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Tonsillar hypertrophy implications in sleep disorders in adults and children

RÉKA SÓLYOM[1)], IRÉN CSISZÉR[2,3)], ADRIANA NEAGOŞ[4)]

[1)]*Department of Pediatry, University of Medicine and Pharmacy of Tirgu Mures, Romania*
[2)]*Department of Otorhinolaryngology, Emergency County Hospital, Tirgu Mures, Romania*
[3)]*Department of Otorhinolaryngology, "Iuliu Haţieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania*
[4)]*Department of Otorhinolaryngology, University of Medicine and Pharmacy of Tirgu Mureş, Romania*

Abstract

Introduction: The obstructive sleep apnea syndrome is the most common sleep disorder. It covers a multitude of symptoms associated with apnea. Next to polysomnography, otorhinolaryngological clinical examination plays an important role in establishing the diagnosis, in evaluating any oropharyngeal and hypopharyngeal modification. *Patients and Methods*: In this research, we intend to demonstrate the histopathological examination importance in establishing the tonsillar hypertrophy degree. This is made in direct correlation with its volume, and the sleep apnea degree. In this context, we have conducted a retrospective study between 2007–2012 on a group of 69 patients diagnosed by polysomnography with Obstructive Sleep Apnea (OSA). In the research, otorhinolaryngological examination was supplemented with histopathological examination of the parts collected after the surgery. *Results*: It has been demonstrated that the size, volume of the tonsil can be directly correlated with the severity of sleep apnea. The term "tonsil hypertrophy" is a histopathological one, with or without macroscopic implications. A specificity of tonsil enlargement without the narrowing of the oropharyngeal isthmus was demonstrated. This was in all groups of obstructive apnea, even in snoring patients with normal apnea–hypopnea index values, with a non-significant statistical correlation. *Conclusions*: The use of multiple indices in the classification of OSA severity is an important advantage. Therefore, it can be proved that there is no singular structure to induce the disorder, but the cause is rather a combination of several elements. The polysomnographic examination remains the golden standard for assessing in patients with OSA.

Keywords: polysomnography, sleep endoscopy, tonsil hypertrophy, obstructive sleep apnea.

Introduction

Obstructive Sleep Apnea (OSA) can be defined as a respiratory sleep disorder. It is characterized by the appearance of apnea due to partial or total obstruction of the superior respiratory tract during sleeping. This is characterized by the lack or decreased amount of inspired air while sleeping. It consequently associates an increased respiratory effort. These periods of lack of breath decrease the oxygen concentration and increase that of carbon dioxide in the entire organism. It associates with an oxyhemoglobin recurrent desaturation. This is the most frequent pathology as far as respiratory disorders during sleeping are concerned [1, 2]. Obstructive apnea during sleeping associated with quotidian somnolence is defined as Obstructive Sleep Apnea Syndrome (OSAS). This phenomenon materializes into excitatory periods. These periods intercalated with short periods of sleep, may have serious consequences on daily activities. Although in most cases, OSA is caused by the hypertrophy of tonsils or chronic adenoiditis. This obstructs the respiratory tract, obesity, different types of allergy, bronchial asthma, infectious sinusitis or reflux, which are illnesses that contribute to the appearance of this pathology [3–5]. These etiological factors can be divided into three different groups: Structural factors – they are due to anatomic variations of the facies such as elongation, posterior facial compression, retrognatism, micrognatism, mandibular hypoplasia, Marfan syndrome, Prader–Willi syndrome. Some researches state that these anatomic variations can be noticed mainly in case of children and asthenic patients [6]. Non-structural factors – represented by obesity, age, male preponderance, post menopause condition, alcohol consumption, smoking, REM during sleeping. According to certain studies, the family plays a very important role too [7]. Among the non-structural factors, we can also mention hypothyroidism, the neurological syndromes and exposure to pollutants. Genetic factors – OSA is more commonly encountered in the case of African Americans; the main cause is the structural one, namely the shape of the cranium and the facies of this race [8].

