

Excessive daytime sleepiness and fatigue in nonapnoeic snorers: improvement after UPPP

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ABSTRACT: Even in the absence of sleep apnoea, heavy snoring may be a cause of excessive daytime sleepiness (EDS) and fatigue. The aim of this investigation was to study whether uvulopalatopharyngoplasty (UPPP) is effective in relieving snoring and excessive daytime sleepiness in nonapnoeic snoring patients.

UPPP was assessed in 155 nonapnoeic, snoring patients (136 men and 19 women, mean age 45 yrs). Postoperative evaluation was made after 3 months in 105 patients, and after 12 months in 50 patients. Fifty four patients were evaluated after both 3 and 12 months. In 49 patients, a further evaluation was made after 2 yrs. The results were compared with those of 76 conservatively-treated, nonapnoeic, snoring patients, who were reinvestigated 12 months after their initial examination.

The proportion of patients with frequent loud snoring had decreased postoperatively from 96 to 18%. A highly significant improvement was reported in EDS and daytime fatigue. The proportion of patients who reported problems staying awake when driving had decreased from 29 to 7%, and the number who felt rested when awakening in the morning had increased from 23 to 78 after the operation. The patients in the UPPP group had somewhat more severe symptoms before treatment than those treated conservatively. One year after treatment the situation had been reversed, with significantly more snoring and excessive daytime sleepiness in the conservatively-treated group.

In conclusion, these results indicate that UPPP is effective in relieving snoring and EDS in nonapnoeic snorers.

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Snoring and excessive daytime sleepiness (EDS) are two cardinal symptoms in obstructive sleep apnoea (OSAS) [1]. Snoring has usually been regarded as a social nuisance rather than a significant health problem. Recently, there have, however, been several reports that heavy snoring, even in the absence of sleep apnoea, can cause EDS [2–4].

Uvulopalatopharyngoplasty (UPPP) was introduced as a method of surgery for OSAS at the beginning of the 1980s [5]. The diminution or disappearance of apnoeas and hypopnoeas with UPPP has been reported to occur in 40–65% of patients [5–7]. The operation is even better for reducing snoring and is, therefore, also used when treating patients with socially-impairing snoring without apnoeas [8]. The aim of this investigation was to study the long-term results of UPPP in nonapnoeic snoring patients.

Material and methods

This study comprised 155 patients, 136 men and 19 women (mean age 45 yrs, range 24–74 yrs), with socially-impairing snoring but without OSAS, who have undergone UPPP operation.

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Symptom evaluation

All the patients classified their symptoms on a 5-point scale, multiple-choice questionnaire [4, 6]. The questionnaire consisted of 16 symptom-related questions: difficulty in inducing sleep (DIS), difficulty in maintaining sleep (DMS), excessive daytime sleepiness (EDS), excessive daytime tiredness (EDT), feeling rested in the morning, waking up with a headache, snoring loudly, excessive movement in bed while sleeping, excessive sweating during the night, waking up because of trouble breathing, tendency to fall asleep involuntarily during the day, falling asleep while relaxing, difficulties staying awake when driving, and tendency to take a nap during the day. The symptoms were classified as: 1) none/never; 2) small/seldom; 3) moderate/occasional; 4) severe/frequent; 5) very severe/very frequent.

Nocturnal oximetric investigation

The patients were investigated during a full night with oximetry (finger probe, BIOX III). This was carried out in hospital under the supervision of a nurse, who also regularly noted whether or not the patient was asleep.

The oximetric curves were evaluated manually, with calculations of the number of desaturations of at least four percentage points during the night divided by the time spent in bed, thereby producing the desaturation index (DSI). All patients in this study group had a DSI of less than five reductions per hour. Sixteen patients were additionally investigated with full night polysomnography, comprising the simultaneous recording of electroencephalogram, electrooculogram, submental electromyograms, respiration, airflow and oxygen saturation, as described previously [1, 4, 6]. Snoring was monitored using a microphone. The diagnosis of snoring without OSAS (apnoea index <5) was confirmed in all 16 patients.

Clinical evaluation

All the patients were seen by a pulmonary specialist, to evaluate any complicating diseases, and they were also examined by an experienced ear, nose and throat (ENT) surgeon, to evaluate the possibility of a successful operation based on anatomical considerations.

