Do Patients With Obstructive Sleep Apnea Wake Up With Headaches?

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Background: There is a controversy regarding the association of obstructive sleep apnea (OSA) and morning headaches. This study investigates whether this relationship exists.

Methods: This is a retrospective study of 80 consecutive patients with OSA who underwent sleep polysomnography from December 1996 to March 1997. Patients were interviewed about their headache history. Headaches were classified according to International Headache Society criteria and the severity graded by the Chronic Pain Index. Headache characteristics were compared with those of 22 control patients with periodic limb movement disorder. Headache response to continuous positive airway pressure or uvulopalatopharyngoplasty in the patients with OSA was also assessed.

Results: Forty-eight (60%) patients had headaches in the year prior to study. Twenty-five of the 48 patients had headaches that did not fit any category. Of these 25 patients, 23 (48% of total group) reported awakening headaches. These awakening headaches were significantly more common in the OSA group compared with the periodic limb movement disorder group, 9 (41%) of whom had headaches, none of which occurred on awakening. The proportion of common types of headaches in both groups was similar. The awakening headaches were brief (shorter than 30 minutes), and their occurrence and severity correlated with OSA severity. Of the 29 patients with OSA who were treated with continuous positive airway pressure or uvulopalatopharyngoplasty, awakening headaches improved by a mean of 80% compared with minimal improvement of migraine, tension, and cervicogenic headaches.

Conclusions: Awakening headaches are associated with OSA. These headaches are of brief duration, and their occurrence and severity increase with increasing OSA severity. Treatment of OSA with continuous positive airway pressure or uvulopalatopharyngoplasty can reduce these headaches.

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There is conflicting evidence\(^1\) regarding the association of headaches and obstructive sleep apnea (OSA). Guilleminault et al\(^1\) found that headaches occurred in 11 of 25 patients with OSA. Boutros\(^2\) found a similar relationship in 9 of 20 patients with OSA. However, Aldrich and Chauncey\(^3\) and Poceta and Dallessio\(^4\) disputed these findings and concluded that morning headaches occurred just as frequently in other sleep-related disorders as in OSA.

We therefore sought to establish if an association between OSA and headaches exists. We believe that these headaches occur more frequently in OSA because oxygen desaturation causes cerebral vasodilation, and this may provoke headaches. As such, patients with sleep disorders due to nonrespiratory causes should have a lower occurrence of headaches compared with patients with OSA. These headaches should also occur with greater severity and frequency the more severe the OSA. Finally, treatment of the OSA by continuous positive airway pressure (CPAP) or uvulopalatopharyngoplasty (UPPP) should reduce or eliminate these headaches.

Results

Eighty patients were diagnosed as having OSA between December 1996 and March 1997 (56 men). Age ranged from 24 to 86 years, with a mean of 50.2 years. Sixteen patients had mild, 23 had moderate, and 41 had severe OSA.

Forty-eight patients (60%) had experienced headaches in the past 1 year; 6 (12%) had migraine, 12 (25%) had tension headache, 5 (10%) had cervicogenic headache, 1 (2%) had cluster headache, and 12 (25%) had headaches related to other causes (sinusitis, 9; glaucoma, 1; temporal arteritis, 1; and temporomandibular joint dysfunction, 1). Twenty-five patients (52%) had headaches that did not fit into any of the above categories. Of

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PATIENTS AND METHODS

This is a retrospective study of 80 consecutive patients with OSA who underwent sleep polysomnography from December 1996 to March 1997. Patients underwent a 1-night 8-hour polysomnogram attended and supervised by a qualified technologist. The polysomnographic study was conducted according to the guidelines recommended by the American Electroencephalographic Society and the following parameters were measured: electroencephalographic activity, electrooculographic activity, submental electromyographic activity, intercostal electromyographic activity, chest movement, abdominal movement, snoring, airflow, oxygen saturation, lower limb movement, and electrocardiographic activity. Each polysomnographic study was scored manually and interpreted by a trained clinical polysomnographer.

