

## PRACTICAL CONSIDERATIONS AND GUIDELINES IN DENTAL SLEEP MEDICINE

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**Author contribution:** All authors have equally contributed to this paper, as the first author

**AIM:** This scientific paper focuses on dentists’ role in the early detection and treatment of certain types of sleep disorders, as nowadays they represent a frequently met chronic pathology.

**MATERIAL AND METHODS:** We have analyzed the dentists’ strategic position in the interdisciplinary collaboration that allows the detection, diagnosis and treatment of sleep disorders and, based on the obtained results, we have elaborated a specific protocol. **RESULTS AND DISCUSSIONS:** The proposed protocol provides patients’ screening guidelines, proposed assisting clinical charts; recommendations for correctly interpreting the diagnoses belonging to the OSA (obstructive sleep apnea) syndromes; suggestions for interdisciplinary monitoring; treatment guidelines; advice for patients’ long-term monitoring. **CONCLUSIONS:** The presented protocol qualifies for immediate implementation in the dentists’ daily practice as well as in the university curriculum, contributing to the improvement of the quality of life of patients with sleep disorders.

**KEY WORDS:** dental sleep medicine, sleep disorders, obstructive sleep apnea, oral appliance

### INTRODUCTION

As sleep disorders represent an increasingly common pathology, whose undesirable effects could profoundly affect patients’ every-day life, it is important to detect and treat them in an early stage and, in this respect, dental practitioners should assume an active role in the medical strategy of approaching such pathologies.

The American Academy of Sleep Medicine (AASM) places the sleep-related breathing disorders (SRBD) among the six categories of sleep disorders in the International Classification of Sleep Disorders Third Edition (ICSD-3) [1, 2].

Obstructive Sleep Apnea (OSA) is a pathology included in the SRBD, associated with upper airway collapse [1]. Two to four per cent of the global population is estimated to suffer from sleep apnea; a cessation of breathing must last 10 seconds or more to be called apnea [3]. Apnea is associated with a

reduction in the blood oxygen level; the brain is therefore alarmed so “micro arousals” appear during sleeping. Apnea episodes can repeat hundreds of times a night, without the patient being aware of them. The physiological sleep-pattern is disturbed so the sleep-quality is poor and the individuals are constantly tired during the day. OSA is a potentially life-threatening disease, its consequences including high blood pressure, heart attack and stroke [3].

Oral appliances (OA), which can be applied by properly qualified dentists, are considered an effective treatment of OSA and, for more than 20 years, dentists have been involved in the therapy of SRBD along with sleep medicine specialists in the United States and Canada [3]. Furthermore, international sleep societies recommend oral appliance therapy for patients with SRBD as OA efficacy is indicated by evidence-based data [4].

In order to provide high-quality healthcare services to patients with OSA, dentists should adhere to the latest standards of care and should be able to effectively manage these pathologies, according to evidence-based practices [1, 5]. On the other hand, the medical interdisciplinary collaboration represents the key for managing the patient suffering from OSA. Dentists hold an important position in this medical interdisciplinary team, which allows them to bring a consistent contribution to preventing and treating sleep disorders.

With the aim of achieving the above desiderata, a distinct protocol was elaborated for guiding dentists in their daily practice and supporting students and residents in dentistry to become familiar with the vast domain of dental sleep medicine.

## MATERIAL AND METHODS

Analyzing the present stage of dental sleep medicine development, it can be stated that, along with other medical specialists (pneumologists, sleep medicine specialists, cardiologists, E.N.T. specialists, neurologists, maxillofacial surgeons, endocrinologists, psychiatrists, psychologists), the dentist is able to participate both in the identification of possible patients with sleep disorders and in the treatment of certain types of sleep pathologies (snoring, bruxism, obstructive sleep apnea / OSA – mild, moderate).