Operation technique

If they were found to be suitable for operation, three different techniques of UPPP were used, depending on their anatomy. Fifty five patients, who had large tonsils and/or tonsils situated high up in a narrow angle to the uvula were operated with the classic UPPP, including tonsillectomy [6]. Thirty patients with a prolonged clumsy uvula but small tonsils and normal posterior pillars were treated with CO₂-laser technique [9]. Finally, 70 patients with small tonsils, prolonged uvula and/or pronounced posterior pillars (often web-like, attached far down onto the uvula) were operated under local anaesthesia with the same technique as the classical UPPP, except for the tonsillectomy.

Postoperative evaluation

A questionnaire, with the same questions as the pre-operative one, was completed by the patients in a post-operative evaluation. The patients were also asked to report postoperative complications. The first postoperative evaluation was made after 3 months in 105 of the patients, and after 12 months in 50. In 54 patients, an evaluation was made after both 3 and 12 months. In 49 patients, a further evaluation was made after approximately 2 yrs.

Controls

Seventy six patients (47 men and 29 women, mean age 49 yrs, range 18–79 yrs) were investigated as above. In 12 patients this included a full night-time polysomnography. All patients were found to be heavy snorers, without OSAS. The patients were not considered suitable for UPPP for various reasons (operative risk factors, such

as heart diseases, unfavourable conditions of the pharynx or refusal of surgery). They were therefore treated conservatively, which included advice on weight reduction. A symptomatic re-evaluation of the patients was made after 12 months, using the same questionnaire as the patients who had been operated on.

Statistics

Analysis of variance (ANOVA) for repeated measurements was used to test the significance of changes within each group. Factorial ANOVA was used when comparing the two patient groups and the three operation methods. Spearman's rank correlation test was used when studying the influence of different variables on the symptomatic outcome of the treatments. A p-value of 0.05 (two-tailed test) was considered significant.

Results

The patient characteristics and results of the otorhinolaryngological examination in the patient groups that were operated on and in those treated conservatively are presented in table 1.

Symptomatic effect of UPPP

A highly-significant improvement in all the symptom variables apart from DIS was seen in the first postoperative evaluation, which was made after 3 months in 105 patients and after 12 months in 50 patients (table 2). The number of patients who often felt rested in the morning when awakening had increased from 23 to 78 after the operation. A highly significant ($p < 0.01$) improvement in all symptoms, apart from DIS, was also seen when comparing the 3 month ($n = 105$) and the 1 yr ($n = 104$) evaluation, separately, with the pretreatment values. Results from the 1 yr evaluation are presented in figures 1 and 2.

Table 1. – Patient characteristics in 231 patients investigated because of suspected OSAS where no sleep apnoea was detected

	UPPP treatment (n=155)	Conservative treatment (n=76)
Body mass* kg	80±11	76±13
BMI* kg·m ⁻²	25±3	25±3
Oxygen desaturation index*	1.2±1.4	1.1±1.3
Concurrent diseases		
Ischaemic heart disease n	1	7
Hypertension n	15	17
Diabetes n	3	-
Upper airway evaluation		
Possibly suitable for UPPP %	51	37
Clearly suitable for UPPP %	29	11

*: data presented as mean±sd. OSAS: obstructive sleep apnoea syndrome; UPPP: uvulopalatopharyngoplasty; BMI: body mass index.

Table 2. – Change in reported symptoms before and 3 or 12 months after UPPP (n=155)

	Before			After	
	M %	S %		M %	S %
Difficulty inducing sleep	14	7	*	11	4
Difficulty maintaining sleep	33	27	***	19	10
Excessive daytime sleepiness	36	41	***	21	7
Excessive daytime tiredness	31	54	***	30	7
Snoring	4	96	***	21	18
Morning headache	29	15	***	10	2
Awakening because of trouble breathing	24	13	***	7	3
Involuntarily falling asleep	23	12	***	6	3
Falling asleep when relaxing	30	50	***	29	26
Tendency to take a nap in the daytime	26	20	***	20	6
Difficulty staying awake when driving	21	8	***	6	1

UPPP: uvulopalatopharyngopathy; M: moderate or occasional problems; S: severe or frequent problems. *: $p < 0.05$; ***: $p < 0.001$ (before vs after UPP).

