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Review Article

Drug Induced Sleep Endoscopy, the Key Evaluation Tool in the Surgical Management of Snoring and Obstructive Sleep Apnea: Our Experience in Qatar

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Abstract

Obstructive sleep apnea (OSA) is prevalent in 9-38% of the population accounting for reduced quality of life, and is associated with an increased incidence of hypertension, type 2 diabetes mellitus, coronary heart disease, stroke, and death. Surgical interventions are indicated to improve compliance and outcomes in patients not tolerating CPAP. Recently, drug-induced sleep endoscopy (DISE) has taken the position as a method of dynamic evaluation of the upper airway during medically induced sleep. This study aims to illustrate our technique and experience with DISE in Qatar.

We recommend all patients to have a sleep study and an awake fiberoptic endoscopic upper airway examination, before listing for DISE. DISE can be performed in patients with acceptable anesthesia risk. Absolute contraindications for DISE are ASA 4, pregnancy, and drug allergy to DISE agents. We perform all the DISE procedures in a fully equipped operating theatre with Bi-spectral index (BIS) to monitor sleep depth. We do not use nasal decongestants, local nasal anesthesia, or anti-secretory drugs. In patients with positional changes in a sleep study, we perform DISE in both the lateral and supine positions. We prefer to sedate all patients with Propofol, and Midazolam is used as an alternative. The anesthetists use target- controlled infusion (TCI) to infuse propofol with a starting dose of 2.0 µg/ml and were able to achieve the ideal sedation level at an effective site concentration of ~3.0 µg/ml in most of our patients. Our DISE report documents the level, severity and pattern of obstruction. The documented levels are nose and VOTE (velum, oropharynx, Tongue base and epiglottis) and the severity is expressed in a semiquantitative manner with % of obstruction. The patterns of obstruction are documented: anteroposterior, lateral, and concentric. DISE, is the best tool presently available to assess the UA of patients with snoring or OSA dynamically if carefully performed. DISE should be done with precision and UA modification maneuvers in order to gather complex information on obstruction level, pattern and severity. It is vital for patients to have a standard DISE procedure with reporting in a common template in order to pursue their treatment in various health facilities.

Keywords: Snoring; Obstructive Sleep Apnea; Sleep Disordered Breathing; Drug Induced Sleep Endoscopy

Introduction

Obstructive sleep apnea (OSA) is featured by multiple episodes of partial or total upper airway collapse while sleeping, which results in reduced (hypopnea) or absent (apnea) airflow lasting more than 10 seconds and associated with sleep arousal or a low oxygen saturation level. OSA is prevalent in 9-38% of the population [1]. It causes excessive daytime sleepiness, accounting for reduced quality of life, impaired work performance, and

increased motor vehicle crash risk [2,3,25]. OSA is associated with an increased incidence of hypertension, type 2 diabetes mellitus, atrial fibrillation, heart failure, coronary heart disease, stroke, and death [4-7,25].

Conservative treatment with continuous positive airway pressure (CPAP) therapy is the gold standard in OSA management. Surgical interventions are indicated to improve compliance and outcomes in patients not tolerating CPAP [8,9]. Increasing identification of the dynamic multilevel anatomical obstruction led to specialized surgical approaches and techniques in an attempt to address the anatomical problem [10]. The sleep surgeon should know the exact level of obstruction in the upper airway (UA) in order to deliver an acceptable result.

Traditionally, awake upper airway assessment is done in the outpatient clinic using flexible endoscopes. Recently, drug-induced sleep endoscopy (DISE) has taken the position as a method of dynamic evaluation of the upper airway during medically induced sleep [11]. Multiple studies have demonstrated the importance of DISE as an important diagnostic approach to sleep apnea, proving its simplicity, safety, and cost-effectiveness [12-14]. As there is no standardization, different centers are performing DISE in their own way. European position paper on DISE was published in 2014 and released an update in 2017 in order to find a common language in DISE procedure and reporting [11].

The Snoring and Sleep Disordered Breathing (SDB) surgery division under the ENT department was established in Hamad Medical Corporation, Doha, Qatar, in 2015. The team incorporated the DISE procedure as a key diagnostic tool and started it in early 2016. As the leading health provider in the country, we wish to bring our methods to the limelight and to provide an efficient diagnostic pathway for the aspiring sleep surgeons.

Aim of the Study

This study aims to illustrate our technique and experience with DISE in Qatar.

Technique and Method

Selection of patients, indication and pre-evaluation

We recommend all patients to have a complete clinical upper airway assessment in Snoring and SDB outpatient setup, including awake fiberoptic endoscopic upper airway examination, before listing for DISE. We make sure that the patient has a type 1, 2, or 3 sleep study according to the American Academy of Sleep Medicine (AASM) to know the OSA severity, positional dependence and type of events (central or obstructive). We perform DISE only for adults.

