Sleep-disordered breathing comorbidities

Clinical references for cardiologists

Association of atrial fibrillation and obstructive sleep apnea
Apoor S. Gami, MD, et al.
Circulation 2004;110:364-367

Background: Obstructive sleep apnea (OSA) is associated with recurrent atrial fibrillation (AF) after electrocardioversion. OSA is highly prevalent in patients who are male, obese, and/or hypertensive, but its prevalence in patients with AF is unknown.

Methods and results: We prospectively studied consecutive patients undergoing electrocardioversion for AF (n=151) and consecutive patients without past or current AF referred to a general cardiology practice (n=312). OSA was diagnosed with the Berlin questionnaire, which is validated to identify patients with OSA. We also assessed its accuracy compared with polysomnography in a sample of the study population. Groups were compared with the 2-tailed t, Wilcoxon, and X² tests. Logistic regression modeled the association of AF and OSA after adjustment for relevant covariates. Patients in each group had similar age, gender, body mass index, and rates of diabetes, hypertension, and congestive heart failure. The questionnaire performed with 0.86 sensitivity, 0.89 specificity, and 0.97 positive predictive value in our sample. The proportion of patients with OSA was significantly higher in the AF group than in the general cardiology group (49% versus 32%, P=0.0004). The adjusted odds ratio for the association between AF and OSA was 2.19 (95% CI 1.40 to 3.42, P=0.0006).

Conclusions: The novel finding of this study is that a strong association exists between OSA and AF, such that OSA is strikingly more prevalent in patients with AF than in high-risk patients with multiple other cardiovascular diseases. The coinciding epidemics of obesity and AF underscore the clinical importance of these results.

Figure 1. Proportion and 95% CI of patients with OSA. Prevalence of OSA is significantly higher in patients with AF than in patients without past or current AF in general cardiology practice (49% [95% CI 41% to 57%] vs 32% [95% CI 27% to 37%], P=0.0004).

Odds ratio for association between AF and OSA

<table>
<thead>
<tr>
<th>OR</th>
<th>95% CI</th>
<th>OR and 95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body mass index</td>
<td>1.11</td>
<td>1.06-1.16</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Neck circ</td>
<td>1.02</td>
<td>0.97-1.07</td>
<td>0.439</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1.27</td>
<td>1.01-1.61</td>
<td>0.039</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1.23</td>
<td>0.96-1.57</td>
<td>0.104</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>2.19</td>
<td>1.40-3.42</td>
<td>0.0006</td>
</tr>
</tbody>
</table>

Figure 2. Adjusted OR and 95% CI for association between AF and OSA. After adjustment for body mass index, neck circumference (neck circ), hypertension, and diabetes mellitus, AF is significantly associated with OSA (OR 2.19, 95% CI 1.40 to 3.42, P=0.0006).
Mortality in obstructive sleep apnea-hypopnea patients treated with positive airway pressure
Francisco Campos-Rodriguez, MD, et al.

Chest 2005;128:624-633

Study objectives: The aims of this study were to analyze mortality in patients with obstructive sleep apnea-hypopnea syndrome (OSAHS) treated with positive airway pressure (PAP) and to know whether PAP compliance affects survival, as well as to investigate the prognostic value of several pretreatment variables.

Design and patients: A study was made of an historical cohort of 871 patients in whom OSAHS had been diagnosed by sleep study between January 1994 and December 2000 and who had been treated with PAP. Patients were followed up until December 2001. The mean (± SD) age of the group was 55.4 ± 10.6 years, the mean apnea-hypopnea index (AHI) 55.1 ± 28.7, and 80.9% were men. To assess whether mortality was influenced by PAP therapy compliance, patients were assigned to one of the following compliance categories: < 1 h/d; 1 to 6 h/d; or > 6 h/d. Survival rates were calculated according to the Kaplan-Meier method. Survival curves were compared with the log-rank test and the trend test, when necessary. Univariate and multivariate analyses using a time-dependent Cox model were performed to elicit which variables correlated with mortality.

