

REVIEW

OBSTRUCTIVE SLEEP APNEEA - PATHOPHYSIOLOGICAL MECHANISMS AND ITS EFFECTS ON THE HUMAN BODY

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SUMMARY

Snoring is a frequent health problem among the grown-up population with a high currency of 15%-28% in women and 35% to 45% in men. Obstructive Sleep Apnea (OSA) can be defined as a respiratory sleep disorder. It is characterized by the appearance of apnea, caused by partial or total obstruction of the superior respiratory tract all along sleeping. The obstructive sleep apnea bears semblance of many symptoms associated with apnea. They are both correlated with grave clinical and morbidity effects with impairment in well-being of individuals and rising cost of management. A wide range of studies have been developed with the aim of addressing the problem. This article reviews recent literature data on the prevalence of snoring, and associations between sleep disordered breathing, common causes of secondary hypertension, insulin resistance, dyslipidemia, cardiovascular disease and to identify the key variables associated with a significant reduction in the consequences of snoring.

Abbreviations: OSA - obstructive sleep apnea, OSAS - obstructive sleep apnea syndrome, AHI - apnea-hypopnea index, LNL - lateral neck length, MNL - midline neck length, SDB - sleep disordered breathing, CPAP - nasal continuous positive airway pressure, ESS - epworth sleepiness scale, BMI - body mass index, CV - cardiovascular

Key words: sleep apnea, snoring, risk factors

RÉSUMÉ

L'apnée obstructive du sommeil - mécanismes pathophysiologiques et leurs effets sur l'organisme humain

Le ronflement est fréquent parmi la population adulte à une prévalence de 15-18 % pour les femmes et de 35-45 % pour les hommes. Le ronflement est aussi un symptôme évocateur de syndrome d'apnée du sommeil. Le syndrome d'apnée du sommeil se caractérise par la survenue, pendant le sommeil, d'épisodes d'apnée, à cause de l'obstruction totale ou partielle des voies aériennes supérieures. Il est associé aux comorbidités et une mauvaise qualité de la vie et un coût élevé du traitement. Le syndrome d'apnée du sommeil est caractérisé par une hypoxie intermittente qui a comme conséquences la majoration du stress oxydant, une inflammation systémique, une somnolence diurne, des troubles cognitifs et, en général une baisse de la qualité de vie. Parmi les complications on retient l'apparition de l'hypertension artérielle, l'insulino résistance, une dyslipidémie. Cet article revise la littérature récente ayant analysé la prévalence des ronflements et l'association entre les troubles du sommeil et la respiration et ayant identifié les facteurs de risque communs pour les comorbidités citées ci-dessus. Afin d'étudier la littérature de spécialité on a utilisé une combinaison des mots clés et on a sélectionné les articles en anglais publiés après 2012.

Mots clés: apnée du sommeil, ronflement, facteurs de risque

INTRODUCTION

Snoring is the sound formed when breathing air passes through the upper airways and vibrates the structures in the pharynx region all along sleeping. Snoring is a frequent health problem among the

grown-up population with a high currency of 15%-28% in women and 35% to 45% in men. Obstructive Sleep Apnea (OSA) can be defined as a respiratory sleep disorder. It is characterized by the appearance of apnea, caused by partial or total obstruction of the superior respiratory tract all along sleeping.

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The obstructive sleep apnea bears semblance of many symptoms associated with apnea. They are both correlated with grave clinical and morbidity effects with impairment in well-being of individuals and rising cost of management. A wide range of studies has been developed with the aim of addressing the problem.

Purpose

This article reviews recent literature on the prevalence of snoring, and associations between sleep disordered breathing, common causes of secondary hypertension, insulin resistance, dyslipidemia, cardiovascular disease and to identify the key variables associated with a significant reduction in the consequences of snoring.

Methods

We searched the literature using combinations of keywords risk factors, sleep apnea, snoring, for articles published since 2012. We included reports that were published in English.

Results

Among the 2 reports that met a strict set of study inclusion criteria, we found that there were no difference between the neck length indicators for intensity of snoring.

Many epidemiologic studies have reported that gender plays an important role in the pathogenesis of OSAS, which is more frequent in men than in women.

The sex specific discrepancy of OSAS occurrence is supposed to be caused by a variety of factors, including hormonal influences and sex related differences in upper airway anatomy and body fat deposition.

In a French report, OSAS was diagnosed in 57% of the community-dwellers aged 68 years, 34% having a mild form with an apnea-hypopnea index (AHI) 15–30/hr whereas 23% had an AHI >30/hr

Among the articles reviewed, we found studies revealed that men with sleep times <6 hours had shorter LNL height ratios than men with sleep times \geq 8 hours but without statistical significance, and women with sleep times of 6 to 8 hours had significantly shorter LNL height ratios than women with sleep times \geq 8 hours. Male chronic snorers were generally found to have shorter LNLs and MNLs, while female chronic snorers were found to have shorter MNLs.

Anatomy that promotes sleep apnea

A study that proposed to analyze skeletal characteristics and soft tissue structure of Asian patients reported the lower-positioned hyoid bone as characteristic of sleep apnea. Some authors report that individuals with longer distances from the base of the maxillary sinus to the upper margin of the hyoid bone have longer soft-tissue upper airways with greater air resistance, resulting in severe sleep apnea. Other studies show that individuals with shorter lengths from the upper margin of the midline hyoid bone to the jugular notch and longer soft-tissue upper airways are more vulnerable to SDB.