Diagnosis of OSA was based on the criteria recommended by the American Sleep Disorders Association. Apnea is defined as a cessation of airflow for at least 10 seconds. Obstructive apnea occurs when there is presence of respiratory effort despite cessation of airflow. Hypopnea occurs when there is a reduction of airflow by 50% or more for at least 10 seconds.

The OSA severity was based on the apnea-hypopnea index (AHI) and the degree of oxygen desaturation as summarized in Table 1. In patients with oxygen desaturation out of proportion to their AHI, the severity of OSA was increased by 1 grade. Although this classification tends to increase OSA severity in some cases, we believe it is a more accurate measure of the OSA severity because it takes into account the duration of apnea, which would be reflected in part by the degree of oxygen desaturation.

All 80 patients were interviewed about their headache history by one of us (N.K.L.) from May 1997 to July 1997. The patient’s sleep disorder was not made known to the interviewer until after the interview. Patients experiencing 3 or more headaches in the past 1 year were included. The headaches were classified according to International Headache Society criteria. Headaches that could not be classified were grouped together and characterized according to time of occurrence, nature, location, frequency, and severity.

Headache characteristics were compared with those of a control group of 22 patients with periodic limb movement disorder (PLMD), as diagnosed with the criteria recommended by the American Sleep Disorder Association. This disorder was selected as the control because of earlier reports that suggested that awakening headaches represent a nonspecific feature of sleep-related disorders and were not mediated by hypoxia. Patients with snoring, upper airway resistance syndrome, and other medical disorders characterized by headaches were excluded from the control group.

Headache severity was measured by the Chronic Pain Index. The Chronic Pain Index is a validated scale and correlates with headache impact, depressive illness, and utilization of health care services (Table 2). Points are accorded to each answer and when summated, a certain grade is derived, ranging from grade 0 (headache free) to grade 4 (severely limiting) (Table 3).

Headache response to CPAP or UPPP in the patients with OSA was assessed. Patients were interviewed and asked to quantify headache improvement in increments of 10%.

did not differ significantly (P = .39) from the OSA group (range, 0.7 to 69 arousals per hour; mean, 17.6 arousals per hour).

Awakening headaches were significantly more common in patients with OSA compared with the control group (χ² test, P = .02). Patients with more severe OSA were more likely to have awakening headaches compared with patients with mild OSA (Mantel-Haenszel χ² test for linear trend, χ² = 4.87, P = .05) (Table 5, top). Statistical tests for trends were used as the patients with OSA were divided into 3 groups of increasing OSA severity. Similarly, patients who had severe OSA had more severe headaches (Spearman correlation = 0.75, P < .001) (Table 6, left side). Likewise, there was a positive correlation between oxygen desaturation and occurrence of awakening headaches. In the 23 patients with awakening headaches, 12 (52%) had an oxygen saturation less than 80%, compared with 9 (36%) of 25 patients without awakening headaches. At an oxygen saturation of less than 70%, 5 (22%) of 23 patients had awakening headaches compared with 2 (8%) of 25 patients without awakening headaches. Oxygen desaturation was also closely related to the severity of awakening headaches (Table 6, right side). However, when we compared the OSA severity and headache frequency, although there was a trend suggesting increasing headache frequency with OSA severity, this correlation did not reach statistical significance (Spearman correlation = 0.17, P = .44) (Table 7).

| Table 1. Classification of Severity of Obstructive Sleep Apnea (OSA) |
|-----------------------------------------------|-----------------|-----------------|-----------------|
| **Mild OSA** | **Moderate OSA** | **Severe OSA** |
| Apnea-hypopnea index (AHI) | >5 to 20 | >20 to 50 | >50 |
| Oxygen saturation, % | >80 | >70 | <70 |
| Special circumstances | None | AHI in mild range with oxygen saturation <80% | AHI in moderate range with oxygen saturation <70% |

these 25 patients, 23 (48%) reported awakening headaches. Seven patients had 2 types of headaches and 3 patients had 3 types of headaches. Two of the 23 patients with awakening headaches reported recurrence of headaches after afternoon naps and another 2 patients with positional (supine) OSA had improvement of headaches after changing sleep positions.