In severe cases, apnea can occur hundreds of times during one night, 1–2 times/minute. It can be accompanied by cardiac rate fluctuations, oxygen saturation decrease and short encephalographic excitement periods that alternate with noisy breathing [9–11]. The symptoms of OSA can be divided into three types according to the period of time it appears: general, daily, nocturnal. Patients with apnea can also have symptoms during the day because of interrupted sleep [12–14]. The superior respiratory tract has a small cross-sectional surface. During inspiration, the diameter of the respiratory tract can increase due to a higher capacity of distension of the superior respiratory tract.

Patients and Methods

This research is a retrospective, observational study between 2007–2012 and was conducted in the "Galenus"

Medical Centre, Tîrgu Mureş, Romania, on 69 patients with obstructive sleep breathing disorders. The subjects of this observation were only those patients who presented at least one of the clinical symptoms of OSAS. The clinical symptoms are: snoring, diurnal somnolence or insomnia, periods of nocturnal respiratory obstruction, apnea with or without awakening while sleeping. Every patient was polysomnographically evaluated. This method is considered the golden tool in the diagnosis of OSA. In conformity with a pre-established protocol, a clinical otorhinolaryngological examination was added to the polysomnographic examination.

The polysomnographic examination was performed on a period of physiological non-drug induced sleep. It was conducted in a somnology laboratory compliant to required standards, on a SOMNOscreen™ plus apparatus. This machine incorporates a small portable device to which standard sensors were connected. The sensors used were: internal effort sensor, corporal posture, pulse oximeter, patient marker, movement sensor, electro-encephalographic signals sensor, and electro-oculographic sensor. The collected data was processed with appropriate software. Throughout the study, the 3.2 version of this software was used. This had the same configuration for each analysis case and the allocated time was six hours. The polysomnographic examination was supplemented with an otorhinolaryngological clinical examination. It consisted of a rigid nasal and pharyngeal endoscopy in a wakeful state, completed with flexible pharyngeal endoscopy also in a wakeful state. For those patients who were to be subjects of surgical interventions, examinations with the flexible endoscopy were performed during medically induced sleep (sleep endoscopy). For the evaluation of these modifications and for the creation of a database, a special otorhinolaryngological form was used. It consisted of nasal pathology, uvula function, appearance of the palatine and lingual tonsils, dimensions and appearance of the uvula and the epiglottis, the dimensions of the tongue, and cranial/facial appearance and alterations. This form was adapted to the examination conditions in the specialized laboratory. It was equipped with appropriate examination technique and equipment: flexible pharyngoscope, optical rigid pharyngoscope at 0^0, 30^0, 70^0, and 90^0 for an effective evaluation of the above mentioned alterations. The clinical data of the otorhinolaryngological examination was correlated with the data of the polysomnographic examination. In this way, it was possible to make a proper association between the aspect of the palatine and lingual tonsils and the degree of sleep apnea.

The collected data were centralized in a common database using Microsoft Excel, Microsoft Office Professional Plus 2010 and IBM SPSS Statistics, version 20. In the analysis of the data D'Agostino–Pearson tests, Grubbs tests, χ^2 with Yates' correlation and the exact Fischer test were used. Global support was ensured by the data obtained from the polysomnographic examinations. The apnea–hypopnea index (AHI) and respiratory disturbance index (RDI) values were globally calculated during sleep and in correlation with the sleeping position as well as tonsil modifications. The statistical tests have drawn conclusions by analyzing every pathological case compared to cases with normal structure for each degree of OSA severity.

Results

As far as the characteristics of the examined population are concerned, the maximum age was lower than 80. The Gaussian model demonstrated the existence of a mean age of 44.39±12.95 years (Figure 1). Moreover, the incidence in men was 3.6 times higher than in women (Figure 2).

