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ORIGINAL ARTICLE

Pharyngeal disturbances in OSAS patients before and 1 year after UPPP

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Abstract

Conclusions: The results indicate that conservative uvulopalatopharyngoplasty with tonsillectomy (UPPP) did not change the degree of pharyngeal disturbances in patients with obstructive sleep apnea syndrome (OSAS). **Objectives:** To investigate if the symptom scores of pharyngeal disturbances in OSAS patients were changed 1 year after UPPP, by using a questionnaire pre- and postoperatively, and to compare with healthy non-snoring controls. **Methods:** Fifty men and eight women, median age 46 years (range 25–75), median body mass index (BMI) 28 kg/m² (20–38), and median preoperative oxygen desaturation index 16 (7–100) were included as they had all failed non-surgical treatment and wanted pharyngeal surgery. The questionnaire consisted of 10 questions with 4 degrees of disturbances; the maximum score was 30 and was evaluated before and 1 year after surgery. Fifteen age-, gender- and BMI-matched controls responded to the same questionnaire. **Results:** Responses to the questionnaire were provided pre- and postoperatively by 47 of 58 patients (81%). Their median score was unchanged from 5 (range 0–17) to 5 (0–19), compared with controls 1 (0–3). Analyses of separate questions showed a significant decrease in the score for ‘globus sensation’ and ‘swelling’ postoperatively.

Keywords: *Dysphagia, swallowing disturbances, globus, snoring*

Introduction

Obstructive sleep apnea syndrome (OSAS) is common, with a prevalence of 4% among men and 2% among women. The main symptoms of OSAS are loud snoring, daytime sleepiness, and cognitive impairment. Known complications are diabetes mellitus and cardiovascular diseases, which are the main reasons for an increased mortality rate [1]. OSAS may also be a progressive disease. The etiology of the progression is probably an increased upper airway resistance due to weight gain and/or dysfunction of the reflexogenic dilatation during inspiration and sleep. The latter may be explained by a pharyngeal nerve lesion with damaged pharyngeal muscles and mucosa caused by the trauma of snoring, i.e. vibration and stretching [2].

Treatment methods have varied during past decades. Uvulopalatopharyngoplasty (UPPP) was first introduced by Fujita et al. in 1981 [3] for treatment

of OSAS, and it aims to relieve the obstruction by increasing the surface area of the pharynx. The enthusiasm for UPPP has declined since severe postoperative adverse effects have been reported [4]. Well-known side effects are different kinds of swallowing disturbances. According to a recently published review, persistent side effects occurred in a mean of 58% (range 42–62%) [5]. Swallowing difficulties were listed, including nasal regurgitation, voice changes, taste and smell disturbances, as well as globus sensation.

Levring-Jäghagen et al. have shown in videoradiographic studies that OSAS patients had subclinical pharyngeal swallowing dysfunction after UPPP and UPP (without tonsillectomy) [6]. The authors suggest that a local neuropathy caused by snoring could explain the findings. Other possible mechanisms for the swallowing disturbances in OSAS include laryngopharyngeal reflux (LPR). Gastro-esophageal reflux (GER) has been shown to be significantly higher in

OSAS patients than in the normal population [7], but the prevalence of LPR in OSAS patients is unknown. LPR means that GER continues to the laryngopharynx, oral cavity, etc. Symptoms of LPR include globus sensation [8], dysphagia, chronic sore throat (pain and irritation), excessive throat clearing, and excessive phlegm/saliva [9].

To the best of our knowledge there is no validated questionnaire translated into Swedish concerning pharyngeal symptoms. In the present study we used a local questionnaire, similar to the one used by Levring-Jäghagen et al. in their study of OSAS patients [6].

A recent study from our group presented data from 158 OSAS patients who had undergone conservative UPPP with tonsillectomy [10]. The study showed significant decrease in oxygen desaturation index (ODI) and a low rate of postoperative complications. However, the long-term pharyngeal side effects were not shown, which we chose to do in the present study, by questioning the first 58 consecutively recruited patients from the same cohort.

The first aim of the present study was to investigate the pharyngeal disturbances in OSAS patients with a local questionnaire before and 1 year after a conservative UPPP including tonsillectomy. The second aim was to compare pharyngeal disturbances in OSAS patients with non-snoring healthy controls.