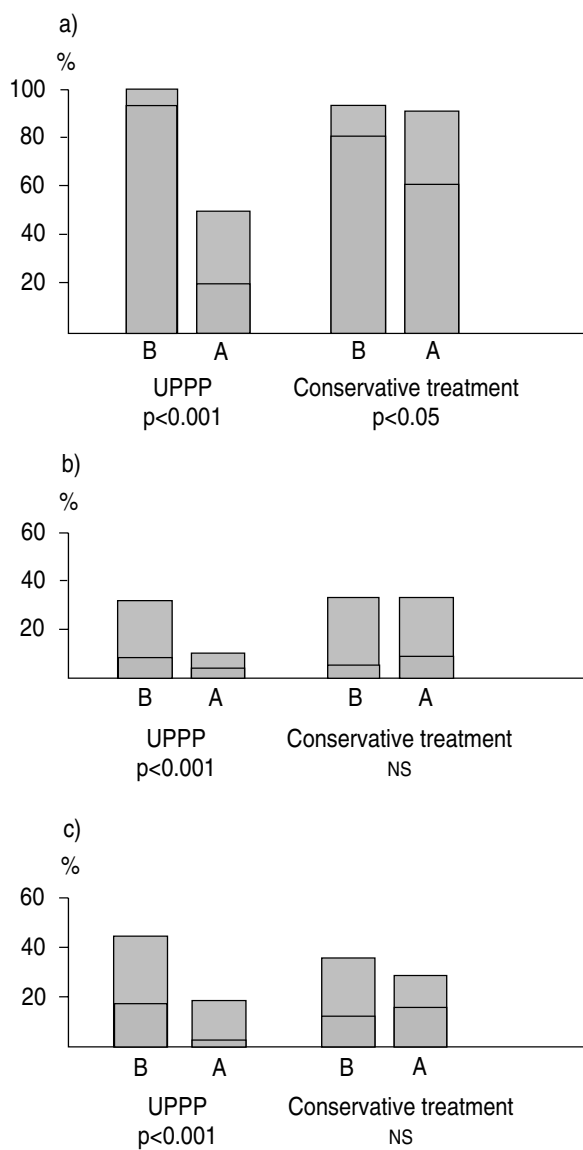


Fig. 1. – a) snoring loudly; b) awakenings due to nocturnal breathing problems; and c) morning headache, before (B) and one year after (A) treatment, in nonapnoeic patients treated with UPPP (n=104) or conservatively (n=76). ■: frequent problems; □: occasional problems. UPPP: uvulopalatopharyngopathy; NS: nonsignificant.

