■ ORIGINAL ARTICLES

Analysis of the Anthropometric, Epidemiological, and Clinical Parameters in Patients With Snoring and Obstructive Sleep Apnoea

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Objectives: The existence of snoring, apnoeas, and diurnal somnolence constitutes Obstructive Sleep Apnoea (OSA), a disease of high prevalence that can cause serious complications. We have made a descriptive study of the epidemiological and clinical characteristics of patients with suspected OSA, with the main target of knowing the value of some of these characteristics in the evaluation of these patients.
Patients and method: We have had access to a retrospective sample of 433 patients (361 men and 72 women) with an average age of 47 (11.1) years (range, 18-75), referred due to suspected OSA. The variables and examinations studied were: age, gender, electrocardiogram, spirometry, blood pressure, smoking, neck perimeter, body mass index (BMI), diurnal drowsiness (Epworth Sleepiness Scale), nasal, and pharyngeal examination, Müller's manoeuvre, and respiratory disturbance index (RDI).
Results: Patients with OSA included in this study are older and more obese, and they have a greater neck perimeter. In addition, they present greater diurnal sleepiness and a greater frequency of pharyngeal collapse in Müller's manoeuvre than mere snorers. Clinical and epidemiological parameters were seen to correlate better with the existence of OSA in clearly obese individuals (BMI >30) than in individuals with normal BMI scores (<24) or even overweight (25-29). As far as age was concerned, the clinical and epidemiological parameters showed more statistically significant differences between patients with OSA and simple snorers among the youngest individuals in our sample (<43 years of age).
Conclusions: Physical examination and the clinical and epidemiological data are useful to complete the diagnostic assessment of these patients.

Key words: Obstructive sleep apnoea. Snoring. BMI. Drowsiness. Müller's manoeuvre.

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Análisis de los parámetros antropométricos, epidemiológicos y clínicos en los pacientes con roncopatía y síndrome obstructivo de apnea-hipopnea del sueño

Objetivos: Los ronquidos, las apneas y la somnolencia diurna constituyen el síndrome de apnea-hipopnea obstructiva del sueño (SAHOS), enfermedad de elevada prevalencia que puede causar graves complicaciones. Hemos realizado un estudio descriptivo de las características epidemiológicas y clínicas de los pacientes con sospecha de SAHOS, con el objetivo principal de conocer el valor de algunas de esas características en la evaluación de los pacientes.
Pacientes y método: Hemos dispuesto de una muestra retrospectiva de 433 pacientes, 361 varones y 72 mujeres, con una media ± desviación estándar de edad de 47 ± 11,1 (intervalo, 18-75) años, remitidos por sospecha de SAHOS. Las variables y exploraciones estudiadas fueron edad, sexo, electrocardiograma, espirometría, presión arterial, tabaquismo, perímetro del cuello, índice de masa corporal (IMC), test de somnolencia diurna (Epworth Sleepiness Scale), exploración nasal y faríngea, maniobra de Müller e índice de apnea-hipopnea (IAH).
Resultados: Los pacientes con SAHOS incluidos en este estudio tienen más edad, son más obesos y tienen mayor perímetro cervical. Además, presentan más somnolencia diurna y mayor frecuencia de colapso faríngeo en la maniobra de Müller que los roncadores simples. Por otra parte, se observó que los parámetros clínicos y epidemiológicos se correlacionan mejor con el diagnóstico de SAHOS en los individuos con obesidad franca (IMC > 30) que en los individuos con IMC normal (< 24) e incluso con sobrepeso (IMC 25-29). En cuanto a la edad, los parámetros clínicos y epidemiológicos mostraron más diferencias estadísticamente significativas entre los pacientes con SAHOS y los roncadores simples en los individuos más jóvenes de nuestra muestra (menores de 43 años).
Conclusiones: La exploración física y los datos epidemiológicos y clínicos son útiles para completar la evaluación diagnóstica de estos pacientes.

Palabras clave: Síndrome de apnea-hipopnea obstructiva del sueño. Ronquido. IMC. Somnolencia. Maniobra de Müller.