Material and methods

This was a prospective intervention study carried out between 2002 and 2004. The primary outcome was defined as changes in the symptom score of a local questionnaire concerning pharyngeal disturbances in OSAS patients before and 1 year after UPPP. The secondary outcome was defined as differences in the symptom scores between OSAS patients preoperatively and non-snoring healthy matched controls. Additional outcomes were satisfaction rate and changes in ODI 1 year after UPPP.

Inclusion criteria included responding to the local questionnaire on pharyngeal disturbances before

surgery, ambulant sleep apnea recordings resulting in ODI > 5, and/or AHI > 9, and daytime symptoms of OSAS. The patients should have failed or not accepted continuous positive airway pressure (CPAP) and/or a mandibular retaining device (MRD), and wished to undergo surgery.

Exclusion criteria included a negative for surgical treatment; severe heart, pulmonary, psychiatric or neurological disease; American Society of Anesthesiologists (ASA) class > 3; coagulopathy; and morbid obesity, i.e. body mass index (BMI) > 38.

The study was approved by the Regional Ethical Review Board in Stockholm.

Subjects

Fifty-eight patients, 50 men and 8 women, fulfilled the criteria and were consecutively included. They underwent UPPP at the ORL Department during the years 2002–2004 (Table I), and had been evaluated in our previous study with other outcome variables [10]. Upper airway examination included fiber-endoscopy and grading of tonsil size on a scale of 1–4 (where 4 = maximum). None of the patients had previously undergone tonsillectomy. The examinations showed that 15 of 57 (26%) had hypertrophied tonsils (size 3–4).

Controls

The control group consisted of 15 persons, 3 women and 12 men. They were age-, gender- and BMI-matched to the OSAS patients (see Table I). Their spouses or family members confirmed that the persons were non-snorers.

Characteristics of the dropout group

Dropouts were defined as OSAS patients who had not filled out the postoperative questionnaire on pharyngeal disturbances. Table I shows anthropometric data

Table I. Characteristics of patients before surgery.

Parameter	All	Male	Female	Dropouts	Controls
Number of subjects	58	50	8	11 (9 M/2 F)	15 (12 M/3 F)
Age (years)	46 (25–75)	45 (25–75)	47 (31–70)	42 (30–58)	43 (18–58)
BMI (kg/m ²)	28 (20–38)	28 (22–35)	27 (20–38)	27 (23–35)	27 (22–31)
Total score for pharyngeal disturbances	5 (0–17)	5 (0–17)	7 (1–14)	5 (0–11)	1 (0–3)
ESS	12 (1–21)	12 (1–21)	9 (4–19)	13 (2–21)	...
ODI ₄	16 (7–100)	16 (7–100)	14 (10–70)	15 (7–100)	...

Values are presented as median and range. BMI, body mass index; ODI₄, oxygen desaturation index ≥ 4%.

and preoperative ODI, ESS, and pharyngeal disturbance scores for dropout patients. There were no significant differences in age, BMI, score for pharyngeal disturbances, tonsil size, ESS or ODI when comparing the dropout group with the patients who fulfilled the study (Mann–Whitney U test).

Surgical procedure

Eleven ear, nose, and throat surgeons, specialists and residents under training, performed a conservative UPPP with tonsillectomy, as previously described by Lundkvist et al. [10]. Briefly, the uvula was shortened to approximately 1 cm, the posterior tonsil pillars were preserved, the anterior pillars were reduced with approximately 2–3 mm, and suturing of the mucosa also included fibers of the palatopharyngeal muscle, especially in the upper lateral corner.

No concurrent surgery, such as for example surgery of the nose or tongue, was performed.

Follow-up

All patients were followed up by the surgeon 2 months after surgery and by receiving a letter with questionnaire 1 year after surgery.

One of the authors (K.L.) performed telephone interviews with some of those who had not returned the questionnaire.

Questionnaire

There were 10 questions on the degree of pharyngeal disturbances. Four of the questions (nos 6, 8, 9, and 10) have previously been used by Jäghagen et al. [11]. See Table II for questions concerning pharyngeal disturbances. The questions were answered on a four-point ranking scale: never (0), sometimes (1), often (2), and always (3). The maximum symptom score was 30.

