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Review

Drug-induced sleep endoscopy: A new gold standard for evaluating OSAS? Part II: Results

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ABSTRACT

Surgical results in obstructive sleep apnea syndrome (OSAS) vary greatly, whatever the surgical technique or site. Most authors agree that rigorous patient selection is logical and mandatory. Drug-induced sleep endoscopy (DISE) was introduced in 1991 and has been rediscovered and used extensively since the 2000s. It attempts to mimic natural sleep in order to observe the upper airway on flexible endoscopy in a situation in which obstruction may occur. A review of the DISE literature was performed, and is reported in two parts. The present second part reports DISE results concerning obstruction sites, impact on treatment efficacy and the consequent indications for this exploration.

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1. Introduction

Drug-induced sleep endoscopy (DISE) explores the upper airway during induced sleep, and should improve assessment of patients presenting snoring and/or obstructive sleep apnea syndrome (OSAS). An exhaustive review of the literature was conducted to describe vibration/obstruction sites, the classifications available to inventory them, the concordance between DISE and clinical examination during wakefulness, the impact of DISE on the results of surgery or oral appliances, and indications for DISE in the OSAS work-up.

2. Obstruction and vibration sites

2.1. Regions and tissue structures, obstruction mechanisms, and classification

The obstructions implicated in abnormal respiratory events (apnea, hypopnea, restricted airflow) and the vibrations causing snoring occur in certain pharyngeal and laryngeal regions, although the regions (or sites) involved in obstruction and snoring may not be identical. There are 4 such regions: retrovelar, oropharyngeal, hypopharyngeal and laryngeal. The nasal cavities, although they may be obstructed and induce pharyngeal obstruction, are

not directly involved. Each of these regions comprises various structures that can induce obstruction: the retrovelar site, which includes the soft palate, the mucosal velum, and uvula; the oropharyngeal site, which includes the palatine tonsils and pharyngeal walls; the hypopharyngeal site, which includes the tongue base, lingual tonsils and lateral pharyngeal walls; and the laryngeal, site which includes the epiglottis and arytenoids. Some structures, originating in one region, may increase in volume or length so as to protrude into adjacent regions.

Obstruction may be more or less severe. Some authors use qualitative assessment (absent, partial, total) [1], others quantitative (25–50%, 50–75%, > 75% or 100%) [2].

Sleep endoscopy showed that obstruction could be observed in 3 dimensions: anteroposterior, transverse and circumferential [1,2].

To describe obstructing and vibrating structures and be able to compare results between studies, a number of more or less sophisticated classifications have been developed, integrating part or all of the data. They may or may not include the concept (and site) of vibration. They may take into account spaces or structures visible on endoscopy, as obstruction sites [3–12] (Table 1). One classification (NOHL) [13] also includes nasal obstruction, which may equally well be assessed during wakefulness; thereby, it introduces a therapeutic aspect (including nasal cavity treatment) in classifications that are otherwise based on anatomic description alone.

The classifications inventory obstructed and vibrating regions and, in principle, structures, but do not presently show established therapeutic implications. Obstruction seems difficult to quantify precisely without a software to measure cross-sectional area on freeze frames. None of the classifications are perfect, particularly

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Table 1
Sleep endoscopy classifications.

1st author [ref] date	Obstruction sites	Degree of collapse	Mechanism	Classification
Croft [3] 1991	Soft palate Tongue base	St 1: minimal collapse St 2: < 50% obstruction St 3: > 50% obstruction St 4: total obstruction	Circumferential mentioned	GrA: simple palatal snorer Gr B: palatal vibration and obstruction Gr C: multisegment obstructions
Pringle [4] 1993	Soft palate Tongue base			Gr 1: simple palatal snorer Gr 2: 1 palatal vibration and obstruction Gr 3: multisegment involvement - intermittent orohypopharyngeal collapse Gr 4: sustained multisegmental collapse Gr 5: tongue base level obstruction
Sadaoka [5] 1996	Soft palate Tongue base		Circumferential mentioned	Gr A: single level palatal obstruction Gr B: single level tongue base obstruction Gr C: multisegment involvement
El Badawey [6] 2003	Soft palate Oropharynx Tongue base Epiglottis			Gr 1: single level palatal snoring Gr 2A: multisegment involvement: palatal level + epiglottic obstruction Gr 2B: multisegment involvement: palatal level + circumferential orohypopharyngeal obstruction Gr 3: tongue base level obstruction
Iwanaga [7] 2003	Soft palate Tonsils Tongue base		Circumferential	Palatal obstruction Circumferential palatal obstruction Tonsillar obstruction Mixed obstruction Tongue base obstruction
Den Herder [8] 2005	Nasal cavity Soft palate Tongue base Larynx			Obstruction level 1: nasal obstruction Obstruction level 2: palatal obstruction Obstruction level 23: palatal obstruction + lesser degree tongue base/laryngeal obstruction Obstruction level 3: tongue base/laryngeal obstruction Obstruction level 32: tongue base/laryngeal obstruction + lesser degree palatal obstruction
Bachar [9] 2012	N: nasal cavity P: soft palate, uvula tonsils T: tongue base L: larynx H: hypopharynx	0: no obstruction 1: partial obstruction 2: total obstruction		NPTLH
Kezirian [1] 2011	V: soft palate/uvula/pharyngeal walls at the level of the velopharynx O: oropharynx: tonsils/pharyngeal walls T: tongue base E: epiglottis	0: no obstruction 1: partial obstruction 2: total obstruction	T: transverse AP: antero-posterior C: circumferential	VOTE
Campanini [2] 2012	N: nasal cavity O: soft palate H: tongue base L: larynx a: supraglottic b: glottic	Grade 0: no collapse Grade 1: obstruction < 25% Grade 2: obstruction < 50% Grade 3: obstruction < 75% Grade 4: total obstruction	T: transverse AP: antero-posterior C: circumferential	NOHL Larynx: p: positive n: negative
Soares [11] 2012	Retropalatal space Retrolingual space Supraglottic space	Mild: obstruction 0–25% Moderate: obstruction 25–75% Severe: obstruction > 75%	T: transverse AP: antero-posterior C: circumferential	
Gillepsie [12] 2012	Palate Lateral pharyngeal walls Palatine tonsils Tongue base Lingual tonsils Epiglottis	Grade 0: no collapse Grade 1: partial collapse. Lingual region + lingual tonsils Grade 2: complete collapse. Lingual region without lingual tonsils Grade 3: partial collapse, tongue + lingual tonsils Grade 4: complete collapse tongue + lingual tonsils		DISE index score: sum of grades for different levels

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