INTRODUCTION

The national consensus document on sleep apnoea drafted by the Spanish Sleep Group defines Sleep Apnoea as a set of symptoms of excessive drowsiness, cognitive-behavioural, respiratory, cardiac, metabolic, or inflammatory disorders secondary to repeated episodes of obstruction of the upper respiratory tract during sleep. These episodes are measured with the respiratory disturbance index (RDI). An RDI ≥5 associated with symptoms related to the disease and not explained by other causes confirms the diagnosis. RDI is defined by the number of apnoeas, hypopnoeas, and respiratory effort-related arousals (RERA) per hour of sleep.[1]

In the last few years a great deal of attention has been paid to this problem due to the fact that the high prevalence of this disease in the general population, between 1% and 4%,[2-7] turns this into a true public health problem.

Sleep apnoea is frequently presented associated with obesity, though in children it is normally seen as secondary to adenoid and amygdalar hypertrophy, and less frequently with craniofacial anomalies.[8] Thus, in a first visual exam we should focus on the patient's morphotype, very probably that of an obese individual, with a short, thick neck. In young adults we may find it with morbid obesity, and in primarily non-obese subjects as a consequence of craniofacial anomalies.[9] On the other hand, body mass index (BMI) increases with age, but also raises muscular flaccidity, which contributes to greater collapsibility of the upper respiratory tract. In gender terms, it seems that this constrains snoring and obstructive sleep apnoea-hypopnoea syndrome (OSA), principally by the different modelling of obesity in men and women due to the action of sex hormones. Android obesity is characterized by a greater accumulation of fat in the upper portion of the abdomen and neck than in gynecoid obesity, in which fat is principally in the extremities and the abdomen. In groups with equal BMIs, men have a greater cervical circumference and a greater subscapular skinfold. Thus, the presence of snoring disorder and OSA is more premature and severe in men than in women.[10,11]

Examination, together with anamnesis, should constitute the basis for the diagnostic process of OSA. In this sense, a complete otorhinolaryngological examination should be performed on the patient suspected of OSA that includes a nasopharyngoscopy with a flexible fibroscope. The first publications on this procedure identified the velopharynx as the principle point of collapse in patients with obstructive apnoeas.[12,13] These authors believed that this collapse was an active phenomenon, but later studies with pharyngoscopy and concomitant pharyngeal electromyography demonstrated that this collapse is a passive phenomenon coincident with the beginning of inspiration and the development of negative pressures in the upper respiratory tracts[14,15] and, moreover, that they can also occur in the hypopharynx, at least in some patients.

Müller's manoeuvre (forced inspiration with the nose and mouth covered) was added to the fibroscopic examination during wakefulness and used most widely by Sher et al.[16]

In this paper, a descriptive study is performed of the epidemiological and clinical characteristics of a large sample of patients suspected of OSA, as well as a study of the relationship between BMI with RDI in these patients. On the basis of these parameters, the goal is to find out if otorhinolaryngological evaluation can contribute to the diagnosis of these patients.

PATIENTS AND METHOD

We have used a retrospective sample of 433 patients, 361 men (83.37%) and 72 women (16.63%), with a mean age (standard deviation) of 47 (11.1) (range, 18-75) years, all admitted as suspected sufferers of OSA from primary health care and also from the pneumology department. The following parameters were recorded for all patients: age (years), gender, electrocardiogram (EKG), spirometry, blood pressure, smoking status, neck perimeter (circumference of the neck measured from the cricothyroid membrane in centimetres), BMI, test of diurnal sleepiness (Epworth Sleepiness Scale [ESS]),[17] nasal examination (anterior rhinoscopy and rigid endoscopy), pharyngeal examination, Müller's manoeuvre (collapsibility of the pharynx), and RDI index.

In terms of tobacco consumption, patients were divided into smokers and non-smokers, and smokers were divided into those smoking <10, 10 to 20, and >20 cigarettes a day. The electrocardiogram results were divided into normal and pathological (arrhythmias and ischaemia). Spirometry was divided into normal and pathological (chronic obstructive airway disease, COAD). The nasal examination performed included anterior rhinoscopy and rigid endoscopy, considering 2 groups: *a*) normal, and *b*) pathological (septal dysmorphia, polyposis, turbine hypertrophy). In the pharyngeal examination, the 2 groups considered were: *a*) normal pharynx, and *b*) abnormal pharynx (velopalatine hypertrophy, amygdalar hypertrophy, prior operation). In view of the importance BMI and age could have in OSA, these parameters were studied in various sub-groups. BMI was studied by creating the following sub-groups: BMI ≤24, normal; BMI 25-29, overweight; and BMI ≥30, obese. With regard to age, 3 sub-groups were established: <43; 43-52; and >52 years.

