention.
Aspiration: If the patient has not fasted adequately, there is a risk of aspiration during the procedure, particularly under general anesthesia or deep sedation.
Cardiovascular Events: Sedation agents may impact cardiovascular stability, particularly in patients with pre-existing heart conditions.

Material and Methods

The study was conducted over one year period, on 100 patients which were examined by otolaryngologist in OPD and clinically diagnosed to have sleep apnea. Patients included were those which were fit for the procedure and all suspected to have Sleep Apnoea whether having Diabetes, Hypertension, Hypothyroidism or other co morbidity. Patients excluded were those suffering from Neurologic problems like history of Stroke or mental retardation or Down syndrome. The patients with poor chest conditions and Cardiac issues and active nasal infections were asked to get fitness from concerned departments.

Before procedure patients underwent Pre Anaesthesia check up and blood tests like Complete blood count, Renal profile, Lipid profile, Thyroid function test, Chest x ray, ECG, And Viral markers.

Patients were called eight hours Nil by mouth before the procedure. After explaining patients about the procedure and taking informed consent, they are taken up for the procedure in Operation Theatre.

Positioning – Supine position with Ring below head for support.

Medication- Propofol titration dose

Sleep endoscopy is manually performed using a 20 ml syringe containing 1% or 2% propofol. An induction bolus of 1 mg/kg propofol is followed by 20 mg boluses every two minutes until the start of the Snoring-Apnoea cycle , using Schnider model

Patient is examined with Fibreoptic Laryngoscopy. The Laryngoscope is inserted through nose taking care not to damage the surrounding structures like septum and turbinates. The assessment is done following the VOTE classification. Velum Oropharynx Tongue Base Epiglottis (VOTE) Classification incorporates four structures. Degree and configuration of airway narrowing is assessed related to the structures.[12] Sedation with Propofol notably induce slow waves, which are typically present during natural NREM sleep—the stage where obstruction most frequently happens. [12]

Propofol bolus is stopped once the surgeon is finished with assessment.

Discussion-

Drug-induced sleep endoscopy is an objective technique for visualizing upper airway obstruction. However, the classification and evaluation of clinical findings derived from DISE can be highly subjective. Another classification other than VOTE classification can be used is the NOHL

classification, which identifies obstruction at the levels of the nose, oropharynx, hypopharynx, and larynx.[13]
Drug-induced sleep endoscopy provides a shorter evaluation period compared to the 6 to 8 hours of natural sleep. While this may be advantageous for a quicker assessment, it has the limitation of not offering a comprehensive evaluation for sleep apnea.[2,13]

Conclusion

Anesthesia for sleep endoscopy is a critical component that ensures the safety and efficacy of the procedure. The primary goals of anesthesia in sleep endoscopy are to achieve an optimal state of sedation, ensure airway protection, and allow for accurate assessment of upper airway dynamics. Anesthesiologists must carefully assess each patient's specific needs, titrate sedatives appropriately, and monitor for complications. By doing so, sleep endoscopy can be performed safely and effectively, providing valuable insights into the management of obstructive sleep apnea.

References

1. Viana A, Estevão D, Zhao C. The clinical application progress and potential of drug-induced sleep endoscopy in obstructive sleep apnea. Annals of Medicine. 2022 Dec 31;54(1):2908-19.
2. Vroegop AV, Vanderveken OM, Verbraecken JA. Drug-induced sleep endoscopy: evaluation of a selection tool for treatment modalities for obstructive sleep apnea. Respiration. 2020 May 26;99(5):451-7.

3. Charakorn N, Kezirian EJ. Drug-induced sleep endoscopy. Otolaryngologic Clinics of North America. 2016 Dec 1;49(6):1359-72.
4. Shallik NA. Anesthetic management for drug induced sleep endoscopy. Middle East J Anaesthesiol. 2015 Jun 1;23(2):131-5.
5. Nguyen-Famulare N, Nassar M. Sleep endoscopy and anesthetic considerations in pediatric obstructive sleep apnea: a review. International Anesthesiology Clinics. 2017 Jan 1;55(1):33-41.
6. Shteamer JW, Dedhia RC. Sedative choice in drug-induced sleep endoscopy: a neuropharmacology-based review. The Laryngoscope. 2017 Jan;127(1):273-9.
7. Ehsan Z, Mahmoud M, Shott SR, Amin RS, Ishman SL. The effects of anesthesia and opioids on the upper airway: a systematic review. The Laryngoscope. 2016 Jan;126(1):270-84.
8. Berry RB, Kouchi KG, Bower JL, Light RW. Effect of upper airway anesthesia on obstructive sleep apnea. American journal of respiratory and critical care medicine. 1995 Jun;151(6):1857-61.
9. Evans RG, Crawford MW, Noseworthy MD, Yoo SJ. Effect of increasing depth of propofol anesthesia on upper airway

configuration in children. Anesthesiology. 2003 Sep;99(3):596-602.

10. De Vito A, Carrasco Llatas M, Vanni A, Bosi M, Braghiroli A, Campanini A, et al. European position paper on drug-induced sedation endoscopy (DISE). Sleep Breath. 2014 Sep;18:453-65.
11. Mooney KL, Brooks Peterson M, Skirko JR, Friedman NR. The Quest for a DISE Protocol. Otolaryngology–Head and Neck Surgery. 2022 Sep;167(3):590-9.
12. Schwartz, D., Schall, C., Harders, M. et al. Anesthesia for Drug Induced Sleep Endoscopy (DISE). Curr Anesthesiol Rep 14, 469 – 474 (2024). https://doi.org/10.1007/s40140-024-00632-1
13. Kumar R, Suri JC, Sen MK. Druginduced Sleep Endoscopy. Indian Sleep Med 2017;12(2):15-20.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understand that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.