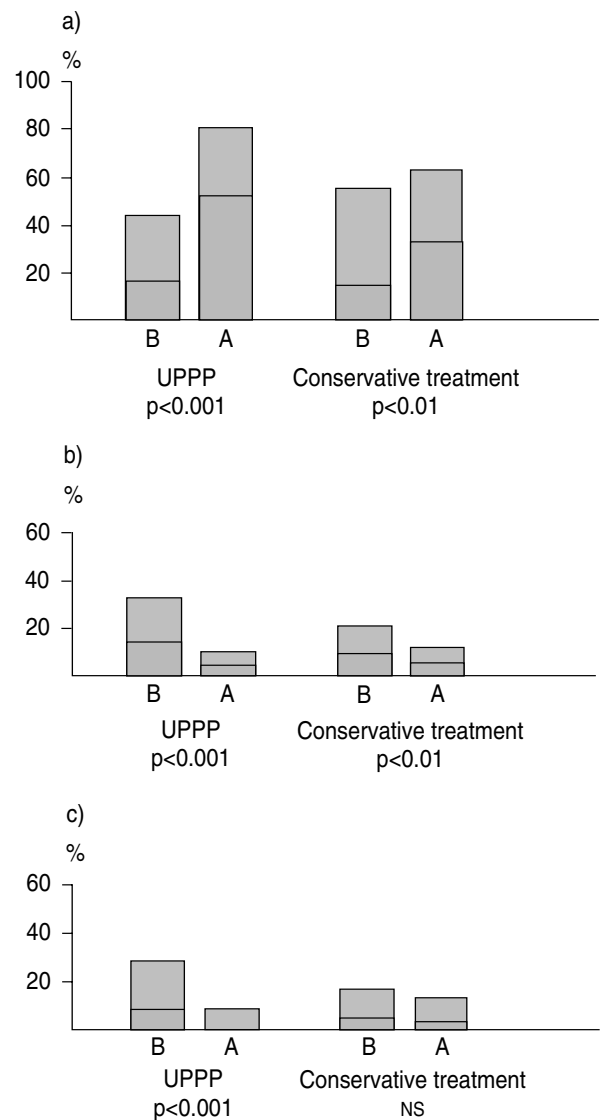


Fig. 2. – Daytime alertness before (B) and one year after (A) treatment in nonapnoeic patients treated with UPPP (n=104) or conservatively (n=76). a) feeling rested in the morning; b) involuntarily falling asleep at daytime; c) problems keeping awake when driving. ■: frequent problems; □: occasional problems. For abbreviations see legend to figure 1.

A significant correlation between a high body mass index before the operation and a better symptomatic effect was found for two of the variables: morning headache and problems with involuntarily falling asleep ($p < 0.01$). No significant correlations were found between the symptomatic outcome and age, DSI or operation method.

Side-effects after UPPP

Minor side-effects were reported by 42 of the patients: problems swallowing ($n=12$), irritation in the throat ($n=19$), nasal speech ($n=3$), hypersecretion in the throat ($n=4$), nasal regurgitation ($n=3$) and a tendency to vomit ($n=1$). There was a tendency towards more side-effects after UPPP performed using the standard technique (35%) than after CO_2 -laser treatment (23%) or UPPP performed under local anaesthesia (23%).

Long-term effects of UPPP

Fifty four patients were evaluated after both 3 and 12 months. The number of patients with frequent snoring had increased from 8 to 12 ($p < 0.05$) at the 12 month evaluation. Otherwise, no significant difference in symptom scores was found between the 3 and 12 month evaluations.

Forty nine patients were evaluated after 2 yrs. Compared with pretreatment data, a highly significant improvement was seen in all variables ($p < 0.01$), except problems with falling asleep when relaxing and staying awake when driving ($p < 0.05$). Compared with the first postoperative evaluation, there was an increase in the number of patients with frequent snoring (10 vs 14, $p < 0.05$). Otherwise, no significant differences in symptom scores were found between the first and the 2 yr postoperative follow-up.

Nine patients were evaluated after 5 yrs. The number of patients who felt rested when wakening was 0 before, and 7 and 5, respectively, at the first and the 5 year postoperative evaluation ($p < 0.001$). The number of patients with frequent snoring had decreased from 9 to 1 and 2, respectively, at the first and 5 year evaluation ($p < 0.001$).

Effect of UPPP compared with conservative treatment

A comparison was made between the 76 conservatively-treated patients and the 104 UPPP-treated patients who were evaluated after one year. Before treatment, the conservatively-treated patients had significantly lower symptom scores for EDS, problems with involuntarily falling asleep, problems staying awake when driving ($p < 0.05$) and snoring ($p < 0.001$), than the patients who were operated on (figs 1 and 2).

In the conservatively-treated group, a small but significant decrease in EDS, snoring ($p < 0.05$), EDT, problems with involuntarily falling asleep and problems with falling asleep when relaxing ($p < 0.01$) was found at the follow-up evaluation. There was also an increased percentage of patients who felt rested in the morning ($p < 0.01$) (fig. 2).

After treatment the patients who were operated on had significantly lower symptom scores for tendency to take a nap in the daytime ($p < 0.05$), EDS, morning headache ($p < 0.01$), DMS, snoring, and waking because of trouble breathing ($p < 0.001$) than the conservatively-treated patients. More patients in the operated group also felt rested when wakening in the morning ($p < 0.01$) (fig. 2).

Twenty four patients in the conservatively-treated group were evaluated after 2 yrs. Before treatment there was significantly less EDS in the conservatively-treated group compared with the operated group ($p < 0.05$). Two years after treatment there was significantly less DMS ($p < 0.05$), snoring and morning headache in the operated group ($p < 0.01$).

Effect on body mass

The mean body mass after UPPP treatment remained unchanged: 80 kg (range 60–113 kg). A decrease in body mass was reported by 51 of the patients (range 1–7 kg). No significant correlation was found between the result of treatment and change in body mass in the UPPP-treated group.