As only DISE can provide additional information about the dynamics of the UA, it is considered for patients looking for CPAP alternatives, such as surgery, oral appliance therapy, positional therapy or combination therapy [15]. Studies show that DISE alters surgical treatment plans in around 50% of OSA patients compared to awake endoscopy [16]. The other indications of DISE include its application in understanding the failure or partial response of surgery, oral appliance, and/or CPAP. In the patient with limited results after surgery, DISE provides input on unaddressed UA obstruction, guiding further surgical and non-surgical options [17,18].

DISE can be performed in patients with acceptable anesthesia risk. Absolute contraindications for DISE are ASA 4, pregnancy, and drug allergy to DISE agents. DISE is of little value in patients with morbid obesity.

We prefer to have a basic blood workup panel for all patients preoperatively, and we send all patients to a pre-anesthesia clinic for assessment.

Location, setup and preparation

We perform all the DISE procedures in a fully equipped operating theatre. The operating rooms are arranged to have a silent and dark ambiance. Bi-spectral index (BIS) is used in all patients to monitor sleep depth. Evidence shows that lighter sedation could underestimate the UA obstruction, while deeper sedation can lead to artificial obstruction [19-21]. We use a BIS level of sedation between 70 and 50 during DISE. A 2.5 mm flexible fiber endoscope is inserted with a video and audio recording.

The procedure requires a Snoring and SDB surgeon who performs the endoscopy, an assistant who manipulates the position, staff nurses and an anesthesiologist. We do not use nasal decongestants, local nasal anesthesia, or anti-secretory drugs. In the case of hypersalivation, gentle oral suction helps in having a better UA assessment [11].

All patients are positioned supine with one pillow. In mouth openers, we examine the airway with a chin lift maneuver. In patients with positional changes in a sleep study, we perform DISE in both the lateral and supine positions. Studies have shown that in these patients, DISE results differ when examined in the supine or lateral position [22,23]. In patients with the possibility of Oral appliance therapy, we do both the mandibular advancement and the vertical mouth opening, mimicking oral appliance characteristics [11]. In those Patients who already have mandibular advancement device (MAD), we begin the DISE with the MAD in place. The device is removed after assessing the UA for a couple of cycles of sleep events.

Several drugs (midazolam, propofol, dexmedetomidine, remifentanil, and ketamine) are studied in literature to achieve the ideal level of sedation during DISE [11]. We prefer to sedate all patients with Propofol, as it is the best in creating sedation that mimics the critical closing pressure during natural sleep without significant differences in the AHI [11,24]. Midazolam is used as an alternative for those who have a Propofol allergy. The anesthetists use target-controlled infusion (TCI) to infuse propofol slowly to achieve the required level of sedation in BIS. We started infusion at a dose of 2.0 µg/ml and increased the dose to 0.2 µg/ml every 2 minutes and were able to achieve the ideal sedation level at an effective site concentration of ~3.0 µg/ml in most of our patients [11]. The DISE assessment lasts for at least a couple of complete cycles of snoring/apnea. The recording is done at various levels, as given below.

Reporting

During DISE, we target events of snoring, hypopnea and apnea. Our DISE report documents the level, severity and pattern of obstruction. The documented levels are nose and VOTE (velum, oropharynx, Tongue base and epiglottis). The severity is expressed in a semiquantitative manner with 0 - 25, 25 - 50, 50 - 75, and 75 - 100% of obstruction. Three patterns of obstruction are documented: anteroposterior, lateral, and concentric.

Post procedure

All DISE patients are scheduled as daycare cases and discharged the same day after the procedure. The results and recommendations are discussed in detail with the patient as a scheduled follow-up in the outpatient clinic.

Conclusion

DISE, is a short procedure taking 15 - 30 minutes, which helps to achieve up to N2 sleep with most of the sleep events occurring. It's the best tool presently available to assess the UA of patients with snoring or OSA dynamically if carefully performed. DISE results help Sleep surgeons to decide the patient-tailored treatment modality when CPAP is not considered or tolerated. DISE should be done with precision and UA modification maneuvers in order to gather complex information on obstruction level, pattern and severity. Also, keep in mind that even though DISE can be a preview of what happens during the night, and it cannot detail the events of REM sleep. Nevertheless, DISE is the current best direct diagnostic method available for upper airway assessment in snoring and sleep disordered breathing patients. It is vital for patients to have a standard DISE procedure with reporting in a common template in order to pursue their treatment in various health facilities.

Conflict of Interest

The authors declare that there is no conflict of interest.

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