All patients were examined with a flexible nasofibroscope, and during that examination Müller's manoeuvre was performed. This manoeuvre consists in asking the patient, during the flexible nasofibroscopy, making a forced effort to breathe in with the mouth and nose closed, and the velopharyngeal and hypopharyngeal collapse is observed. For this, with the patient in a supine position, an Olympus® nasofibroscope was introduced through a nasal orifice up to the lower level of the oropharynx. The degree of collapse in each level was obtained in accordance with the scale established by Petri et al,[18] and 2 groups were thus established: *a*) those that presented no degree of collapse (collapse 0), and *b*) those that presented some degree of collapse (collapse 1-4).

A nocturnal polysomnograph was performed on all the patients with a 19-channel Alice 3 polysomnograph. The events were counted in accordance with the 2002 norms

Table 1. General Characteristics of the Sample Included in the Study[a]

	No.	%
Gender		
Males	361	83.37
Females	72	16.63
Age, mean (SD), y	46.86 (11.10)	
Arrhythmia	17	3.93
COAD	56	12.93
HBP	76	17.55
Smokers	150	34.65
Neck perimeter, cm	41.68 (3.89)	
BMI	29.73 (5.72)	
Epworth Test	8.87 (5.08)	
Nasal involvement	211	48.73
Pharyngeal abnormality	329	75.98
Pharyngeal collapse (MM)	319	73.84
RDI	40.13 (29.16)	

[a]HBP indicates high blood pressure; RDI, respiratory disturbance index per hour; BMI, body mass index; MM, Müller's manoeuvre; COAD, chronic obstructive airway disease.

Table 2. Clinical, Anthropometric, and Polysomnographic Characteristics of SS and Patients With OSA[a]

	OSA (n=347)	Snoring Disorder (n=86)	P
Gender			
Males	295	66	NS
Females	52	20	
Age, mean (SD), y	48.16 (10.75)	41.59 (11)	<.001
Arrhythmia	15	2	NS
COAD	45	11	NS
Blood pressure			
Normal	281	76	NS
Hypertensive	66	10	
Smokers			
No	225	58	NS
Yes	122	28	
Neck perimeter, cm	42.11 (3.89)	39.94 (3.41)	<.001
BMI			
≤24	47	24	<.001
≥25	300	62	
Epworth test			
Normal ≤9	170	61	<.001
EDS ≥10	177	25	
Nasal examination			
Normal	174	48	NS
Pathological	173	38	
Pharyngeal examination			
Normal	69	35	<.001
Abnormal	278	51	
Pharyngeal collapse (MM)			
No	67	46	<.001
Yes	279	40	
RDI	48.96 (25.81)	4.52 (3.02)	<.001

[a]EDS indicates excessive daytime sleepiness; RDI, respiratory disturbance index per hour; BMI, body mass index; MM, Müller's manoeuvre; NS, not significant.

of the Spanish Society for Pneumology and Thoracic Surgery (SEPAR in its Spanish acronym), using a thermal resistor, a nasal pressure cannula and thoracoabdominal bands to capture respiratory events. Thus, obstructive apnoea is defined as an absence or reduction >90% in the respiratory signal for more than 10 seconds in the presence of respiratory effort detected by the thoracoabdominal bands. Hypopnoea is a discernable reduction (>30% and <90%) of the amplitude of the respiratory signal lasting for more than 10 seconds and accompanied by a desaturation of 3% and/or an arousal. Patients with an RDI of ≥10 were considered to have OSA. Patients with an RDI of ≤9 were catalogued as simple snorers (SS).

Statistical Analysis

For the contrast of hypotheses a χ^2 test was used for the comparison of categorical variables, and Fisher's exact test was the most appropriate where the frequencies expected from the related dichotomic variables were <5. When we wanted to contrast the average difference in continuous variables, the Student's *t* test and variable analysis (ANOVA) were used when the variable followed a normal distribution; otherwise, the tests used were the Mann-Whitney *U* and Kruskal-Wallis H, respectively. All these contrasts were stratified by the age of the patient and BMI.