Results: By the end of the follow-up period (mean duration, 48.5 ± 22.7 months), 46 patients had died. The 5-year cumulative survival rates were significantly lower in patients who did not use PAP (compliance < 1 h) than in those who used the device for > 6 h/d (85.5% [95% confidence interval (CI), 0.78 to 0.92] vs 96.4% [95% CI, 0.94 to 0.98; p < 0.00005]) and 1 to 6 h/d (85.5% [95% CI, 0.78 to 0.92] vs 91.3% [95% CI, 0.88 to 0.94; p = 0.01]), respectively. A trend in survival rates across the groups was identified (p = 0.0004). The main cause of death in 19 cases was cardiovascular disease (CVD). Variables that independently correlated with mortality in the multivariate analysis were the following PAP use categories: compliance for > 6 h/d (odds ratio [OR], 0.10; 95% CI, 0.04 to 0.29); compliance for 1 to 6 h/d (OR, 0.28; 95% CI, 0.11 to 0.69); arterial hypertension (AHT) (OR, 3.25; 95% CI, 1.24 to 8.54); age (OR, 1.06; 95% CI, 1.01 to 1.10); and FEV1 percent predicted (OR, 0.96; 95% CI, 0.94 to 0.98).

Conclusion: Mortality rates in OSAHS patients who did not receive PAP therapy were higher compared with those treated with PAP and were moderately or highly compliant with therapy. A trend in survival across compliance categories was found. Patients died mainly from CVD. Categories of PAP compliance, AHT, age, and FEV1 percent predicted were the variables that independently predicted mortality.

Figure 1. Kaplan-Meier cumulative survival rates according to categories of PAP compliance. Cumulative survival rates in the PAP > 6-h group were significantly higher than in the PAP < 1 h group (p < 0.00005). Cumulative survival rates in the PAP 1-6 h group were significantly higher than in the PAP < 1 h group (p = 0.01). Cumulative survival rates were not different in the PAP > 6 h group and the PAP 1-6 h group (p = 0.11).

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**Long-term cardiovascular outcomes in men with obstructive sleep apnoea-hypopnoea with or without treatment with continuous positive airway pressure: an observational study**

Jose M Marin, Santiago J Carrizo, Eugenio Vicente, Alvar G N Agusti

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**Summary**

**Background:** The effect of obstructive sleep apnoea-hypopnoea as a cardiovascular risk factor and the potential protective effect of its treatment with continuous positive airway pressure (CPAP) is unclear. We did an observational study to compare incidence of fatal and non-fatal cardiovascular events in simple snorers, patients with untreated obstructive sleep apnoea-hypopnoea, patients treated with CPAP [for OSA], and healthy men recruited from the general population.

**Methods:** We recruited men with obstructive sleep apnoea-hypopnoea or simple snorers from a sleep clinic, and a population-based sample of healthy men, matched for age and body-mass index with the patients with untreated severe obstructive sleep apnoea-hypopnoea. The presence and severity of the disorder was determined with full polysonomography, and the apnoea-hypopnoea index (AHI) was calculated as the average number of apneas and hypopnoeas per hour of sleep. Participants were followed-up at least once per year for a mean of 10.1 years (SD 1.6) and CPAP compliance was checked with the built-in meter. Endpoints were fatal cardiovascular events (death from myocardial infarction or stroke) and non-fatal cardiovascular events (non-fatal myocardial infarction, non-fatal stroke, coronary artery bypass surgery, and percutaneous transluminal coronary angiography).

**Findings:** 264 healthy men, 377 simple snorers, 403 with untreated mild-moderate obstructive sleep apnoea-hypopnoea, 235 with untreated severe disease, and 372 with the disease and treated with CPAP [for OSA] were included in the analysis. Patients with untreated severe disease had a higher incidence of fatal cardiovascular events (1.06 per 100 person-years) and non-fatal cardiovascular events (2.13 per 100 person-years) than did untreated patients with mild-moderate disease (0.55, p=0.02 and 0.89, p<0.0001), simple snorers (0.34, p=0.0006 and 0.58, p<0.0001), patients treated with CPAP (0.35, p=0.0008 and 0.64, p<0.0001), and healthy participants (0.3, p=0.0012 and 0.45, p<0.0001). Multivariate analysis, adjusted for potential confounders, showed that untreated severe obstructive sleep apnoea-hypopnoea significantly increased the risk of fatal (odds ratio 2.87, 95% CI 1.17–7.51) and non-fatal (3.17, 1.12–7.51) cardiovascular events compared with healthy participants.

**Interpretation:** In men, severe obstructive sleep apnoea-hypopnoea significantly increases the risk of fatal and non-fatal cardiovascular events. CPAP treatment [of OSA] reduces this risk.

Cumulative percentage of individuals with new fatal (A) and non-fatal (B) cardiovascular events in each of the five groups studied.

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