The PLMD control group consisted of 12 women and 10 men, aged 24 to 86 years (mean age, 35.2 years). Headaches occurred in 9 (41%) of the 22 patients. The proportion of the various headache types was similar to the OSA group (Table 4). None experienced awakening headaches. Arousal in the PLMD group (range, 7.2 to 37 arousals per hour; mean, 14.5 arousals per hour)
Awakening headaches were brief (shorter than 30 minutes) in 9 (39%) of 23 patients. In contrast, only 1 (4%) of 25 patients without awakening headaches had headaches of brief duration.

No consistent feature regarding nature and location of awakening headaches was observed. Nine patients described their awakening headaches as sharp, 6 as dull, 4 as throbbing, and 4 as nonspecific in nature. The location was occipital in 8 patients, frontal in 6, transcranial in 5, and shifted from one location to another in 4.

Response of awakening headaches to treatment was different compared with other headache types. Of the 48 patients with OSA and headaches, 25 had CPAP and 3 had UPPP treatment, while one had both CPAP and UPPP. This included 17 patients with severe, 4 with moderate, and 4 with mild OSA. Marked improvement was seen in patients with morning headaches and cluster headaches. Both groups improved by a mean of 80% (range, 60%-100%) whereas patients with tension headaches, migraines, and cervicogenic headaches showed only minimal improvement.

To determine if patients with OSA wake up with morning headaches involved many issues. The first issue pertains to selection of an appropriate control group. Even though we found that awakening headaches occurred very frequently in patients with OSA (23 of 48; 48%), this by itself was insufficient to conclude that OSA and morning headaches were related. We had to be certain that these morning headaches also were not consistent features in patients with other sleep-related disorders. Therefore, we chose as our control group patients with PLMD. Patients with evidence of snoring were excluded from the control group because we could not be certain they did not have OSA based on just one polysomnogram. This was important, as earlier studies that disputed the association of OSA and awakening headaches included snorers in their control groups. Had they excluded snorers, they might have found a similar association. In addition, having PLMD as our control group also helped in discounting the effect of arousals as a cause of the headaches, as arousals occur in both OSA and PLMD.

Next, we had to be certain that awakening headaches were not due to an exacerbation of a preexisting headache syndrome. This was done by taking a careful history to ensure that these headaches did not have characteris-
Headache frequency correlated with obstructive sleep apnea (OSA) severity. 

Table 6. Effects of OSA Severity and Oxygen Saturation on Severity of Awakening Headaches in 23 Patients With OSA*

<table>
<thead>
<tr>
<th>Headache Grade</th>
<th>OSA Severity</th>
<th>Oxygen Saturation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mild</td>
<td>Moderate</td>
</tr>
<tr>
<td>Grade 1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Grade 2a</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Grade 2b</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Grade 3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Grade 4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total No. of Patients</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

* Headache severity correlated with obstructive sleep apnea (OSA) severity and with the degree of oxygen desaturation.

Table 7. Effect of OSA Severity on Frequency of Awakening Headaches in 23 Patients With OSA*

<table>
<thead>
<tr>
<th>Daily headaches</th>
<th>Headache frequency &lt;1/d but ≥1/wk</th>
<th>Headache frequency &lt;1/wk but ≥1/mo</th>
<th>Headache frequency &lt;1/mo</th>
<th>Total No. of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild OSA</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Moderate OSA</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Severe OSA</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>13</td>
</tr>
</tbody>
</table>

* Frequency of awakening headaches did not correlate significantly with increasing obstructive sleep apnea (OSA) severity.

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REFERENCES