The threshold value for statistical significance is *P*=.05. All calculations were performed with the SAS Institute Inc. v8.02 and Stata 8 software.

RESULTS

The general characteristics of the 433 subjects included in the study are shown in Table 1.

The clinical, anthropometric, and polysomnographic data with statistical significance for the comparison between OSA and SS are compiled in Table 2. It can be seen that patients with OSA are older, in general significantly more obese and have a larger cervical perimeter than SS (*P*<.001). Moreover, the patients with OSA present a greater degree of diurnal sleepiness than the SS in the Epworth test (9.26 [5.12] against 7.32 [4.63]; *P*<.001).

As for the examination results, patients with OSA were more often seen to present some type of pharyngeal abnormality and some degree of pharyngeal collapse in Müller's manoeuvre than the SS (*P*<.001). In Müller's manoeuvre it was observed that the pharyngeal collapse can be a good predictor of OSA (*P*<.001), but there is no

Table 3. Characteristics of the BMI Sub-Groups[a]

	BMI ≤24		*BMI 25-29*		*BMI ≥30*	
	OSA	*SS*	*OSA*	*SS*	*OSA*	*SS*
Patients, n	47	24	133	36	167	26
Gender						
Males	42[b]	14	118	30	135	22
Females	5	10	15	6	32	4
Age, mean (SD), y	45.74 (12.25)	37.08 (9.77)	46.77 (10.19)	44.86 (11.68)	49.95 (10.5)[c]	41.23 (9.85)
Blood pressure						
Normal	42	23	117	31	122	22
Hypertension	5	1	16	5	45	4
Smokers						
No	30	15	76	24	119	19
Yes	17	9	57	12	48	7
Neck perimeter, cm	38.78 (2.81)	37.5 (4.01)	40.67 (2.57)	40.27 (2.19)	44.19 (3.88)[b]	41.73 (2.97)
ESS						
≤9	25	17	76	24	69	20
≥10	22	7	57	12	98[c]	6
Nasal examination						
Normal	19	14	57	22	98	12
Pathological	28	10	76	14	69	14
Pharyngeal examination						
Normal	22	15	28	13	19	7
Abnormal	25	9	105	23	148[d]	19
Pharyngeal collapse (MM)						
No	18	20	27	16	22	10
Yes	29[c]	4	106[b]	20	144[b]	16
RDI	37.85 (20.02)	4 (2.9)	41.53 (22.17)	4.44 (3.10)	58.01 (26.93)	5.11 (3.029)

[a]RDI indicates respiratory disturbance index per hour; BMI, body mass index; MM, Müller's manoeuvre.
[b]*R*<.01, OSA versus snorers in the same sub-group.
[c]*R*<.001, OSA versus snorers in the same sub-group.
[d]*R*<.05, OSA versus snorers in the same sub-group.

statistical difference between patients with OSA and SS by degree of collapse (*P*=.5). The nasal examination of the patients with OSA did not present any statistical significance (*P*=.3) in terms of the presence or absence of involvement. By gender, a difference close to but not reaching statistical significance was observed (*P*=.06). Among the 347 patients diagnosed with OSA, only 66 (19%) presented high blood pressure, with no statistical significance (*P*=.1). Lastly, there was no significant statistical difference between smokers and non-smokers in terms of contracting OSA (*P*=.6), but there was a difference among smokers, as the probability of having OSA is greater when more cigarettes are smoked (*P*<.005).

