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Opioids, Respiratory Depression and Sleep-Disordered Breathing (SDB): Perioperative Implications

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University of Chicago

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University of Toronto
SASM President-Elect

Syllabus
Incidence of Unrecognized Obstructive Sleep Apnea in Major Noncardiac Surgery

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Background: Obstructive sleep apnea (OSA) affects 9-17% of the general population, and it is more common in the tertiary care settings. Unfortunately, the majority of these patients are unrecognized at the time of surgery. The international Postoperative Vascular Events in Unrecognized Obstructive Sleep Apnea (POSA) Trial aims to determine the postoperative outcome of unrecognized OSA in moderate-to-high risk patients undergoing major noncardiac surgery > 2 hours duration. In an interim analysis, we present the prevalence of unrecognized OSA among POSA trial participants.

Methods: The study was approved by local research ethics committee (ClinicalTrials.gov Identifier: NCT01494181), and all patients gave written informed consents. Patients above 45 years, with a history of atherosclerotic disease (defined as > 1 risk factor of the revised cardiac risk index) received ambulatory polysomnographic monitoring (ApneaLink, Resmed, San Diego, CA) to determine the presence and severity of unrecognized OSA before surgery.

Results: As of June 2013, we analyzed data from 368 patients. The mean age (± SD) was 68 ± 10 years, and 57% were males. A total of 232 patients (63%) had unrecognized OSA with apnea-hyponea index (AHI) > 5/h, 105 (29.5%) patients had moderate-to-severe OSA (AHI > 15/h) based on the polysomnographic results. Patients with unrecognized OSA had an increased body mass index (p < 0.001).

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>AHI &lt; 5/h</th>
<th>AHI 5-15/h</th>
<th>AHI &gt; 15/h</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>136</td>
<td>127</td>
<td>105</td>
<td>0.101</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>25.3 ± 5.2</td>
<td>27.0 ± 5.8</td>
<td>28.2 ± 5.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.053</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>82 (43.2%)</td>
<td>64 (33.7%)</td>
<td>44 (23.2%)</td>
<td></td>
</tr>
<tr>
<td>Malaysians / Indians</td>
<td>36 (35.0%)</td>
<td>36 (35.0%)</td>
<td>31 (30.1%)</td>
<td></td>
</tr>
<tr>
<td>Caucasians</td>
<td>18 (24.3%)</td>
<td>27 (36.5%)</td>
<td>29 (39.2%)</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions: Unrecognized OSA is prevalent in moderate-to-high risk patients undergoing major surgery. Further investigation is required to determine if this cohort of unrecognized OSA patients are at increased risk of vascular and other perioperative complications.
**Funding support:**
Health and Health Service Research Fund (09100351), Food and Health Bureau, Hong Kong; University Health Network Foundation, University of Toronto; High Impact Research Grant UM.C/625/1/HIR/067 from the University of Malaya; Alexandra Health Singapore, Small Innovation Grant
Design and Rationale for the Postoperative Vascular Events in Unrecognized Obstructive Sleep Apnea (POSA) Trial

Edwin Seet1, Matthew Chan2, Chew-Yin Wang3, Stanley Tam4, Frances Chung5

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Introduction

• Obstructive sleep apnea (OSA) is the most common type of sleep disordered breathing.1
• Unfortunately, the majority of these patients are undiagnosed at the time of surgery.2
• Emerging epidemiological data suggest that OSA is common in the surgical population.
• The extent of unrecognized OSA in causing postoperative vascular events is currently unknown.
• Hypothesis: Repeated episodes of nocturnal hypoxia predispose patients with OSA to vascular complications after surgery.
• Aim: Determine the effect of unrecognized OSA on postoperative vascular complications in moderate-to-high risk patients undergoing major noncardiac surgery.

