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Mini Review

Obstructive Sleep Apnea Syndrome (OSAS): The Key Role of the Dentist in the Management of a Potentially Life- threatening Condition

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Abstract

Obstructive Sleep Apnea Syndrome (OSAS) is a chronic nocturnal respiratory disorder associated to excessive daytime sleepiness. It's a potentially life-threatening condition. If left untreated it's at high risk for comorbidities, such as cardiometabolic complications and neurocognitive sequelae, as well as road and workplace accidents. For this reason, OSAS has an adverse impact on economic systems: direct costs, which are the health costs necessary for diagnosis and treatment of the disorder and its correlated medical consequences and for recourse to hospital admissions, and indirect, or social, costs due to a decrease in work productivity and an increase of permanent disabilities resulting from road and workplace accidents. These patients can obtain a better quality of life only from an adequate management of the disorder and, consequently, the whole society will enjoy the benefits. This article focuses on the most relevant social and medical-legal issues correlated to OSAS and highlights the importance of a multidisciplinary approach wherein the dentist can play a significant prevention, diagnostic and treatment role.

Introduction

Obstructive sleep apnea (OSAS) is a chronic nocturnal respiratory disorder characterized by recurrent upper airway complete and/or partial collapse (airflow reduction) during sleep, with increased airflow resistance, resulting in oxygen desaturation, intrathoracic pressure changes, sleep fragmentation to restore breathing and/or oxygen desaturation, and excessive daytime sleepiness [1-5]. Its severity is expressed by the Apnea-Hypopnea Index (AHI): occurrence of 5 or more episodes per hour of sleep (5 to 15 mild; 16 to 30 moderate; > 30 severe). According to Jung et al. [6] male sex, age \geq 50 years, high body mass index, hypertension, snoring and witnessed apneas are considered the most important predictor factors for moderate/severe OSAS. Especially young and middle-aged adults affected by mild and moderate OSAS are at increased risk for developing hypertension; so, an early detection and treatment of these patients with an improving of their metabolic indices is desirable in order to prevent future cardiovascular disease [7]. OSAS has systemic effects on various organ systems, so that is a potentially life-threatening condition. Patients with untreated disorder are at significantly increased risk of cerebro-cardiovascular disease, diabetes, metabolic disorders, depression; moreover, in adults it is reported to be associated with cognitive dysfunction, morning headaches, mood disturbances, performance deficits, impaired productivity at the workplace and an increased risk of both work and motor vehicle accidents [8-10]. OSAS is a common serious condition that is under-recognised in children too, who may develop a disturb similar to that seen in adults associated with altered learning performance and physical growth [11,12].

Prevalence varies depending on diagnostic criteria and population studied. New data, published in a world epidemiological study from the analysis of the results of 17 epidemiological prevalence studies made in 16 countries, suggest that more or less 1 billion adults aged 30-69 years would have mild to severe obstructive sleep apnea, symptomatic or not; moreover, >45% of these individuals would require treatment. The countries with the highest number of subjects affected by OSAS result China, USA, Brazil, and India [13]. Despite the high prevalence and the important burden of morbidity and mortality, the OSAS remains an underdiagnosed and undertreated disease throughout the world. In Italy the first epidemiological data recently published indicate that the percentages of diagnosis and treatments performed are very low. The Research Center on Health and Social Care Management of the Bocconi University of Milan, from literature review and Italian expert opinions estimated in Italy a prevalence of the disease in 12.329.614 patients with obstructive sleep apnea moderate-severe (27% adult population), of which 65% male, and an overall prevalence of over 24 million people aged 15-74 years with mild and medium-severe obstructive sleep apnea (54% adult population). Based on experts opinion and data provided by the Apnea Patients Italian Association, only 460.000 moderate-severe patients (4% of the estimated prevalence) are diagnosed and 230.000 treated with ventilation (2% of the estimated prevalence), suggesting that in Italy little diagnostic and therapeutic activity is practiced [14].