Studies about the correlation between neck length and cardiovascular risk factors revealed that men showed little

association between neck length and cardiovascular risk factors, but those with cardiovascular risk factors tended to have shorter LNLs than MNLs. An interesting outcome of these studies was that women with diabetes, hyperlipidemia, or metabolic syndrome had significantly shorter MNLs.

A report that met a stricter set of inclusion criteria, concluded that the tonsillar hypertrophy degree is in direct association with the sleep apnea degree. In support of this, it was made a retrospective study between 2007–2012 on a group of 69 patients diagnosed by polysomnography with Obstructive Sleep Apnea (OSA). In the study, otorhinolaryngological examination was supplemented with histopathological examination of the parts obtained after the surgery. It has been revealed that the size, volume of the tonsil can be directly associated with the severity of sleep apnea. As result, this article claims that the use of multiple indices in the classification of OSA severity is an important advantage

Etiological factors involved in the appearance of OSA

There is a variety of etiological factors involved in the appearance of OSA. These factors can be classified as structural factors – they are due to anatomic variations of the facies such as elongation, posterior facial compression, retrognathism, micrognathism, mandibular hypoplasia, Marfan's syndrome, Prader–Willi syndrome and Non-structural factors – represented by obesity, age, male preponderance, post menopause condition, alcohol consumption, smoking, REM during sleeping. Other studies shown that among the non-structural factors, we can also mention hypo-thyroidism, the neurological syndromes and exposure to pollutants.

OSA is more commonly encountered in the case of Afro Americans; the main cause is the structural one, namely the shape of the cranium and the facies of this race.

Recent studies noticed that snoring is independently associated to metabolic syndrome, cardiovascular disease, and carotid atherosclerosis.

Snoring and OSA are associated with many cardiovascular disorders including hypertension, coronary heart disease, congestive heart failure, stroke, erectile dysfunction and impaired glucose tolerance/diabetes mellitus. In literature we found a report that showed that OSA and snoring can be correlated with impaired glucose tolerance and increased left ventricular mass.

As cardiovascular disease remains the first cause of death worldwide with increasing occurrence and severity in the developing economies, the frequency of snoring and high risk for OSA may relieve the population at risk of cardiovascular disease. In this way we can identify people who will require more intensive drug and non-pharmacological based intervention in order to reduce their risk of cardiovascular death.

Female OSAS patients tend to suffer from hypertension more than the male group. Reports that compared women with and without OSAS revealed no significant differences in clinical or anthropometric measures. The presence of hypertension was significantly correlated with OSAS risk in women with the odds ratio of 1.52.

The conclusion is that the appearance of OSAS is associated with hypertension in the elderly women.

Treatment methodes

Treatment methodes are multiple; Nasal continuous positive airway pressure (CPAP) is a very effective treatment for OSAS and very frequently used. A review reported positive effects of CPAP treatment in the elderly on sleep architecture, subjective daytime sleepiness, and nocturia .

A study of CPAP use in elderly OSAS patients in Spain has noted that untreated severe OSAS is correlated with cardiovascular death in the elderly. A proper CPAP treatment may reduce this risk. There are insufficient data published about the level of evidence for CPAP acceptance and compliance with treatment in elderly. Among the reports that met a strict set of study inclusion criteria, we found a study that revealed that 78.7% of the subjects with OSAS refused CPAP treatment. Of the 30 subjects who accepted CPAP therapy, only 44% of them adhered to the treatment with the nightly use of 4.2 (2.2) hours. The study concluded that there was an important improvement of ESS, digit symbol, trail A and B, and stroop colour after 12 months of CPAP treatment. These CPAP users clearly had higher BMI and neck circumference, and more severe SDB, as reflected by a higher AHI than those who refused CPAP treatment.

Different studies explored the relationship between SDB and cardiovascular risk factors and diseases, and concluded the association, therefore may allow the use of OSA and snoring as a cardiovascular risk.

The frequency of visceral obesity, those with generalised obesity and those assessed to be at high risk of OSA using the Berlin questionnaire were significantly higher among snorers than non-snorers. Participants assessed to be at high risk of OSA were more likely to be hypertensive, had visceral obesity, elevated total cholesterol and generalised obesity than those assessed to be at low risk of OSA.

Mean total cholesterol and low density lipoprotein cholesterol were higher while high density lipoprotein were lower among those at high risk of OSA compared with those at low risk; however, they were not statistically significant.

The mean number of cardiovascular risk factors clustered together among those with high risk of OSA was significantly higher among participants assessed to be at high risk of OSA compared with those at low risk (3.7 ± 1.5 vs. 2.7 ± 1.7 CV risk factors respectively, $P < 0.05$)

The rising prevalence of SDB and association with increasing age and obesity had been known in the scientific literature. The Berlin questionnaire has been validated and it is used worldwide to predict the risk for OSA in the population with good effect.

CONCLUSIONS

The risk factors for OSA include increasing age, excess body weight, male gender, craniofacial abnormality, genetics, cigarette and alcohol intake. Other conditions that have been associated with increasing prevalence of

OSA include polycystic ovarian syndrome, hypothyroidism and pregnancy.

As a conclusion we want to point attention on the different risk factors for developing OSA and also on the effects that this disease has on the normal function of the human body.

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