Methods

• Postoperative vascular events in unrecognized OSA or POSA Trial commenced in 2011.
• Clinical Trial Registry: NCT 01494181.
• Prospective multicenter observational cohort study (Hong Kong, Canada, Malaysia, Singapore).
• Ethics board approval and informed consent from all patients obtained.
• Funding support by 4 peer-reviewed grants: Health and Health Research Service Fund (09100351), Food and Health Bureau, Hong Kong; University Health Network Foundation, University of Toronto; University Malaya, High Impact Research Grant; Alexandra Health Singapore, Small Innovation Grant.
• Total projected sample size: approximately 1,200 patients.
• Inclusion Criteria:
  1. Age ≥ 45 years
  2. Elective major abdominal / thoracic / vascular surgery staying ≥ 3 nights
  3. History of at least one risk factor for postoperative vascular event (ischemic heart disease, congestive heart failure, cerebrovascular disease, diabetes mellitus, serum Cr ≥ 170 µmol/L)
• All patients underwent a portable diagnostic system (ApneaLink, Resmed, San Diego, CA) preoperatively to determine the presence of and severity of OSA before surgery.
• Results of the Level 3 ambulatory sleep studies are blinded until 30 days after surgery.
• Serial plasma samples are collected for measurement of cardiac troponin T concentrations during the first 3 days after surgery. Serial daily ECGs are performed.
• Primary Outcome = composite endpoint of postoperative vascular complication including myocardial infarction; nonfatal cardiac arrest; stroke; pulmonary embolism; congestive heart failure; new clinically significant atrial fibrillation and cardiac death within 30 days of surgery.
• The POSA trial has recruited >120 patients in 4 countries to date.
• 56% are females and 44% males. Mean (± standard deviation) age is 61 (± 12) years.
• 25% have documented coronary artery disease, 10.6% have a history of peripheral arterial disease, and 41.2% have diabetes.
• 36% of patients had OSA with apnea-hypopnea index (AHI) > 5 /hour. 7% of patients had moderate OSA with AHI 15-30/hour, and 6% of patients had severe OSA with AHI > 30/hour.
• Details are illustrated in Table 1.

Results

Table 1

<table>
<thead>
<tr>
<th>AHI (events /hour)</th>
<th>All patients (n = 120)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 5</td>
<td>61 (51)</td>
<td>51%</td>
</tr>
<tr>
<td>5-15</td>
<td>37 (31)</td>
<td>31%</td>
</tr>
<tr>
<td>&gt; 15</td>
<td>22 (18)</td>
<td>18%</td>
</tr>
</tbody>
</table>

Diabetes Mellitus

<table>
<thead>
<tr>
<th>Diabetes Mellitus (DM)</th>
<th>All patients (n = 120)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>49 (41)</td>
<td>41%</td>
</tr>
<tr>
<td>No</td>
<td>71 (59)</td>
<td>59%</td>
</tr>
</tbody>
</table>

Hypertension

<table>
<thead>
<tr>
<th>Hypertension (HTN)</th>
<th>All patients (n = 120)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>46 (38)</td>
<td>38%</td>
</tr>
<tr>
<td>No</td>
<td>74 (62)</td>
<td>62%</td>
</tr>
</tbody>
</table>

Obstructive Sleep Apnea (OSA) Syndrome

<table>
<thead>
<tr>
<th>Obstructive Sleep Apnea (OSA) Syndrome</th>
<th>All patients (n = 120)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>98 (82)</td>
<td>82%</td>
</tr>
<tr>
<td>No</td>
<td>22 (18)</td>
<td>18%</td>
</tr>
</tbody>
</table>

Cardiovascular Events

<table>
<thead>
<tr>
<th>Cardiovascular Events</th>
<th>All patients (n = 120)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ischemic heart disease</td>
<td>18 (15)</td>
<td>15%</td>
</tr>
<tr>
<td>Stroke</td>
<td>0 (0)</td>
<td>0%</td>
</tr>
<tr>
<td>Cardiac arrest</td>
<td>5 (4)</td>
<td>4%</td>
</tr>
</tbody>
</table>

Conclusion

• POSA Trial will provide a reliable assessment of the magnitude and severity of unrecognized OSA in the surgical population.
• It will determine the independent risks of postoperative vascular events in patients with unrecognized and untreated OSA.

References