Long-term Survival After Uvulopalatopharyngoplasty in Nonobese Heavy Snorers

A 5- to 9-Year Follow-up of 400 Consecutive Patients

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Background: Heavy snoring and the obstructive sleep apnea syndrome are associated with increased morbidity and mortality in patients with cardiovascular disease. The effect of uvulopalatopharyngoplasty on mortality has been questioned.

Objective: To investigate long-term survival after palatal surgery.

Design: An observational retrospective case-control study with a 5- to 9-year follow-up.

Setting: A university medical center.

Patients: Four hundred consecutive heavy snorers (median age, 47 years), 256 of whom had obstructive sleep apnea syndrome. The mean±SD body mass index (calculated as weight in kilograms divided by the square of height in meters) of all included patients was 27.1±4.2. Comparison was made with 744 control patients (median age, 43 years) who underwent nasal surgery during the same period and a matched general control population.

Intervention: Uvulopalatopharyngoplasty or laser uvulopalatoplasty between 1986 and 1990.

Main Outcome Measures: Mortality and causes of death up to 9 years after surgery.

Results: High blood pressure at the time of surgery and subsequent death due to cardiovascular disease were 3 times more frequent in the patients with obstructive sleep apnea syndrome than in both control groups (P<.01), but the overall long-term mortality was not increased either in snorers or in persons with sleep apnea. The cumulative survival rate was more than 96% for the 400 patients, the 744 controls, and the matched general population.

Conclusions: No increased mortality was seen following palatal surgery in this long-term follow-up of 400 consecutive, on average, nonobese snorers, 256 of whom had obstructive sleep apnea syndrome. This might indicate a positive survival effect of surgery.

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SUBJECTS AND METHODS

SUBJECTS

All adult patients treated for rhonchopathy between February 1986 and March 1990 at the Department of Otorhinolaryngology, Karolinska Hospital, Stockholm, Sweden, were included.

To account for complete consecutive patient material, even patients primarily undergoing CPAP treatment before March 1990 or undergoing CPAP as a secondary treatment during this period were registered.

Control group 1 consisted of patients older than 30 years who underwent nasal surgery between January 1986 and October 1990, because of nasal obstruction. Those who underwent palatal surgery during the control period, because of rhonchopathy, were excluded.

Control group 2 was a sex- and age-matched general population collected from the Cancer Epidemiological Institute in cooperation with Statistics Sweden, both located in Stockholm. It reflected the expected survival of each specific individual.

The survival of patients and controls was followed up to a definite end point of the study, February 6, 1995. Subjects no longer living in Sweden were excluded to avoid inaccurate data.

DIAGNOSIS AND DEFINITIONS

All patients scored their symptoms in a validated self-report questionnaire. The questions concerned presence of snoring, daytime sleepiness, involuntary sleep attacks, midsleep awakenings, and breath cessations. Based on this, the patients were classified as having social rhonchopathy if they were nonsleepy snorers. Patients who reported disturbing, habitual snoring (often to always) in combination with EDS were classified as having medical rhonchopathy. These patients were subjected to sleep studies. If this study showed an apnea-hypopnea index or an oxygen desaturation index above 5, the patient was diagnosed as having OSAS. The remaining patients were sleepy snorers clinically diagnosed as having upper airway resistance syndrome.

PREOPERATIVE EXAMINATION

All patients were subjected to a thorough review of their medical record; a standard preoperative ear, nose, and throat examination; and, in selected patients, cephalometry and fiberoptic rhinolaryngoscopy during voluntary throat examination; and, in selected patients, cephalometry and fiberoptic rhinolaryngoscopy during voluntary throat examination. The level of obstruction during this period was registered.

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MORTALITY

The Swedish Personal Register is based on a specific personal code number given to each citizen at birth. It contained addresses and information concerning patients and controls in group 1 at the study end point; it contained data on those who were still alive and on those who had died.

The Swedish Death Register supplied copies of death certificates, stating the cause of death.

STATISTICS

A life table was used. The starting point was the day of surgery, and the unambiguous end point was the day of death. The patients were observed for different lengths, and the end point for survivors was unknown at study termination. The mortality risk rates for patients and controls were compared using the log-rank test, based on the life tables’ accounted for censored observations. We calculated the 9-year survival chance for all subjects and the cumulative probability of surviving the whole observation time using confidence intervals. For comparison of causes of death between patients and control group 1, the Fisher exact test was used. For comparison of hypertension treatment between patients with OSAS and patients without apnea, the χ² test was used. P<.05 was considered significant.