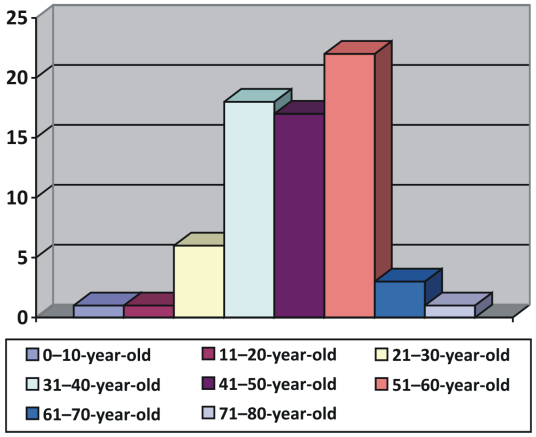

Figure 1 – ***Mean age of the population included in the study.***

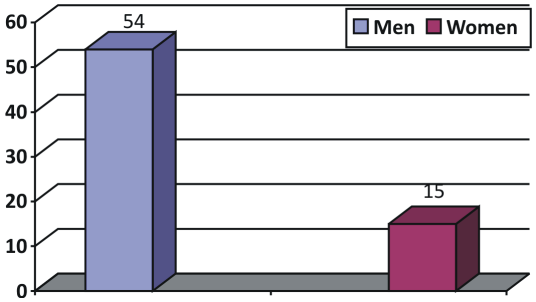

Figure 2 – ***Gender distribution of obstructive sleep apnea.***

According to AHI values, OSA severity classification, independent from the sleeping position showed the predominance of patients with severe apnea (Figure 3).

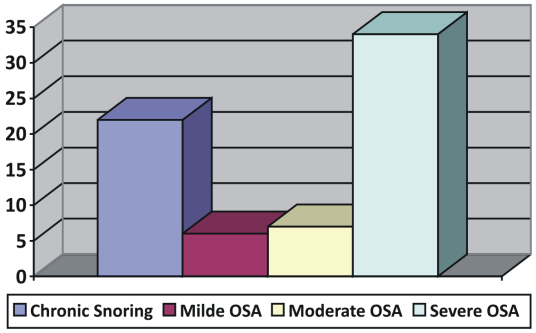

Figure 3 – ***OSA severity in the examined patients.***

The distribution of palatine tonsil characteristics corresponding to the degree of apnea severity according to AHI values demonstrated the predominance of normal tonsils in each age group. The increase of the tonsil volume and the narrowing of the buccopharyngian isthmus have also been noticed with predilection in patients with moderate or severe apnea. Within the same study, a

specificity of tonsil enlargement without the narrowing of the oropharyngean isthmus was demonstrated. This was in all groups of obstructive apnea, even in snoring patients with normal AHI values, with a non-significant statistical correlation (Figure 4).

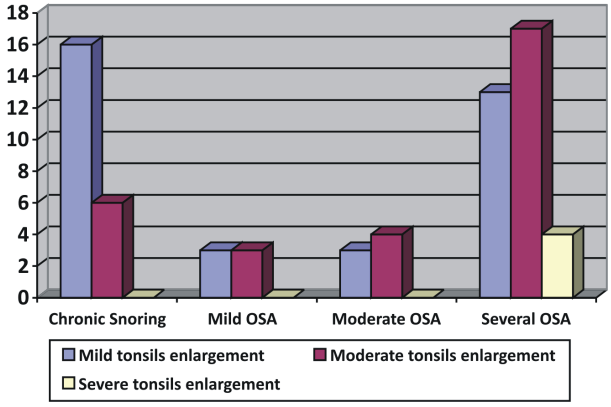

Figure 4 – ***OSA severity classification in correlation with tonsil enlargement.***

It is to be noticed that tonsil hypertrophy notion referred not only to the dimensions of the palatine tonsils, but also to the histopathological features of the specimens in patients who were subsequently subjected to surgical interventions such as uvulopalatopharyngoplasty with or without tonsillectomy (Figure 5).

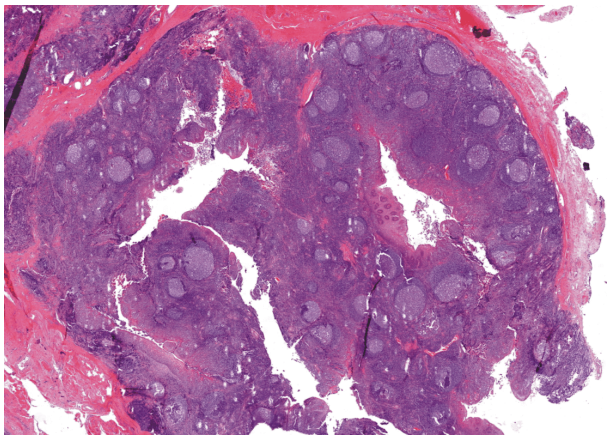

Figure 5 – ***Histologically tonsillar hypertrophy is characterized by a hyperplasia of lymphoid tissue with slight enlargement of follicles. Focal epithelial lesions may also be observed (Hematoxylin–Eosin staining, 40×).***

