1. Prevalence, Relation to Systemic Hypertension, and Mortality

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Key words: sleep apnea syndrome, systemic hypertension, apnea hypopnea index, mortality

In the past more than 30 years, enormous gains have been made in the knowledge concerning sleep disordered breathing particularly in the United States as well as in the western countries. Particularly since the obstructive type (obstructive sleep apnea: OSA) has been clarified, the outline of this syndrome is well recognized, even almost the general public; and a large number of SAS patients are found annually in various countries. However, the majority of physicians in Japan have been reluctant to describe the precise outline of SAS to the public, therefore, only a small number of patients with SAS has been reported until recently in Japan.

The purpose in this review is to show the reported SAS prevalence, the subject of SAS-related systemic hypertension (HT), and the mortality of SAS ascertaining some problems which exist in the reported SAS epidemiology.

The SAS prevalence varies very much among reports, which include 1–3% in middle aged males in European countries (1–4), and close to 10% in the middle aged males, in contrast, 4% in the middle aged females in the United States (5). In Japan, it is approximately 1% of the whole population aged 15 to 89 years (6). Interestingly, all of the reports observe the same finding in which the prevalence of SAS tends to increase up to age 50 or 60, and then decrease after the age of around 60.

Regarding the SAS prevalence variation in different countries, a few major factors may affect the calculation of SAS prevalence in these reports, although these factors to be clarified. First, it is possible that the differing size of the standard body build in different countries might alter the SAS prevalence. In comparison with the standard Japanese body build, Americans tend to be more obese, which in turn might induce an increase in SAS prevalence. Although the SAS prevalence is reported very much higher in the United States than in the European countries in spite of the similar body build. Further, there has been no data to indicate that the different body build itself affects the SAS prevalence. It is, therefore, impossible to assess this possibility of whether the varied SAS prevalence can be attributed to the different body build in the different countries.

The second factor to vary the prevalence, could be based on the difference in the methods used to estimate the SAS prevalence. The majority of the papers estimated the prevalence on the basis of answers from interviews or from questionnaires concerning snoring or witnessed sleep apneas. However, as these specific signs or symptoms of SAS are basically objective, it seems very difficult for subjects themselves to respond to such questions.
properly. In fact, Stradling and Cosby (4) showed that the prevalence of habitual snoring was much higher when the subject’s spouse was present than when the subject was alone at the interview (23% vs. 10%, Fig. 1). This observation suggests that the calculated SAS prevalence on the basis of such response is considered to be substantially lower than the true values, it is likely because the subjects who respond that they do not have habitual snoring are misclassified as being normals in these papers. In fact, Young et al (5) observed that unavoidable numbers of subjects, who deny habitual snoring in their interview, do meet the criteria for SAS by Guilleminault and colleagues (7) (16.1% in males, 5% in females, Table 1), although it is true that the SAS prevalence is much higher in subjects with than without “habitual snoring”. Taking these findings into account, the “real” SAS prevalence should be much higher than reported in the papers from the European countries and from Japan.

The strong association between OSA and sustained hypertension (HT) has been well-recognized particularly in the United States (8). The prevalence of sustained HT varies among papers, as it ranges from 48% to 96% in selected patients (9). Conversely, up to 35% of the subjects with essential HT (maximum blood pressure >160mmHg or minimum blood pressure >95mmHg or both while awake) meet the criteria as having SAS. On the other hand, the prevalence of HT seems quite low in Japan from our clinical experience, although there has been no precise data available to elucidate the relationship between sustained HT and OSA. Some of the recent reports, that analyze the mechanism between sustained HT and OSA, strongly suggest that it is not apnea itself, rather either obesity or aging, or the two together play an important role in the elevation of blood pressure in OSA patients (8, 10, 11). For instance, Rauscher and colleagues (11) divided the subjects with habitual snoring into 2 groups based on whether they have an apnea plus hypopnea index (AHI) of more than 5 in polysomnography. The first group was classified as having SAS (AHI >5, OSA), and the second was the group of habitual snorers without SAS (AHI ≤5, HSN). Each group of subjects was then subdivided into 3 subgroups based on their body mass indexes (weight kg/height m², BMI, <25, 25–30, >30) to compare the prevalence of HT. As a result, it was not apnea severity, but the degree of obesity and subject’s age which were revealed to be positively correlated to the HT prevalence (Fig. 2 (11)). However, as it still remains unknown how obesity or age induces sustained HT in these subjects with OSA; further studies are necessary to elucidate the precise mechanism.

There have been only a few studies, which investigated the increased mortality could be increased in OSA patients (12–14). From these reports, the mortality in patients with severe OSA (A1 >20) was significantly worse than in those with mild OSA (A1 ≤20) (Fig. 3). Additionally, mortality in untreated OSA was significantly higher than that in treated OSA with both nasal CPAP (12, 14) and tracheostomy (13) in severe cases; there is still controversy regarding the effectiveness of uvulopalatopharyngoplasty (UPPP) (12, 14). Looking at the causes of death in untreated OSA patients in detail, the majority of deaths were caused mainly by vascular disorders, which included coronary artery diseases and cerebrovascular accidents (13, 14). There was no case, which resulted in sudden-death during asleep in these reports. Moreover, one of the studies showed that the majority of cases died during the

% of subjects

Wife present at interview (n=468)
Wife not present

Do you snore or have you been told you do?

Fig. 1. Prevalence of snoring in 890 men (4).

Table 1. Sex-Specific Prevalence of Sleep-Disordered Breathing (5)

<table>
<thead>
<tr>
<th>Group</th>
<th>Apnea-Hypopnea Score</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>&lt;5</td>
<td>5–14</td>
</tr>
<tr>
<td>Women (n=250)</td>
<td>number of subjects</td>
<td>percent</td>
</tr>
<tr>
<td>Habitual snorers</td>
<td>105 (81)</td>
<td>16 (12)</td>
</tr>
<tr>
<td>Not habitual snorers</td>
<td>114 (95)</td>
<td>3 (2.5)</td>
</tr>
<tr>
<td>Men (n=352)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitual snorers</td>
<td>149 (66)</td>
<td>38 (17)</td>
</tr>
<tr>
<td>Not habitual snorers</td>
<td>106 (83)</td>
<td>17 (13)</td>
</tr>
</tbody>
</table>

Fig. 2. Prevalence of sustained hypertension (HT) and mean blood pressure in normal weight (left), overweight (middle), and obese snorers (right). Gray bar: HT prevalence in patients with obstructive sleep apnea (OSA), open bar: prevalence of HT in snorers without OSA (HSN) (11).
daytime (14). Therefore, it is still unclear why the mortality is substantially higher in severe OSA cases, and the mechanism by which those patients tend to die from vascular disorders. On the other hand, no data has been yet available on the mortality in OSA patients in Japan. Further studies are thus needed to elucidate the connection between the higher mortality rate and OSA, and whether the mortality of OSA patients differs in Japan from that in the western countries.

References

1) Lavie P. Sleep habits and sleep disturbances in industry workers in Israel: main findings and some characteristics of workers complaining of excessive daytime sleepiness. Sleep 4: 147, 1981.

2. Pathophysiology

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Key words: hypertension, heart rate, apnea, hypoxemia, hypoxic chemosensitivity

Introduction

Recurrent sleep apnea is associated with cyclic fluctuations in systemic arterial blood pressure (BP), pulmonary arterial pressure, heart rate (HR) and others. To investigate the mechanisms for these changes is important because such events may lead to systemic hypertension and/or poor cardiac performance during the daytime. Although hypoxemia has been claimed by some to be a major contributor to apnea-associated changes in the BP and HR, there may be several other factors involved.