In view of the potential importance of BMI, this parameter has been studied in different sub-groups, whose results are given in Table 3. By gender, it is seen that, for individuals with a BMI ≤24, OSA is more frequent among men (*P*<.01); in other words, in patients with a BMI ≤24, gender has statistical significance for predicting a pathological RDI (≥10), and this is more frequent in men (*P*<.01). Age and Müller's manoeuvre also attained statistical significance in the BMI ≤24 sub-group. Patients with OSA were older than the SS (*P*<.01) and the presence or absence of pharyngeal collapse affects RDI to some extent, ie, the absence of a collapse would denote an RDI/hour <10 and its presence, an RDI ≥10 (*P*<.001). In the BMI ≥30 sub-group, gender did not show a statistically significant difference, but age did (older age in the patients with OSA; *P*<.001). In this sub-group statistically significant differences were also observed between the patients with OSA and SS in neck perimeter, Epworth test, pharyngeal exploration, and Müller's manoeuvre. Neck perimeter was greater in patients with OSA (*P*<.001); diurnal sleepiness is more frequent in individuals with OSA than in those with SS (*P*<.01), and patients with OSA presented some type of pharyngeal abnormality (*P*<.01) more frequently than SS. With Müller's manoeuvre, the same occurs as in the BMI ≤24 sub-group (*P*<.001). Lastly, in the BMI 25-29 sub-group (overweight), it turns out that no parameter, except pharyngeal collapse in Müller's manoeuvre (*P*<.01), was statistically significant for differentiating OSA from SS. Though they were close to

Table 4. Characteristics of Sub-Groups by Age[a]

	Age <43 Years		*Age 43-52 Years*		*Age >52 Years*	
	OSA	*Snoring Disorder*	*OSA*	*Snoring Disorder*	*OSA*	*Snoring Disorder*
Patients, n	103	43	118	29	126	14
Gender						
Males	94[b]	30	96	25	105	11
Females	9	13	22	4	21	3
Age, mean (SD), y	35.32 (5.18)[c]	32.16 (5.96)	47.39 (3.03)	47.13 (3.07)	59.38 (5.11)	58.14 (4.07)
Blood pressure						
Normal	100	38	98	26	83	12
Hypertension	3	5	20	3	43	2
Smokers						
No	54	27	72	20	99	11
Yes	49	16	46	9	27	3
Neck perimeter, cm	41.58 (3.46)[c]	38.9 (3.64)	41.88 (3.91)	40.86 (2.92)	42.75 (4.14)	41.21 (2.77)
BMI						
≥24	18	18	13	5	16[c]	1
25-29	47[c]	13	50	13	36[c]	10
≥30	38[c]	12	55	11	74[c]	3
Epworth test						
Normal	56	28	59	21	55	12
EDS	47	15	59[d]	8	71[c]	2
Nasal examination						
Normal	44	27	67	14	63	7
Pathological	59[d]	16	51	15	63	7
Pharyngeal examination						
Normal	27	22	27	9	15	4
Abnormal	76[c]	21	91	20	111	10
Pharyngeal collapse (MM)						
No	27	26	20	13	20	7
Yes	75[b]	17	98[c]	16	106[c]	7
RDI	47.61 (26.66)[b]	4.46 (3.07)	46.57 (26.38)[b]	4.93 (2.95)	2.3 (24.38)[b]	3.85 (3.18)

[a]EDS indicates excessive daytime sleepiness; RDI, respiratory disturbance index per hour; BMI, body mass index; MM, Müller's manoeuvre.
[b]*P*<.001, OSA versus snorers in the same sub-group.
[c]*P*<.01, OSA versus snorers in the same sub-group.
[d]*P*<.05, OSA versus snorers in the same sub-group.

statistical significance, nasal examination (*P*=.05) and pharyngeal exploration (*P*=.06) did not achieve it.

In short, according to these results, we can say that, the BMI, clinical, epidemiological, and anthropometric parameters show more statistically significant differences between patients with OSA and SS in individuals with frank obesity, and not as much in overweight or normal BMI patients.

The results with statistical significance between OSA and SS by age groups are shown in Table 4. The youngest patients (<43 years of age) with OSA have a larger neck perimeter and are more obese in general than SS (*P*<.01). Statistical significance is also noted in terms of gender as the patients with OSA are primarily men (*P*<.001). The data obtained during examination also attained significance and a pathological nasal examination (*P*<.05), abnormal pharynx (*P*<.01), and pharyngeal collapse in Müller's manoeuvre were observed in patients with OSA (with respect to SS). In the 43-52 year age sub-group, apart from Müller's manoeuvre, only the ESS showed a statistically significant difference (*P*<.05) between OSA and SS. Lastly, in the oldest sub-group (>52 years of age) the same occurs as in the previous group (43-52 years). Moreover the BMI again shows statistically significant differences (*P*<.01) between OSA and SS, and the patients with OSA are more obese. Definitively, the clinical, epidemiological and anthropometric parameters show more statistically significant differences between patients with OSA and SS in the youngest individuals (<43 years), and thus, they correlate better with RDI/hour than in older patients (>43 years).