Relative survival was analyzed using a computer program designed for cancer survival studies. The relative survival rate is defined as the ratio of the observed survival in the studied group to the expected survival in a comparable general population (control group 2), taking into account population, age, sex, and time. Statistics Sweden provided data on expected survival probabilities for the general Swedish population.
have been performed on extremely obese patients (mean±SD BMI, 36.5±7.4) who had severe sleep apnea (mean±SD AI, 60.0±24.9); both conditions are regarded as contraindications to UPPP.12 Moreover, of the 8 patients who died after UPPP, UPPP was known to have failed in 2, and these 2 were not subsequently treated with continuous positive airway pressure (CPAP) or tracheotomy, and 6 were not restudied. Even patients in other North American mortality studies1,5,9 have shown a degree of obesity far in excess of that seen in the average Scandinavian patient with OSAS.

This study, therefore, ascertains whether increased mortality is still present after palatal surgery in a mainly nonobese patient population and to what extent death is related to cardiovascular disease.

**RESULTS**

The demographic data of patients and control group 1 are given in Table 1 and in the Figure.

Four hundred twenty-six consecutive patients were studied. Four hundred patients were diagnosed as having OSAS. Sixty-nine (27%) of the patients with OSAS had a BMI greater than 30 and were considered obese (Figure).23

**SUBJECTS AND THEIR CHARACTERISTICS**

The demographic data of patients and control group 1 are given in Table 1 and in the Figure.

Four hundred twenty-six consecutive patients were treated. Seventeen were treated with CPAP primarily or secondarily and were all excluded, as were the 9 patients who had emigrated.

Sixty of the 400 analyzed patients were diagnosed as being nonsleepy snorers (ie, having social rhonchopathy) (Table 2). Twenty-three (38%) were women. The remaining 340 patients were diagnosed as having medical rhonchopathy, of whom 250 were classified as having OSAS. Sixty-nine (27%) of the patients with OSAS had a BMI greater than 30 and were considered obese (Figure).23

The mean age of the 400 patients at the time of their first operation was 47.5 years (range, 18-75 years). Thirteen were younger than 30 years. Sixty-three (16%) were women (mean age, 47.2 years; range, 24-74 years). Twenty patients, primarily subjected to LUPP, underwent another operation with UPPP or LUPP up to March 1990, but they were included in the study from the first surgical procedure. Ten percent of the patients underwent additional septoplasty.

Control group 1 comprised 744 patients (mean age, 45.1 years; range, 30-71 years) with nasal obstruction, who had been subjected to nasal surgery such as septorhinoplasty, turbinatectomy, or polypectomy but who had never been treated with palatal surgery.

**MORBIDITY AND MORTALITY**

Treatment for hypertensive blood pressure was found almost 3 times more frequently in the patients with OSAS compared with the nonapneic patients (28.1% vs 9.7%; P<.001).

Thirteen (3.3%) of the 400 analyzed patients died during a cumulative period of 9 years, as did 29 (3.9%) of the 744 controls. The mean±SD age at the time of death was 58.5±8.1 years for the patients and 59.8±11.6 years for the controls. The mean±SD BMI of the patients at the time of death was 27.6±4.0. The cause of death among patients is given in Table 3. Six (46%) of the 13 deceased patients died of cerebral and cardiovascular disease, including one with organic heart disease. All 6 had OSAS. Three of the 17 patients (mean BMI, 30.1) receiving CPAP died during the control period, 2 of cardiovascular disease.

Among group 1 controls, the cause of death could be obtained in 27 of 29 cases. The death certificate could not be located for one case, while the other had not been discovered until putrefaction had set in. Five (18.5%) of the 27 died of vascular disease.

The 95% confidence interval for the probability of the patients dying within the 9-year observation period was 3.3%±1.7%; for control group 1, 3.9%±1.4%.

There was no difference in relative mortality for all patients (13 of 400) (P= .77), those diagnosed as having OSAS (10 of 256) (P=.99), sleepy snorers (2 of 84) (P=.85), or nonsleepy snorers (1 of 60) (P=.66), compared with control group 1 (29 of 744), irrespective of surgical method used (all P values obtained using the log-rank test). The cumulative 9-year survival for patients...
and control group 1 was more than 96%, even though the relative risk of dying of vascular disease was increased 3-fold in patients with OSAS (6 of 10 patients) compared with control group 1 (3 of 27 controls) (P<.01).

COMMENT

Few earlier studies exist dealing with long-term mortality after palatal surgery for patients with OSAS, and the samples have so far been limited. Keenan et al21 included 149 patients with a mean ± SD BMI of 30 ± 5 who were treated with UPPP in an up to 6-year follow-up, while He et al16 included 60 UPPP-treated patients with a mean ± SD BMI of 36.5 ± 7.4 in an 8-year follow-up. To our knowledge, no such study concerning nonobese patients has been performed.

Although the rate of hypertension and cardiovascular disease–related death was increased among patients, the present investigation did not indicate any increased mortality of the 400 surgically treated patients when compared with a sex- and age-matched general Swedish population. Also, control group 1, operated on for nasal obstruction, had a similar mortality rate. These controls lived in an environment similar to the patients and were, therefore, valid for comparison for causes of death.

Patients who underwent UPPP and LUPP had a similar BMI and showed no difference in mortality. Laser uvulopalatoplasty was used on patients obstructed by lax palates only, a common finding in the nonobese, which explains why most patients were treated by this procedure.