The percentage of patients and controls responding 'often or always' was calculated for each question.

An extra question was added: 'Are you satisfied with the operation?'. The question was answered with a 'yes' or a 'no'.

Sleep apnea recordings

All ambulant recordings with Embletta (Medcare Flaga, Reykjavik, Iceland) included monitoring of respiratory movements and nasal flow, snoring, pulse oximetry, and body position. The ODI, measuring the

number of oxygen desaturations $\geq 4\%$ per sleeping hour (ODI₄), was determined. The recordings for all patients before and after surgery were interpreted by specialists in neurophysiology from the same laboratory department. The apnea-hypopnea index, measured by means of a thermistor, was considered to be unreliable at this time, and was therefore excluded.

Statistical analysis

Comparisons were made between OSAS patients and controls and dropouts, respectively, with the Mann–Whitney U test for unpaired groups. The Wilcoxon matched pair test was used for individual analyses of the swallowing questions before and after surgery. The Spearman rank correlation test was used for all correlations. In the intention to treat analyses missing values for dropouts were imputed by using their baseline values +1. Hence, for dropouts we assumed a small increase between baseline and follow-up. *p* values < 0.05 were considered significant.

Results

Questionnaire on pharyngeal disturbances

Patients before and after surgery. The range of the scores varied between 0 and 30. In all, 58 patients responded preoperatively and 47 responded both preoperatively and 1 year postoperatively, giving a dropout rate of 19%. There was no change between pre- and postoperative symptom score; median of 5.0 (range 0–17) and 5.0 (0–19), respectively. The intention to treat analyses of 58 patients showed the same results, median of 5.0 (range 0–17) and 5.0 (0–19).

Preoperatively 38 of 58 patients (66%) and postoperatively 31 of 47 (66%) had a total score higher than 3 (maximum possible = 30). In contrast, none of the controls showed a total score above 3.

Separate questions for patients before and after surgery. The range of the scores varied between 0 and 3. The scores of the 47 patients showed significant decreases between pre- and postoperative scores for question nos 2 and 4 (Figures 1 and 2). Data from all the questions are shown in Table II.

Patients before surgery compared to controls. The range of the scores varied between 0 and 30. The 58 patients had a significantly higher median score of 5 (range 0–17), compared with the 15 controls, with a median score of 1 (range 0–3), *p* < 0.001 (Mann–Whitney U test).

Table II. Results for questionnaire.

Question	Controls Tot N = 15	Patients preop 1 Tot N = 58	<i>p</i> value	Patients preop 2 Tot N = 47	Patients postop Tot N = 47	<i>p</i> value
Q1 Do you have vivid queasy feelings in your throat, for example when you brush your teeth?	0 (0–2) N = 1 7%	0 (0–3) N = 13 23%	NS	0 (0–3) N = 10 22%	0 (0–3) N = 7 15%	NS
Q2 Do you have a globus sensation in your throat, for example at dry swallowing?	0 (0–1) N = 0 0%	1 (0–3) N = 23 39%	0.001	1 (0–3) N = 19 41%	0 (0–3) N = 11 24%	0.02
Q3 Do you have problems with excessive mucus secretion in your throat?	0 (0–0) N = 0 0%	1 (0–3) N = 12 21%	0.000	1 (0–3) N = 11 24%	1 (0–3) N = 18 39%	NS
Q4 Do you have problems with a swollen throat in the morning?	0 (0–1) N = 0 0%	1 (0–3) N = 14 24%	0.024	1 (0–3) N = 10 22%	0 (0–2) N = 3 7%	0.003
Q5 Do you have problems with a feeling of scraping in your throat?	0 (0–0) N = 0 0%	0 (0–3) N = 5 9%	0.011	0 (0–3) N = 4 9%	0 (0–3) N = 8 16%	NS
Q6 Do you have any trouble with swallowing when drinking, for example water?	0 (0–0) N = 0 0%	0 (0–2) N = 3 5%	NS	0 (0–2) N = 2 4%	0 (0–2) N = 3 7%	NS
Q7 Do you have any trouble with swallowing when eating solid food?	0 (0–1) N = 0 0%	0 (0–2) N = 2 4%	NS	0 (0–2) N = 2 4%	0 (0–3) N = 4 9%	NS
Q8 Do you get drinks or food behind or into your nose when swallowing?	0 (0–1) N = 0 0%	0 (0–1) N = 0 0%	NS	0 (0–1) N = 0 0%	0 (0–3) N = 2 4%	NS
Q9 Does food or drink go down into the trachea, so that you have to cough when you swallow?	0 (0–1) N = 0 0%	0 (0–2) N = 2 4%	NS	0 (0–2) N = 2 4%	0 (0–2) N = 3 7%	NS
Q10 Do you have to concentrate on swallowing to avoid problems?	0 (0–1) N = 0 0%	0 (0–2) N = 4 7%	NS	0 (0–2) N = 3 7%	0 (0–3) N = 4 9%	NS