In the conservatively-treated patients, the mean body mass was also unchanged 76 kg (50–105) after treatment. A decrease in body mass was reported by 16 of the patients (range 1–13 kg). A significant correlation between the decrease in body mass and the decrease in symptom score after one year was found for awakening because of trouble breathing ($r=0.30$; $p < 0.05$), and tendency to take a nap ($r=0.36$; $p < 0.01$).

Discussion

The main finding in this study is that UPPP is effective both in relieving snoring and EDS in nonapnoeic snorers. As a result, the proportion of patients with problems with daytime sleepiness had decreased from 77 to 28%, and reported problems staying awake when driving had decreased from 29 to 7%, in the group of patients who were operated on. A similar symptomatic improvement was seen in all the other studied variables of daytime sleepiness.

Concerning the long-term effect of UPPP in nonapnoeic snoring patients, we have only limited data. In the subgroup of patients who were reinvestigated after 2 yrs in the present study, some patients displayed a tendency to relapse in terms of the snoring problem. The symptom score for the variables of daytime sleepiness remained relatively unchanged, compared with the first postoperative evaluation, however. The results from the nine patients that were evaluated after 5 yrs also indicate that there is a beneficial long-term effect after UPPP operations in many patients.

The usual purpose for screening investigations on patients with heavy snoring is to find patients that have obstructive sleep apnoea. Patients in whom sleep apnoea is detected are then often offered treatment. The reason for this is that patients with OSAS have an increased

cardiovascular morbidity [10], and often also severe problems with daytime sleepiness, which can be a hazard both for the patient and others as for instance in the traffic [11]. Our intention with this report is to give some attention to the proportion of patients in whom the screening result is negative - the non-apnoeic heavy snorers.

In a previous study, we have reported that daytime sleepiness is not exclusively a problem for snorers with sleep apnoea [4]. Thus, when comparing heavy snorers with and without sleep apnoea, we have found that both have frequent problems with daytime sleepiness, with a considerable overlap between the groups. One polysomnographic study has shown that some snorers without sleep apnoea have an increased number of electro-encephalographic (EEG) arousals [2]. This is a possible explanation for the high prevalence of daytime fatigue in nonapnoeic snorers.

We are well aware that this is not a randomized study, and that our choice of a control group of nonoperated patients is open to criticism. Our patients were unselected patients who were referred to us because of suspected sleep apnoea. In patients in whom no apnoea was found, the decision for treatment was based primarily on the patient's view of the degree of social impairment caused by the snoring. Other factors, such as anatomical features and complicating concurrent diseases also played a part in the decision-making. This is also reflected in the differences between the two treatment groups of non-OSAS patients. Consequently, more of the patients in the group in which UPPP was performed had upper airways regarded as anatomically suitable for UPPP. In this group, fewer patients also had ischaemic heart disease. The group that was operated on had somewhat more severe symptoms before treatment than the conservatively-treated group. One year after treatment, the situation was, however, reversed, with significantly more problems with snoring, morning headache, nocturnal breathing problems and daytime fatigue in the nonoperated group.

It is well-known that both snoring and OSAS are related to obesity [1]. It is also known that weight loss improves OSAS [12, 13]. In this study, the mean body mass remained unchanged in both treatment groups. In the conservatively-treated group there was, however, some indication that patients who managed to lose weight improved symptomatically. The main problem with weight reduction as a treatment for snoring or OSAS is the difficulty in maintaining the weight loss in the long-term [12].

In the majority of patients, the diagnosis of nonapnoeic snoring was solely based on measurements of oxygen saturation at night. RAUSCHER *et al.* [14] found that oximetry alone caused a misclassification (>30% difference) in 23% of the patients compared with polysomnography. Similar results were reported in a study by COOPER *et al.* [15], where 30% of patients with a negative oximetry had a positive polysomnography (apnoea index >5). It is, therefore, possible that we have included some patients with a low-grade OSAS.

A further reason why our results must be interpreted with some caution is that we have not used objective measurements of daytime fatigue, such as the multiple sleep latency test. Such studies would be of value in heavy snorers without sleep apnoea.

In conclusion, this study indicates that UPPP should be considered as a treatment option in nonapnoeic snorers who have problems with daytime sleepiness.

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