Only a few patients were treated for heavy snoring alone. More than 85% combined heavy snoring with EDS. The OSAS diagnosis was based on clinical findings,13 but then confirmed by sleep studies measuring either the apnea-hypopnea index or the oxygen desaturation index.

Over time, the sleep respiratory diagnostic recordings in our department varied and data are, therefore, not immediately comparable.13,22 The overall results of this study showed, however, that most of our patients with OSAS had moderate obstructive sleep apnea (index values around 30-40). Desaturation below 85% of arterial oxygen saturation was uncommon.

Lindberg et al17 have, in a recently published 10-year prospective study on 3100 male subjects in Uppsala, Sweden, investigated self-reported symptoms related to OSAS and long-term mortality. They showed that nonsnoring subjects complaining of EDS and simple snorers did not have any increased mortality. Sleepy snores, on the contrary, displayed a significant increase in overall mortality, decreasing after age 50 years and disappearing after age 60 years, even when adjusting for BMI, reported hypertension, cardiac disease, and diabetes. This study was performed in a city only 70 km from Stockholm and the subjects were nonobese and are, therefore, comparable to patients in the present study. Partinen and Guilleminault5 and Lavie et al23 found increased cardiovascular disease–related mortality among untreated patients with OSAS but could not find any correlation to the AI. Excessive daytime sleepiness, on the other hand, is not only an important clinical symptom but also appears to have an impact on mortality among snorers.27

In the Stockholm region, cardiovascular disease is the most common cause of death among the middle aged, followed by malignant neoplasms and trauma or suicide.28 Because of the unique citizen code number system in Sweden, it was possible to investigate all subjects in a national database with no loss to follow-up. Moreover, the cause of death could be stated for all the 42 deceased patients and controls (except for 2 cases as previously described). Cardiovascular disease was found to have caused death in 6 (60%) of the 10 deceased patients with OSAS (Table 3). In contrast, only 5 (19%) of the 27 controls died of vascular disease (P<.01). Partinen and Guilleminault5 and Lavie et al29 demonstrated similar vascular death rates in patients with OSAS. Most (5 of 6) of the patients dying from vascular disease had hypertension, a risk factor related to BMI and sleep apnea but not clearly to simple snoring.3 This may explain the predominance of vascular disease–related death among patients with OSAS.
Continuous positive airway pressure treatment was uncommon in Sweden in the mid-1980s. Therefore, it was initially offered to and accepted by a limited number of patients. This situation, however, appears to have been of limited importance for the mortality in this study as there was, nevertheless, no increased mortality among the patients with OSAS even though the decision to give complementary treatment with CPAP was not based on sleep study results but on the clinical outcome alone. In contradiction to other studies, an increased death rate was seen among those treated with CPAP (3 of 17 patients). All had severe OSAS and cardiovascular disease at the time of initial treatment. The few subjects do not, however, allow any conclusion.

The patients included in the present study had a mean BMI of 27.1, which is not substantially different from the average BMI of the general Swedish male population (mean ±SD, 24.4 ±3.2). Only 15 (3.8%) of the 400 patients had a BMI exceeding 36 (Figure), the figure given as a mean for those 60 patients treated by UPPP in the study by He et al. The North American studies indicate that most patients with OSAS are obese, whereas the present study, probably representative for most Scandinavian patients with OSAS, shows a much slimmer patient population. A conclusion to be drawn from the present and the referred studies is that investigations performed on populations of patients with OSAS with a mean excessive BMI may not be representative for a more weightwise normal population and are, therefore, not valid worldwide. That the reported prevalence of OSAS is about 4-fold in a working population of the United States compared with one of Israel further stresses this point.

Obesity contributes to upper airway obstruction, hypopertension, and cardiovascular disease. Obesity itself has been reported to be a major mortality risk factor, influencing mortality far more than the AI. The combination of extreme obesity and OSAS, however, is a significant risk factor for sudden cardiovascular death, even in the absence of other conventional risk factors.

The predominance of heavily obese patients with severe sleep apnea in the studies by Partinen et al and in that by He et al may also explain the high mortality rate found in conservatively treated patients. Not less than 17% of those 127 patients with OSAS who were conservatively treated by recommended weight loss died within 7 years. In contrast, only 2.8% of the 71 patients with OSAS who underwent tracheotomy died during the same period, figures similar to our controls and nonobese patients with OSAS treated with palatal surgery.

The beneficial effect of tracheotomy and CPAP treatment in these obese subjects with OSAS indicates that the abolishing of upper airway obstruction may eradicate the apparent synergistic effect on morbidity of obesity and sleep apnea.

In conclusion, the present study did not disclose any increased mortality at long-term follow-up after palatal surgery. With respect to the findings by Lindberg et al, this indicates that palatal surgery might have a positive effect on long-term mortality in nonobese sleepy snorers with or without OSAS.

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