OSAS Social Impact

OSAS has an high prevalence and a significant economic impact on health worldwide because of its costs for diagnosis and treatment, for the associated and recurring comorbidities and correlate hospital admissions; furthermore, this disorder is responsible of indirect social costs due to reduction in labor productivity and permanent disabilities resulting from road or work accidents [15]. Clinical studies that investigated the quality of life in patients affected by OSAS show that it is unfavorable but improve significantly after medical, ventilatory, dental and surgical therapies [16,17]. It is noteworthy that the loud night snoring of a patient with untreated OSAS may be responsible for the onset of insomnia in the bed partner resulting in poor quality of life, and an effective treatment of the disorder also improves this condition [18,19].

Often work colleagues mistake reductions in quality of work in people with untreated OSAS in apathy or laziness, so much so that employers even go as far as firing these employees [17, 20-22]. Problems with concentration and learning are commonly described in people with this disturb, who are a near twofold increased odds of being involved in an accident



at work compared to workers not affected [5]. Employers should be aware of the vicarious liability caused by the actions of their sleepy employees. The type of job was relevant: OSAS represents a hazard, especially while driving. Studies that included only professional drivers show higher prevalence than studies drawn from all types of jobs. Furthermore, drivers with OSAS have a twofold to eightfold increased risk of motor vehicle crash [23-26]. The responsibility of physicians is to promptly detect medical conditions that could impair driving and cause harm to the patient or others [27-29]. Hence, doctors could be charged with negligence if an OSAS patient is responsible for a driving accident due to sleepiness [30,31]. Unfortunately, the rules for reporting of patients suffering from diseases for which they may not be eligible to drive vary considerably from state to state: from the absence of obligation to the mandatory reporting of pathologies listed [32]. Despite this, physicians have the duty to inform their OSAS patients of the risk of falling asleep while driving or working and of their potential civil and/or criminal liability if they don't follow treatment recommendations. Further, they have the duty to inform their patients, at the time of the diagnosis of OSAS and/or in the presence of excessive daytime sleepiness, of the need to stop driving until the therapy has proved effective. Profiles of guilt are also recognized in those patients who refuse treatment or those who, despite having accepted the treatment, are not compliant with it [33,34]. When the doctor believes that there are situations of real and concrete danger that the patient causes harm to himself or to third parties, he should report the patient to the competent authority for issuing the driving license.

The increased risk of road accidents has led legislators to consider OSAS as a determining factor for the issuance of driving licenses [35,37], however the medical assessment for obtaining a driving license varies from country to country.

For a long time, European legislation has not considered the OSAS a relevant factor for road safety. Following the recommendations that emerged in 2012 from a working group set up by the Directorate for Transport and Mobility of the European Commission, in 2014 Annex III of the European Union (EU) directive on driving licenses was updated. Since December 2015 this directive has been subjected to mandatory implementation by all member and states the following: "Applicants or drivers in whom a moderate or severe OSAS is suspected shall be referred to further authorised medical advice before a driving licence is issued or renewed" [38]. These patients should not drive until the diagnosis is confirmed. A driver's license can only be issued to people with moderate or severe OSAS who show adequate control of their disorder and adherence to appropriate treatment with improvement in sleepiness; it becomes imperative that patients being treated for moderate or severe OSAS undergo periodic medical review. Persons suffering from OSAS should be made aware, not only of their legal culpabilities but also their rights to lead a better life to cope well with their disease. OSAS can be suspected, screened and diagnosed with relative ease, and that once diagnosed the adequate treatment allows for safe driving. Early case identification is of significant value given the established associations between untreated OSAS and a number of adverse health outcomes. Moreover, costs are significantly reduced by effective diagnosis and treatment performed early.

The Italian law transposed the Directive 2014/85 / EU of the European Commission only in 2016, finally recognizing the need to assess the presence of OSAS before issuing eligibility to drive. In order to restrain the impact of OSAS on public health, the Italian Minister of Health has approved a document in which the line to be taken to prevent and make an early diagnosis of OSAS in both adults and children is indicated. An action on three levels is defined. The first level concerns dentists and physicians in outpatient clinics, who should formulate the clinical suspicion of OSAS. The second level concerns ear-nose-throat specialists neurologists, and pneumologists, all responsible for the multidisciplinary management and long-term care of OSAS patients, who should who should confirm the diagnosis and prescribe treatment. The third level concerns the creation of sleep laboratories for the study and/or treatment of inpatients. The three levels have to be functionally connected, so that at the first level physicians and dentists should have at least an adequate knowledge of OSAS, and at the second and third levels they should be experts in the diagnosis, treatment, and long-term management of these patients [39].