In this regard, we have noted that the participation of dental practitioners is determined by the severity of the existing pathology, being variably orientated to: patients' screening; referral of "sleep disorder suspected" patients to the sleep specialist; elaboration of an appropriate treatment plan; application of customized and minimally invasive therapies; periodical evaluation and management of patients in collaboration with sleep specialists. The sleep medicine specialists will establish the diagnosis for obstructive sleep apnea (OSA) and its severity [1, 5] and will refer the selected patient to the dentist. Within a complex dental treatment

plan, patients presenting snoring, bruxism or mild, moderate obstructive sleep apnea could benefit of treatments with intraoral appliances (OA). Oral appliances consist in by a custom-made adjustable double splint (corresponding to the upper and lower dental arches) that positions anteriorly the lower jaw, tongue, and additional structures, increasing the occlusal vertical dimension, thus resulting in an opening of the pharynx lumen, which mechanically keeps the airway open during sleep [4].

Choosing the intraoral appliances as optimum treatment depends on the general medical, medical dental and social context specific to each patient (integrated, customized treatment) while the dental practitioner establishes and organizes the succession of clinical and laboratory stages necessary for definitizing the treatment.

In order to develop a detailed strategy for the evaluation, management and long-term care of patients with sleep disorders [1], which should answer the need to implement practical standards for dental sleep medicine, a specific protocol and guidelines have been elaborated and can be implemented in private clinics and dental faculties in Romania.

## RESULTS AND DISCUSSIONS

### 1. Dentist's role in identifying OSA potential patients

#### *Guidelines for screening potential OSA patients*

Dentist's involvement in the sleep apnea management starts with the screening of the patients visiting the dental office. Therefore, dentists from private clinics or universities as well as dental residents or students can follow the screening guidelines for the detection of the patients with possible sleep apnea.

Information can be collected during anamnesis and clinical direct observations. General aspects corresponding to the "suspect patient" include: daytime sleepiness; chronic fatigue; difficulties in daily activities; memory, attention and concentration problems; behavioural disorders: anxiety,

aggressiveness, irritability; snoring, bruxism, choking, gasping, wheezing during sleep; movements during sleep; frequent urination during night; night-sweating; morning headaches, dizziness; dry mouth sensation in the morning; hypertension; obesity; large neck-size (>43cm for men; >40cm for women); gastro-oesophageal reflux; age over 50; menopause, amenorrhea, dysmenorrhea; alcohol consumption; smoking.

Local aspects that could appear amplified at a sleep disorder suspect patient include the following: maxillary compression; micrognathism; mandibular posterior position; hypotonic lingual or palatal musculature; macro-glosia; voluminous posterior palatal soft tissues; large tonsils; dental malposition; missing teeth; narrow superior air-ways; oral breathing; deviated nasal septum; tumours.

The general and local examination of the patient is essential in identifying OSA suspects. The results of the thorough oral analysis of the soft and hard tissues (hard palate and soft palate, alveolar processes, teeth, marginal periodontium, insertion of frenula, teeth position and status) as well as the results of the complementary radiological exams can profoundly influence the selection of candidates for an oral appliance therapy as well as the appropriate OA. Furthermore, as temporomandibular disorders (TMD) could be associated with SRBD, an exhaustive examination of the temporomandibular joint (TMJ) is recommended. Both intraoral and extraoral photographs, dental study casts or digital models should be obtained in order to record the pre-treatment data or to create the oral appliance [6]. The dentist should accomplish oral examination, paraclinical tests, fill in the clinical charts and get the patients' signed informed consent.

#### *Questionnaires*

The dentist should ideally apply specific questionnaires for all "patients with suspected OSA"; the most recommended ones are: *EPWORTH* questionnaire [7] and / or *STOPBANG* questionnaire [8].

#### *Selection and referral of patients with suspicion of OSA*

Based on the questionnaires' results and the other collected data, the dentists refer the patients with possible OSA to the pneumologist or to the sleep medicine specialist.

#### **2. Physician's role / Intervention of pneumologists or sleep medicine specialists**

The physician (pneumologist / sleep medicine specialist) who diagnoses the SRBD is responsible for prescribing oral appliance therapy (OAT) to the dentist prior to the initiation of therapy [1].