Tot N, total number of controls and patients in each group. Values represent degree of pharyngeal disturbances, 0 = never, 1 = sometimes, 2 = often, 3 = always, and are presented as median and range. N, number of controls and patients responding 'often or always' for each question, and the percentage of the total number. NS, non-significant difference. Preop 1 means the patients responding to the questionnaire preop N = 58. preop 2 means the 47 patients responding to the questionnaire both preoperatively and postoperatively. (11 patients, 19% were dropouts).

Separate questions in patients compared to controls. The range of the scores varied between 0 and 3. There were significant differences between patients and controls for question no. 2 (Figure 1), question no. 3, question no. 4 (Figure 2), and question no. 5. Data from all the questions are shown in Table II.

Satisfaction with the surgical procedure

In all, 57 of 58 patients answered the question about satisfaction; 52 of 57 (91%) answered 'yes' and 5 of 57 (9%) answered 'no'.

Results from sleep recordings

Fifty patients underwent both pre- and postoperative sleep recordings. Their ODI was significantly

reduced from median 16 (7–70), to median ODI 7.0 (0–60), $p < 0.0001$ (Wilcoxon matched pairs test).

Correlations between pharyngeal disturbances and other outcomes

Significant ($p < 0.05$) positive correlations were found between changes in scores for pharyngeal disturbances and age ($r = 0.38$) and postoperative scores ($r = 0.43$), and significant negative correlations were found between changes in scores for pharyngeal disturbances and satisfaction ($r = -0.35$) and preoperative score ($r = -0.33$, Spearman rank correlation).

Further significant correlations were found between pre- and postoperative scores for pharyngeal disturbances, $p < 0.05$, $r = 0.63$.

Figure 1. Question no. 2. 'Do you have a "globus sensation" in your throat, for example when dry swallowing?'. The question was answered on a four-point ranking scale; never, sometimes, often, and always. The figure shows the percentage of answers for each group. Comparisons between the patients preoperatively ($n = 47$) and the controls ($n = 15$), $p = 0.0009$ (Mann-Whitney U test). Comparisons between patients preoperatively ($n = 47$) and postoperatively ($n = 47$), $p = 0.02$ (Wilcoxon matched pairs test).

Figure 2. Question no. 4. 'Do you have problems with a swollen throat in the morning?'. The question was answered on a four-point ranking scale; none, sometimes, often, and always. The figure shows the percentage of answers for each group. Comparisons between the patients preoperatively ($n = 46$) and the controls ($n = 15$), $p = 0.024$ (Mann-Whitney U test). Comparisons between patients preoperatively ($n = 46$) and postoperatively ($n = 46$), $p = 0.003$ (Wilcoxon matched pairs test).

There were no significant correlations between scores for changes in pharyngeal disturbances and preoperative ODI, BMI, or for changes in ODI. Only seven women responded to the questionnaire pre- and postoperatively, making statistical calculations of gender differences inappropriate. The median BMI values were unchanged.

There were no differences between the surgeons according to success rate or pharyngeal disturbances.

Discussion

This study showed no changes in the median symptom scores between preoperative and 1-year postoperative evaluation of subjective pharyngeal

disturbances in 47 patients with OSAS. There were no differences between the per protocol and the intention to treat analysis. A majority (66%) of the patients had higher scores than any of the controls both pre- and postoperatively. Analyses of separate questions showed a significant decrease in the symptom score concerning 'globus sensation' and 'swollen' throat. None of the other questions, including nasal regurgitation, showed any significant differences after surgery. In all, 91% of patients were satisfied with the surgery.

