Sleep endoscopy with artificial induction of sleep and somnography in 385 snorers

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Introduction

Snoring and obstructive sleep apnoea syndrome (OSAS) are common. About 24% of men and 14% of women are snorers. The prevalence increases with age up to respectively 60% and 40% after 60. Symptom severity increases starting with incidental snoring, habitual snoring or primary / benign snoring, the upper airway resistance syndrome and ends with OSAS. There is a relation between OSAS and the development of several diseases, especially cardiovascular problems.

Both local and general factors contribute to snoring and OSAS. Local causes can be divided in four levels of obstruction: I) nose and nasopharynx, II) oropharynx III) hypopharynx and IV) larynx and combinations (see figure 1). Anatomic causes of increased nasal obstruction are nasal septum deviation, hypertrofic inferior conchae, nasal polyps and adenoid hypertrophy. Obstruction at oropharyngeal level is often caused by tonsillar enlargement long uvula or inadequate patency of the soft palate and/or redundant lateral pharyngeal tissue. Less often there is obstruction at hypopharyngeal-laryngeal level (epiglottis, base of the tongue and lateral pharyngeal tissue). Important general factors aggravating snoring and OSAS are obesity, alcohol abuse and sedative drugs.

Routine ear nose and throat examination (ENT) of the awake patient in a sitting position gives limited information about the situation during sleep. Additional reliable information about local causes of obstruction can be obtained with sleep endoscopy during artificial induction of sleep by means of midazolam. After detection of the severity (by polysomnography), the local cause (by sleep endoscopy) and evaluation of general factors, an indi-
individual therapeutic advice can be given. The aim of the present study is to investigate the value of routine sleep registration in all patients with socially unacceptable snoring.

Patients and methods
385 patients (2/1995 -> 4/1999) who complained mainly of socially unacceptable snoring, with or without complaints of OSAS were reviewed. At the first visit and after routine ENT-examination, they were advised to have

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Figure 1: Levels of obstruction of the upper airway

1. inferior conchae
2. adenoid
3. palate molle
4. uvula
5. base of the tongue
6. epiglottis
polysomnography and sleep endoscopy with midazolam. The snoring group consisted of 302 males and 83 females in an age range from 21 - 82 years (median 47.6; mean 47.6). Bodyweight: the Body Mass Index (BMI) ranged from 18.5 till 48.1 kg/m² (median 27.5; mean 28.5; SD 5). A BMI from 18.5 to 24.9 is defined as a normal weight, from 24.5 to 27 is overweight and more than 27 is obesity. Patients with severe sleep apnoea, severe obesity, patients who had had surgery of the upper airways, who were only recently snoring, patients with obvious alcohol abuse, or seasonal nasal obstruction by allergic rhinopathy, were excluded. For dynamic sleep research with midazolam patients only qualify with ASA (American Society of Anesthesiologists) classification I (the patient is healthy) and II (an illness or abnormality with a minor effect on the common state, for example: hypertension). 380 patients received nocturnal sleeping registration and 340 patients a flexible nasopharyngoscopy and laryngoscopy (also known as “dynamic sleep investigation” or “sleep endoscopy”) with midazolam sedation.

For polysomnography we used a CNS-Sleep I/T-8 recorder, which records the sleep architecture (derived from electroencephalogram, eye movements and submental electromyogram), respiration (thoracic and abdominal measurement), oxygen saturation, movements of limbs and the intensity of the snoring. Some patients had an additional extended Polysomnography (PSG). An apnoea hypopnoea index (AH Index) of > 15 apnoeas per hour established OSAS. Preceding the dynamic sleep endoscopy the nose and nasopharynx were sprayed with a local anaesthetic and decongestive (xylamethazoline and tetraecaine 1%). The investigation took place in supine position and if necessary on the left or right side. We used midazolam intravenously starting with 0.07 mg/kg bodyweight to a maximum of 0.1 mg/kg.

Results

History: beside snoring complains 306 patients (79.5%) reported (incidentally occurring) nocturnal apnoeas. Apnoeas had in many other cases not been noticed by the partner. Hypersomnia was reported in 81 patients (21%), partner insomnia in 315 patients (82%).

Polysomnography severity of apnoeas: 208 out of 380 patients (54.7%) were shown to have a minor to severe OSAS. These patients were on average older then those without OSAS. This holds true for both sexes.

Sleep endoscopy (level of obstruction): 119 patients (35%) had obstruction on one level, 221 patients (65%) on several levels, with in many cases total obstruction at one level and at a second level a minor or partial obstruction.

Eventually 37 patients (11%) of the 119 patients with obstruction at one level suffered from nasal obstruction, 74 patients (21.7 %) had an obstruction on
uvula-palate-tonsil level and 8 patients (2.5%) suffered from an obstruction at a lower level: base of the tongue, epiglottis and/or larynx. One hundred sixty five patients (48%) of the 221 patients with a multisegmental obstruction, turned out to have nasal obstruction, 11 patients (3.2%) had obstruction caused by adenoid hypertrophy, 205 patients (60%) had obstruction at orofaryngeal level and 113 patients (33%) at hypofaryngeal or laryngeal level. In particular patients with obstructions at lower level and with multisegmental obstruction suffered frequently from OSAS. During endoscopy with sedation none of the patients had such an O2-desaturation that intervention with an antidote was necessary.

**Conclusion and discussion**
We worked out how many patients with socially unacceptable snoring also have a OSAS and which local and common factors play a role in it. After polysomnography 54.3% of our patients had an apnoea-hypopnoea index (AHI) of >15. Compared with earlier reports (46% OSAS in loud snoring) this is a higher percentage. An alternative screening for detection of OSAS with as main complaint snoring, de Epworth Sleepiness Scale, a self report questionnaire, proved to be not reliable. Polysomnography remains the golden standard. ENT-examination awake and in sitting position doesn’t give a reliable impression of the level(s) of obstruction during sleep. Endoscopy during artificial induced sleep approaches the situation during snoring. There are two methods to imitate a sleep situation: intravenous administration of propofol, or intravenous administration of midazolam. In the Netherlands recently guidelines were developed to give safely sedation by a doctor who is not an anaesthetist. In 82% of our patients we saw an obstruction at orofaryngeal level, but a considerable number of patients showed obstruction at other levels as well. For all levels of obstruction there are measures and surgical interventions possible, but the severity of the defect determines how radical the therapy must be. Effectiveness and increasing morbidity of the intervention tend to go hand in hand. In conclusion it is clear that snoring and sleep apnoea have a multifactoral etiology and therefore there is no standard treatment which will be equally effective in all patients. After a careful diagnostic work up, which covers several general factors as well as local factors and determination of the severity, an individual treatment advice can be given.

**Literature**