Available Techniques for Objective Assessment of Upper Airway Narrowing in Snoring and Sleep Apnea

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ABSTRACT

A number of techniques are available to determine the level of obstructive predominance in snoring and in the obstructive sleep apnea hypopnea syndrome (OSAHS): lateral cephalography, awake endoscopy, awake endoscopy with the Müller maneuver, endoscopy during sleep, endoscopy with nasal continuous positive airway pressure during sleep, fluoroscopy, CT scanning, MR scanning, manometry, and acoustic reflections. Data from different studies using various methods suggest that different patients have different patterns of narrowing or collapse of the pharynx.

No reference standard exists for the determination of the predominant obstructive level during obstructive events, so further investigations are necessary to improve and validate existing methods and develop new techniques. These would improve our understanding of the pathophysiology of OSAHS and snoring and help to select the correct treatment option for different patients. This article lists criteria that must be used to assess the available techniques for diagnosis of obstruction level in snoring and OSAHS. The advantages and limitations of each diagnostic technique are summarized, with emphasis on the acoustic reflectometry technique.

KEYWORDS: Obstructive sleep apnea, acoustic reflection, diagnosis, upper airway, endoscopy
The obstructive sleep apnea hypopnea syndrome (OSAHS) is characterized by periodic reduction (hypopnea) or cessation (apnea) of airflow during sleep. It results from upper airway narrowing or collapse. The syndrome is associated with disrupted sleep and snoring. Patients are often referred to health care professionals through the concern of bed partners or parents who have witnessed apneas followed by choking and loud snoring.

Prevalence studies estimate that 4% of middle-aged men and 2% of middle-aged women are affected by OSAHS.1,2

A link between OSAHS and cardiac arrhythmias, ischemic heart disease, cardiac failure, hypertension, stroke, daytime sleepiness, and road traffic accidents has been suggested.3

Current diagnostic testing with polysomnography (PSG) provides information regarding the number of apneas and hypopneas per hour of sleep, but PSG does not provide any information regarding the level of pharyngeal narrowing or collapse.

A number of investigative methods have been used in order to determine the level of obstructive predominance in OSAHS: lateral cephalography, awake endoscopy, awake endoscopy with the Müller maneuver, endoscopy during sleep, endoscopy with nasal continuous positive airway pressure (nCPAP) during sleep, fluoroscopy, CT scanning, MR scanning, manometry, and acoustic reflections. Data from different studies using various methods suggest that different patients have different patterns of narrowing or collapse of the pharynx. Some studies have suggested that surgery following identification of the specific area of obstruction is more likely to be successful than surgery carried out without knowledge of the obstructive site.4–6

A recent Cochrane Library document7 suggested that further research should be undertaken to identify and standardize techniques to identify the obstructive sites in the upper airway of patients with OSAHS. This would allow evaluation of selected surgical procedures through randomized controlled trials. This article summarizes the advantages and limitations of each technique, with emphasis on the acoustic reflectometry technique.

### AVAILABLE TECHNIQUES FOR OBSTRUCTION LEVEL DIAGNOSIS IN OSAHS

The following criteria must be used to assess the available techniques for diagnosis of obstruction level in OSAHS.

1. Ease of implementation: The techniques should be noninvasive and simple for both the patient and the technician. They should not be unpleasant to perform and they should be easy to interpret.
2. Accuracy and reproducibility of the procedure are necessary. It should allow dynamic studies during sleep, with the ability to compare one patient with another and to retest at successive examinations. It should also allow simultaneous PSG.
3. Standardization of a method is important to permit comparison of results among examiners.
4. The cost-effectiveness and availability of the equipment should be kept in mind.

Table 1 summarizes the advantages and disadvantages of various methods for determining the level of pharyngeal narrowings.

### Visual Inspection and Indirect Laryngoscopy

Visual inspection of the nose and pharynx should be done to rule out gross anatomical obstructing findings or malignancies. Although inexpensive, available, and easy to perform, visual inspection is semiobjective for parts of the airway. Also, it is performed during wakefulness, where the muscular tone and respiratory drive may be different than during sleep.8