#### *Clinical examinations and preclinical tests*

The pneumologists or the sleep medicine specialists will perform clinical examinations and preclinical tests on patients with possible sleep apnea (i.e. polygraphy; polysomnography – an overnight test that evaluates sleep disorders and generally includes monitoring of the patient's airflow through the nose and mouth, blood pressure, electrocardiographic activity – ECG, blood oxygen level pulse-oximetry, brain wave pattern / EEG, eye movement / EOG, and the movement of respiratory muscle and limbs). In order to obtain relevant data regarding the patient's general health status, interdisciplinary collaboration between cardiologists, E.N.T. specialists, sleep medicine specialists, neurologists, endocrinologists, psychiatrists, psychologists is very useful.

#### *Diagnosis of OSA*

As already stated, the sleep medicine specialists will establish the diagnosis and severity of OSA based on all collected data [1, 5]. Depending on the ethio-pathogenic mechanism, obstructive sleep apnea is classified as central, obstructive and combined. The "*APNEA –HYPOPNEA INDEX*" (AHI) represents the number of times in an hour when a sleeping person either stops breathing completely or inhales limited air-flow. Each episode must last at least 10 sec.

AHI is one indicator for obstructive sleep apnea, as follows:

- AHI of 30 or more events in an hour indicates severe sleep apnea;
- AHI=15 to 29 events suggests moderate apnea;
- AHI=5 to 14 events indicates mild apnea [9].

#### *Treatment of OSA*

The treatment of OSA patients is established by the sleep specialists, who select the patients that can be treated in collaboration with a dentist and refer them to him. The following elements are usually recommended with regard to the oral appliance therapy [1, 3, 4, 5, 10, 11]:

- for severe sleep apnea CPAP therapy (Continuous Positive Airway Pressure Therapy) is frequently recommended; oral appliance therapy should be used when the patient cannot endure or refuses the CPAP therapy;
- for moderate apnea oral appliance therapy can be recommended as an additional treatment;
- in mild apnea cases oral appliances therapy should be the first-choice treatment.

The physician should refer the patient selected for oral appliance therapy to dentists, along with a letter of medical necessity and a copy of the case description [1].

#### **1. Oral appliances therapy – treatment sequence**

##### *Receiving OSA patients*

The treatment for snoring or OSA should never be initiated by a dentist without the patient's assessment by a physician [11]. Should dentists see the patient for the first time, upon referral by a physician (pneumologist or sleep medicine specialist), they should carry out oral examination and preclinical tests, fill in the clinical charts and obtain the patient's signed informed consent. At this stage, the interdisciplinary collaboration with orthodontists, maxillo-facial surgeons or specialists in prosthodontics

is recommended for the correct phasing of the treatments.

##### *Oral appliance selection*

An efficient oral appliance helps protrude and stabilize the mandible during sleep and prevents the soft tissue of the throat and the tongue from collapsing into the airway in order to maintain free upper airway during sleep [3, 4, 12, 13]. Oral appliances generally consist in two occlusal splints (upper and lower), connected by a special system that holds the mandible in a protrusive position – 75% of the maximum protrusion, i.e. approximately 8-9mm, is recommended. The mandibular advancement devices are small-sized, portable, easy to tolerate and easy to clean.

Various aspects should be considered when choosing the appropriate oral appliance: oral condition (number, location and health of remaining teeth, periodontal tissues status etc.); anticipated dental restorative needs; cranio-facial structures; the presence of allergies and / or sensitivities; patient's manual dexterity, visual acuity and cognitive ability; patient's comfort; financial considerations [1].

There are more than 100 models of oral appliances available on the medical market (*Monoblock, Klearway; IST – Intraoral Snoring Appliance; TAP-T Thornton Adjustable Positioner; Erkodent – Silensor; Somnodent*; boil and bite – ready-made splints), therefore the dentist must select the proper oral appliances for specific clinical cases. It is advisable, however, that a custom, titratable appliance be used over non-custom oral devices [5, 10].