Correlation analyses showed that patients with high preoperative symptom scores for pharyngeal disturbances reduced their scores more than patients with low preoperative scores.

Further, not surprisingly, satisfied patients had significantly less changes in the score for disturbances than non-satisfied patients, and older patients had a significantly higher preoperative score than younger patients. A previous study has reported that dysphagia is more common in elderly individuals [12]. However, a recent epidemiologic study from Australia showed that the prevalence of dysphagia based on questionnaires is 16% and the highest peak was between 40 and 49 years [13].

A recently published review has evaluated surgery for snoring and OSA from 1989 and forward [5]. The authors reported persistent side effects after surgery in a mean of 58% (range 42–62%). However, they did not report preoperative symptoms, and many different surgical methods were included in the review. Since Fujita et al. first described UPPP [3] various methods have been described, often with large excisions of the soft palate and uvula, laser-assisted uvulopalatoplasty or temperature-controlled radiofrequency tissue ablation. Nowadays, the methods and learning curve have developed and we have chosen to perform a conservative UPPP with cold steel, which may explain our results of unchanged median symptom score 1 year after surgery. A possible explanation for the significant reduction of the specific disturbances 'globus' and 'swollen throat' in our OSAS patients could be the significantly reduced respiratory effort, indirectly measured with the ODI, which was halved. However, there was a wide range in the degree of symptoms both pre- and postoperatively, indicating a large inter-individual variability.

There was a significant difference in median symptom score of pharyngeal disturbances when comparing OSAS patients with non-snoring controls. Further, when analyzing the scores for separate questions, there were significant differences between patients and controls regarding the questions on 'globus sensation', 'excessive mucus secretion', 'swollen throat', and 'feeling of scraping'. The

prevalence of dysphagia in OSAS patients is unknown and an interesting issue is the probable causes for the pharyngeal disturbances shown in our patients. The causes may be several; first, chronic vibrations of tissue because of snoring may cause neuronal damage. There is reported evidence that snoring might cause pharyngeal local efferent and afferent nerve lesions [2]. Another study has shown a correlation with laryngeal sensory dysfunction and sleep apnea severity [14]. Second, studies have assessed inflammation predominantly in the oropharyngeal tissues of OSAS subjects [15]. Third, a link between OSA and GER has been suggested. The prevalence of GER in OSAS patients is significantly higher (54–76%) compared with the normal population [16], and CPAP treatment may significantly reduce GER symptoms [17]. When GER continues to the laryngopharynx and oral cavity it is called laryngopharyngeal reflux, LPR. Symptoms of LPR include globus sensation [8], dysphagia, chronic sore throat (pain and irritation), excessive throat clearing, and excessive phlegm/saliva [9] – symptoms found in our patients before and to a lesser degree after surgery. Subsequently, several of these symptoms may have been caused by LPR and/or snoring trauma.

This study has some limitations. We did not objectively verify the pharyngeal disturbances in this study as there are no available gold standard methods. Further, the questionnaire used to evaluate pharyngeal disturbances has not been validated. However, four of the questions have been used in previous studies [6], and all questions were considered of clinical significance for this patient group. In addition, there is no validated questionnaire in the Swedish language available for this patient group. Also, we did not perform sleep recordings for the non-snoring controls. However, they all had spouses who confirmed that they were non-snorers.

This study has several strengths, i.e. a prospective design and a control group with subjects that were age-, gender-, and BMI-matched with the OSAS patients. We have analyzed separate questions and identified four types of disturbances in which OSAS patients differed from controls. Furthermore, previous studies reporting postoperative dysphagia most often have been retrospective with the risk of 'recall bias'. In our study this risk was avoided by having the patients fill in the questionnaire twice, directly before and 1 year after surgery.

Conclusions

Our results suggest that conservative UPPP does not change the median symptom score for pharyngeal

disturbances in patients with OSAS after 1 year. Patients with OSAS had a significantly higher score for disturbances before surgery in comparison with non-snoring controls. Plausible causes for the disturbances are LPR, vibration-damaged tissue, and inflammation.

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