Role of the Dentist

Recent decades have seen dentists becoming increasingly involved in the treatment of disorders that also fall within the domain of other medical specialists, OSAS included. The awareness of having a potential diagnostic and therapeutic role stems from a growing recognition of orofacial characteristics as important developmental factors, and from the realisation that they have therapeutic implications [40]. From

the screening perspective, dentists, on account of their contact with many members of the general population during routine examinations, are ideally placed to screen for potential OSAS sufferers. They can recognize OSAS patients by recording anatomical risk factors and/or recognizing symptoms, through structured interviews and/or administration of appropriate screening questionnaires and, then, refer them to sleep medicine physicians. Treatment choice and success can be affected by some anatomic and physiologic phenotypes; in particular large neck, retrognathia/retracted mandible and maxilla, narrow and deep palate, long soft palate, and large adenoids are clinical craniofacial and oropharyngeal characteristics associated with OSAS risk [3, 41-43]. The routine examinations of growing children is an unmissable opportunity for the dentists to identify risk factors for potential airway-related disturbs and establish the appropriate medical or orthodontic treatment to get a correct development of physiologic airway and breathing pattern [44]. Especially between ages 3-6 OSAS is an outcome of adenotonsillar hypertrophy, neuromuscular disease, and craniofacial abnormalities [45].

As regards the treatment, an increasing body of published literature reflects the growing worldwide recognition that oral appliance (OA) has a role to play in the treatment of OSAS. Standard treatment with continuous positive airway pressure (CPAP) is considered the goal standard for this disturb but generally is not well-tolerated and its effectiveness is limited by a low compliance. Nowadays, armed with higher education or OSAS awareness and guided by the sleep physician, patients can choose their treatment according not only to the severity of the disturb and the presence of comorbidities but also to their individual degree of acceptance and willingness to collaborate, with better outcomes. [46-48]. OA therapy, which aims at enlarging the upper airway during sleep by holding the mandible in a forward and downward position, can be a viable alternative in the treatment of OSAS. It is effective in patients unwilling or unable to tolerate CPAP from mild to severe cases, provided that patients receive adequate information on therapeutic alternatives and on the risks associated with the treatment as long-term use of an OA can result in small but significant dental changes compared with CPAP [49-52]. If a treatment with OA is recommended, qualified dentists are the only health care providers able to confirm the suitability of device and, if deemed appropriate, to initiate therapy with the proper custom-made and titratable device, in order to maximize the results and reduce side-effects.

Conclusion

All these considerations indicate the need for an optimal collaboration among the different specialists involved. Dentists, whether or not qualified in dental sleep medicine, have an irreplaceable role in screening patients for OSAS using questionnaires and evaluating the presence of anatomic risk factors during routine examinations. Sleep physicians are tasked with confirming the diagnosis of OSAS, determining whether and treatment is indicated and, if appropriate, recommending OA therapy. The gold standard diagnostic investigation is highly specialized, represented by polysomnography (PSG) complete, sedentary, with neurological electrodes and video surveillance that is performed in a sleep laboratory (LS), the preferred method for diagnosing OSAS in a correct and complete way [52]. After proper diagnosis of the disorder, the qualified dentist evaluate patients for suitability of OA and begin therapy with the proper device. During treatment, patients have to be monitored through a differentiated and coordinated follow-up, performed both by sleep physician, who performs an objective sleep testing, and by qualified dentist, who carries out OA personalized adaptation and manage any side effect. Prevention, early diagnosis, treatment choice and its effectiveness need a special multiple disciplinary approach, through the involvement of multiple disciplines to varying degrees on the same continuum. It is desirable to create a multidisciplinary team that coordinates according to an interdisciplinary or, even better, transdisciplinary perspective: any claim to treat the OSAS independently must be abandoned and it's necessary to look beyond the limits of one's own discipline to integrate with other professionals, bearing in mind that a proper management of this disorder will benefit not only the patient but also the society as a whole.

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