##### *Practical guidelines for dentists*

The main steps in obtaining an oral appliance for the OSA therapy in a dental office are:

- impression of the upper and lower arches (alginate impression or silicone ones);
- obtaining models of the upper and lower arches (cast or 3D printed models, digital models);

- registration of the protrusive position of the mandible, using, for example, “The George Gauge™ Kit” [14]; literature suggests a 25-75% protrusion range as comfortable and yet therapeutic [1, 15, 16]; however, maximizing advancement may be more important in severe diseases. It is generally accepted that “the greater the level of advancement, the better the treatment effect”, but side effects should also be taken into account [1, 15, 17];
- oral appliance (OA) design and fabrication in the dental laboratory;
- oral appliance (OA) delivery: placement and control of the oral appliance (OA); intraoral adjustments for perfect fit;
- instructions for use / homecare instructions delivery (wearing the OA at night; insertion, disinsertion; cleaning and maintenance – the same procedures apply as in case of a complete denture; gymnastics - using, for example, the *Occlusion Trainer* [18]; morning exercises; massages) [1, 19].

#### *Patients' education*

The dentist should inform the patients undergoing oral appliance therapy about the severity of their SRBD and potential risks and educate the patients about the importance of sleep hygiene and weight control [11]; additionally, patients should be made aware that the success of their treatment may be negatively influenced by the use of caffeine, alcohol, tobacco or recreational substances [1]; alcohol consumption may cause or exacerbate OSA, especially when consumed shortly before bedtime [20].

#### *Immediate check-ups*

The patient should return to the dentist's office for the assessment of the OA comfort and efficacy within the first thirty days [1] or, at least, within two weeks after the insertion of OA. During this appointment, the following adjustments are recommended: marginal fit

adjustments; reduction of the pressure against the teeth; titration / calibration - reduction of the protrusion, if necessary. Patients with unsatisfactory results following the oral appliance treatment, (i.e., decrease in snoring) may show further improvement with continued gradual advancement [1, 5]. Upon final calibration of the oral appliance the dentist should refer the patient back to the physician for the evaluation of the oral appliance therapy outcome [1]. The pneumologist or the sleep medicine specialist should make another polysomnography three months after the initiation of the OA treatment; a letter of medical necessity to the dentist is recommended to inform on the patient's status, the registered progress and benefits of the treatment.

#### **2. Long-term follow-up**

Every six months or once a year patients diagnosed with OSA should have periodical dental and medical (pneumology / sleep medicine) check-ups and be long-term monitored. Dentist's regular written communication with the patient's physician and other healthcare professionals concerning the treatment plan, progress, and follow-up is recommended [11]. During the periodical appointments, the dental practitioner should verify: OA efficacy; persistence of previously resolved symptoms; the structural integrity and the occlusal stability of the OA; patient comfort; signs of wear, fractures; bacterial and / or fungal growth [1]; the appearance of possible side effects (excessive salivation or dry mouth; soft tissue or gingival inflammation; muscle and joint soreness; teeth migrations and occlusion disturbances; tooth mobility or fractures) [19, 21]. Both the presence and management of side effects (determination of possible causes, reduction of damage) should be documented. If side effects negatively impact on the effectiveness of the oral appliance therapy (OAT), the dentist should thoroughly evaluate together with the patient's physician the balance between the need of oral appliance and the severity of generated side effects; should the patient agree

with another form of therapy recommended by his / her physician, the OA therapy should be discontinued [11].

## CONCLUSIONS

As obstructive sleep apnea is recognized as one of the most common respiratory disorders [22], the presented protocol qualifies for immediate application by dentists, contributing to the improvement of the quality of life of the patients with sleep disorders. Dentists should participate in an ongoing,

## Acknowledgements

The authors would like to thank Mrs. Florina Popescu for the constant support provided during this study.

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