

Anesthesia and Drug Induced Sleep Endoscopy (DISE)

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Introduction

Drug-induced sleep endoscopy (DISE) is a diagnostic procedure used to evaluate the upper airway in patients with obstructive sleep apnea (OSA) by mimicking natural sleep conditions. OSA is a disorder characterized by repetitive collapse of the upper airway during sleep. Standard treatment for OSA is continuous positive airway pressure therapy (CPAP). However, up to 50% of patients with OSA are unable to tolerate CPAP obligating alternative treatments. DISE allows for the direct visualization of airway dynamics, which aids in identifying the site and pattern of obstruction, thereby guiding treatment decisions. It has been the most used technique to identify specific areas of obstruction and patterns of airway collapse that serves as a baseline screening tool for both surgical and non-surgical options.¹

A variety of drugs are available for sedating patients undergoing DISE, with the goal of achieving a level of sedation that closely mimics natural sleep. The most often utilized agents are propofol, midazolam, and dexmedetomidine.² While no absolute contraindications exist unique to DISE, relative contraindications include drug allergy to selected sedative agents, pregnancy, and medical comorbidities resulting in significant airway compromise. Anesthesia

plays a crucial role in DISE, as it must induce a sleep-like state without compromising airway patency or patient safety.

Preoperative management

DISE is usually performed in the operating room. Standard ASA monitoring is used. Patients with severe OSA may have increased perioperative risk. Detailed preoperative evaluation, including polysomnography, is essential. Cardiovascular and respiratory comorbidities need careful assessment due to the risk of apnea and hypoxemia during the procedure. History of difficult intubation or previous airway surgeries should be noted. In the preoperative setting, anticholinergic agents, such as atropine and glycopyrrolate, could be administered intravenously up to 30 min before the procedure to reduce salivary secretions and improve visualization of the upper airway.

Topical vasoconstrictors and local anesthetics could be administered intranasally to facilitate passage of the endoscope and minimize risk of bleeding. A variety of classification schemes for airway evaluation have been described to characterize and standardize DISE findings. The velum oropharynx tongue base epiglottis (VOTE) classification is proposed as a standard for DISE scoring because it incorporates

the 4 major structures that most often contribute to airway obstruction. They are the velum (palate), oropharyngeal lateral walls (including the tonsils), tongue, and epiglottis.³ Endoscopic examination should be performed before administration of the sedative to verify the anesthetic state

Anesthetic goal

Drug-induced sleep induction must be performed to induce snoring before performing DISE. Achieve a sedation level that mimics natural sleep, typically corresponding to stage N2 sleep. The depth of sedation during DISE plays a crucial role in accurately identifying the anatomical segments obstructing the upper airway. Evaluation with lighter sedation may underestimate the obstruction, whereas over sedation may overestimate obstruction. A deep level of sedation is required to facilitate the procedure. Maintain spontaneous breathing while allowing visualization of the airway collapse sites is essential to minimize the risk of hypoxemia, hypercapnia, and hemodynamic instability.

Generally, the sedation depth can be assessed with the loss of consciousness, onset of snoring, and disordered breathing events. Bispectral index score may provide additional monitoring of sedation. A potential target score of 61-70 will ensure a targeted level of sedation and optimize muscle tone and upper airway collapsibility.⁴ Many European institutions implement DISE using targeted control infusion (TCI) systems.⁵ Continuous infusion provides more stable sedation compared to intermittent

boluses for DISE sedation. TCI allows for precise control of drug concentration, providing a stable sedation level. Non-invasive blood pressure, pulse oximetry, electrocardiogram, and end-tidal carbon dioxide are utilized during the procedure. Continuous monitoring of end-tidal CO₂ (capnography) can detect hypoventilation or apnea early.⁶

Sedative drugs

The standardized sedation protocol has not yet been described. An ideal drug for DISE should be able to be administered intravenously, have rapid onset, and have a short half-life, which allows for easy control of sedation depth. Different drugs have been used to induce sedation during DISE. Propofol, midazolam, and dexmedetomidine are commonly used in this procedure as sleep-inducing drugs. Each drug offers specific advantages and disadvantages, with distinct effects on respiratory physiology.

Propofol is commonly used due to its rapid onset, titratable effects, short duration of action, and any adverse effects are rapidly reversed immediately after administration is discontinued. However, it can cause respiratory depression and hypotension. Electroencephalography analysis during propofol sedation showed the induction of slow-waves' sleep is similar to those found in natural NREM sleep. These effects are dose-dependent, highlighting the importance of administering as lower dosage of propofol as possible. TCI systems represent the preferred option for infusion with a starting dose of 1.5-3.0 mcg/ml, and an increasing rate 0.2-0.5 mcg/ml

until the targeted sedation level.⁵ If the TCI system is not available, either a standard pump system or manual bolus technique could be utilized.⁷ Several studies demonstrated that propofol sedation did not induce snoring or apneas in patients without snoring or apneas during regular sleep.^{8,9}

Midazolam provides amnestic effects and moderate sedation but has a longer duration, which may prolong recovery. It represents an appropriate anesthetic agent for sleep endoscopy no more than 15 min, providing a stable NREM sleep stages 1 and 2, which is the most percentage of time spent during midazolam sedation.¹⁰ A bolus technique of midazolam is starting with a dosage of 0.03 mg/kg, and increasing of 0.03 mg/kg after 2-5 min, and of 0.015 mg/kg, after 5 min, if the patient is not completely asleep. A combination technique consists of a single bolus of 0.05 mg/kg of midazolam, followed by propofol TCI infusion.¹¹

Dexmedetomidine provides a state of sedation closer to natural sleep and lesser upper airways muscular relaxing effect, even at the increased anesthetic dosage. It provides sedation and analgesia without significant respiratory depression, making it a favorable option. However, it has a longer onset time and can cause bradycardia and hypotension. Additionally, there is also some evidence that dexmedetomidine is not reliable when used as the sole anesthetic for DISE.¹² The sedative action of dexmedetomidine can be reached by means of a bolus dose of 1.5 mcg/kg over 10 min, and a maintenance infusion rate of 1.5 mcg/kg/h or TCI starts with a dose of 1 mcg/kg for 10 min, and followed by an infusion at a rate of 1 mcg/kg/h.

Postoperative management

All patients should be closely monitored in a recovery area until they are fully awake and their vital signs including heart rate, blood pressure, heart rate, and oxygen saturation are stable. Importantly, ensure the patient's airway is clear and they are breathing comfortably. The discharge criteria include stable vital signs, adequate oxygenation, and the ability to maintain airway patency and protect airway reflexes.¹³

Conclusion

DISE was introduced as a useful diagnostic and evaluation tool to identify dynamic upper airway collapse during sedation that simulates natural sleep. Anesthesia and the choice of anesthetic drugs for DISE must balance the need for a sleep-like state with the safety considerations unique to each patient. Propofol, midazolam, and dexmedetomidine are commonly used due to their favorable profiles, but patient-specific factors and potential contraindications must guide the final selection. Continuous monitoring and readiness to manage airway complications are crucial for the successful and safe conduct of DISE.

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