The Use of Continuous Positive Airway Pressure in Patients with Obstructive Sleep Apnea to Decrease the Risk and Progression of Cardiovascular Disease

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Abstract

Cardiovascular disease (CVD) is one of the most prevalent illnesses worldwide and the leading cause of death in the U.S. Obstructive sleep apnea (OSA) has been found to be a risk factor correlated to CVD. Therefore, the following clinical question arises: [P] In an adult patient prevalent illnesses worldwide and the leading cause of (35-75 years old) diagnosed with OSA, [I] does the use of CPAP [C] compared to patients with OSA who do not use CPAP [T] decrease the risk and/or progression of CVD?

Introduction

Cardiovascular Disease
- Includes hypertension, stroke, heart failure, coronary artery disease (CAD) and atrial fibrillation
- Risk Factors: hyperlipidemia, family history of hypertension, obesity, smoking and diabetes
Obstructive Sleep Apnea
- Described as repetitive episodes of apnea, or cessation of breathing, during sleep
- Risk Factors: obesity, oropharyngeal abnormalities, increased neck circumference, male sex and smoking
- Treatment: Continuous Positive Airway Pressure (CPAP)

Methods

Literature search conducted in November 2019 using:
- PubMed
- EBSCO
- Google Scholar

Search terms: “continuous positive airway pressure AND cardiovascular AND obstructive sleep apnea”

Inclusion Criteria
- Randomized controlled trials within last 5 years
- Human subjects
- Written in English

Exclusion Criteria
- Subject size with n < 100
- Total trial length < 12 months
- Subject age range outside 35-75 years old
- Studies without a controlled trial
- Studies containing only one gender

Results

   - Cohort study of 483 participants designed to investigate the predictors of long-term non-compliance of CPAP in patients with newly diagnosed moderate to severe OSA over 6 years

   - Cohort study of 483 participants designed to investigate the association between OSA severity and major cardiovascular and cerebrovascular events and to investigate the potential impact of CPAP therapy on cardiovascular outcomes

   - Randomized controlled trial of 15,325 participants designed to test the efficacy of CPAP in reducing rate of cardiovascular events among patients with OSA

   - Randomized controlled trial of 249 participants designed to assess the efficacy of early nasal CPAP treatment on cardiovascular recurrences and mortality in patients with first-ever ischemic stroke and moderate-severe OSA during a 5 year follow-up

   - Quantitative study of 220 participants designed to analyze the one-year survival range of patient who have had an acute stroke with OSA according to gender and age

Discussion

3/6 are considered adequately valid while the remaining 3/6 are considered marginal

Strengths
- 5/6 include factor of CPAP compliance
- 4/6 statistically significant for increased survival of patients
- Consistency of criteria used in majority of articles offers stronger correlation
- Sample sizes
- No studies are considered inadequate

Limitations
- Role of comorbidities in disease
- Bias varies throughout studies
- Variation of trial duration
- Recruitment methods

Future Research
- Improve screening methods for OSA
- Continue long-term research on effects of treatment of OSA on progression of CVD
- Cost effectiveness

Table 1. Comparison of Study Designs

<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Total N</th>
<th>Age Range (years)</th>
<th>OSA Criteria</th>
<th>Duration (months)</th>
<th>CPAP Compliance</th>
<th>Outcome Measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Retrospective Cohort</td>
<td>301</td>
<td>46-68</td>
<td>AHI≥15</td>
<td>74.8</td>
<td>4 hrs per night/5 days per week</td>
<td>Vascular events; survival</td>
<td></td>
</tr>
<tr>
<td>2 Retrospective Cohort</td>
<td>434</td>
<td>43-68</td>
<td>AHI levels</td>
<td>81.3</td>
<td>4 hrs per night/5 days per week</td>
<td>Vascular events; survival</td>
<td></td>
</tr>
<tr>
<td>3 Double Blind RCT</td>
<td>2,687</td>
<td>45-75</td>
<td>SatO2 drops ≥ 4%</td>
<td>44</td>
<td>3 hrs during 1-week run-in with sham CPAP</td>
<td>Vascular events; survival</td>
<td></td>
</tr>
<tr>
<td>4 Prospective Non-Blind RCT</td>
<td>235</td>
<td>54-75</td>
<td>AHI≥20</td>
<td>24-68</td>
<td>4 hrs per night/70% of days</td>
<td>Vascular events; survival</td>
<td></td>
</tr>
<tr>
<td>5 Single Blind RCT</td>
<td>70</td>
<td>41-65</td>
<td>AHI&gt;15</td>
<td>12</td>
<td>4 hrs per night/70% of days</td>
<td>AHI; vascular events</td>
<td></td>
</tr>
<tr>
<td>6 Quantitative</td>
<td>220</td>
<td>56-74</td>
<td>N/A</td>
<td>12</td>
<td>N/A</td>
<td>Survival</td>
<td></td>
</tr>
</tbody>
</table>

RCT = randomized control trial; AHI = apnea/hypopnea events/h; N/A = not applicable

Conclusion

Statistically significant increase in overall survival through use of long-term CPAP

Not enough evidence to support a change in current clinical practice. However, it can be suggested for better screening practices for OSA can be implemented.

Encouragement of CPAP treatment due to mask discomfort and financial responsibility are still major factors that will impact future use in clinical practice.