The correlation of lingual tonsil characteristics, especially its size, with the severity of OSA is significant in cases of severe apnea (p=0.0151) and non-significant in cases of moderate and mild apnea. Using several indices to classify the severity of OSAS is an important asset. Although the AHI-RDI pair is essential, using the AHI index is the benchmark, due to its widespread use. Analysis of the otorhinolaryngological elements aims at investigating the etiologic supporting important part of the obstructive sleep apnea syndrome, by assessing each evaluated structure. Only a small part of the test showed statistical significance. For each structure is observed that the value of p decreases gradually according to the apnea severity. This demonstrates that each structure is not in itself the single cause of the disease, but it also requires the company of other items.

Discussion

Otorhinolaryngological pathology plays an important role in the appearance of this disease. It has to be taken into consideration any time we encounter a patient with sleep apnea. The literature places otorhinolaryngological pathology second after obesity in the order of causes for this disease [15, 16]. Therefore, a comparative study between otorhinolaryngological pathology (tonsil hypertrophy) and OSA is entirely justified. In relation with the age of patients, several studies have shown that the frequency of OSA increases with age. It is more frequent in the case of patients older than 65 in comparisons with patients between the ages of 30–65 [17]. From an epidemiologic point of view, some studies showed that OSA is more frequently encountered in male patients, with an 8:1 ratio [18, 19]. Another research shows that the incidence grows in women during the post-menopausal period [20, 21]. As far as the prognostic of this disease is concerned it is very important to mention that an error in diagnosis or under-diagnosis can have multi-organ consequences on the patient's organism. Patients with OSA are more predisposed to cardiovascular diseases, such as: the endothelial function decrease, left ventricular hypertrophy, arterial hypertension and lung diseases as well [22–24]. Moreover, due to insomnia the risks of traffic accidents and traumatisms are higher in the case of these patients [25, 26]. Although it is a frequently encountered disease, a research in the US showed that 80% of these cases are under-diagnosed [27].

It is known that the lingual tonsil plays an important role in the appearance of OSA, a fact also demonstrated by the present study, in which lingual tonsil hypertrophy appears predominantly in patients with severe apnea.

The use of multiple indices in the classification of OSA severity is an important advantage. Although the essential is the AHI-RDI pair, AHI values are of reference due to their use on a larger scale. The analysis of otorhinolaryngological elements aims to investigate the important etiological support of obstructive sleep apnea by examining every evaluated structure. Only a few of the tests showed a statistical significance but in case of each structure, the p-value decreased gradually with the severity of the apnea. Therefore, it can be proved that there is no singular structure to induce the disorder, but the cause is rather a combination of several elements. The contribution of this research derives from the design and the recommendations of the study. For a more correct evaluation, it is mandatory that the same type of software and hardware to be used in evaluating all cases. The otorhinolaryngological examination has the disadvantage that it cannot accurately describe the macroscopic degree of tonsil hypertrophy and the real dimensions of the palatine tonsils that would imply the aforementioned hypertrophy. Only the dimensions of the palatine tonsils that cause the narrowing of the oropharyngeal isthmus are taken into consideration.

Conclusions

The polysomnographic examination remains the golden standard for assessing OSA patients. The notion of tonsil hypertrophy has to be correlated with the histopathological

confirmation; otherwise, it does not reflect the reality. Therefore, it is more accurate to use the term "tonsil volume" when examining the dimension of tonsils that influence the diameter of the oropharyngeal isthmus. The real value of this research is that it demonstrates the importance of histopathological examination in establishing the criteria for the evaluation of palatine and lingual tonsil dimensions. All these data are essential in establishing the therapeutic conduct in a patient with OSAS.

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Corresponding author

Adriana Neagoş, Senior Lecturer, MD, PhD, Department of Otorhinolaryngology, University of Medicine and Pharmacy of Tîrgu Mureş, 8 Lăpuşna Street, 540342 Tîrgu Mureş, Romania; Phone +40744–112 250, e-mail: neagos.adriana@gmail.com, adriana.neagos@galenus.ro

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