DISCUSSION

It is very difficult to distinguish, with just anamnesis and a physical examination, between simple snorers (SS) and snorers with associated obstructive sleep apnoea (OSA), and this can only be assured with a polysomnograph.

The otorhinolaryngological examination is important in a correct evaluation of the patient despite the fact that, as often happens in clinical practice, the anatomical alteration is not related to the severity of their OSA.[19]

Unfortunately, there is no specific symptom of OSA. The 3 key symptoms, especially excessive diurnal sleepiness, are very frequent in both the general population and in patients suspected of having OSA.[20-23] Even though various predictive diagnostic models have been proposed with the combination of OSA symptoms and anthropometric variables,[24-27] a sufficient degree of diagnostic accuracy in confirming OSA has not been obtained, so its systematic use is not recommended. However, the clinical analysis is the first approximation to the diagnosis and the presence of relevant symptoms is one of the cornerstones for indicating treatment. Thus, a good case history, alone or combined with prediction models, will be of great help in estimating the degree of diagnostic suspicion to determine the type of sleep test to be performed. This will also give priority to patients on the waiting list with a high suspicion of the disease and studies will not be performed on low-probability cases with scant clinical indications. Mayer-Brix et al[28] studied 336 patients with clinical signs of OSA who were referred to the otorhinolaryngologist before being given a polysomnograph test. Of these patients, 95 showed regional alterations not suspected in the visual exam. The most frequent were septal deviations, polyposis, and adenoid hypertrophy. As a result, these authors recommend this examination be performed before beginning treatment. These considerations may be particularly pertinent in non-obese patients, where anatomical alterations are more often the constraints for respiratory alterations during sleep.[29]

Among the data collected in a case history, with regard to age, most cases are situated in the group of patients between 40 and 65 years of age,[3] while the prevalence diminishes[5] in those over 60. In our study, the patients with OSA are older but, curiously, the clinical, epidemiological, and anthropometric parameters show a greater and statistically significant difference between the patients with OSA and SS among the youngest patients (<43 years) and thus, they correlate better with RDI in older patients (>43 years). The influence of obesity and also gender in the increased risk of OSA varies with age, and is greater in middle-aged individuals, in whom the risk is 4 times greater in men.[7,30] In older people, the differences are less (men:women, 2:1) and in the paediatric population there are no differences between genders.[31] In addition, the effect of obesity is very important in middle-aged subjects, among whom the people with BMI >29 have a risk between 8 and 12 times greater of having OSA than non-obese individuals.[13,32,33]

In our study, we have proved that the incidence of OSA was greater in male patients than in females, though without statistical significance, meaning that men and women have the same probability of contracting OSA. For some authors, however, it seems that normal males have greater pharyngeal and supraglottal resistances than women, which makes the former more susceptible to pharyngeal collapse. Thus, the male:female ratio in the study by Young et al[7] is 3:1, although this ratio is lower than those observed in previous studies[6] that cited it as 10:1.

Another fundamental risk factor of SS and OSA would be obesity, defined as a BMI >28, that is present in 60%-90% of patients with OSA.[34] Even greater differences are described by other authors like Kyzer et al,[35] for whom the incidence of obstructive apnoea in obese patients is 12-30 times greater. In our study, patients with OSA are significantly more obese and the clinical, epidemiological, and anthropometric parameters show more statistically significant differences between patients with OSA and SS in individuals with clear obesity, and not as much in overweight patients or those with normal BMI. Numerous studies have described that the cervical perimeter is related to the production of apnoeas[36-38]: in male adults, a neck size greater than 43 cm is an important predictor of OSA, and in those who also snore, the prevalence of OSA is 30%. In women, a neck size greater than 38 cm raises the risk of OSA. However, there is controversy in terms of whether cervical circumference is independent from BMI as a predictive factor of OSA, and also as to whether the type of obesity (abdominal or peripheral) is of importance, whereby obesity in the upper body would be related to a greater risk of OSA.[10]

We have found that 46.65% of the patients in our sample showed some degree of daytime sleepiness (ESS ≥10), and that patients with OSA have a greater degree of daytime sleepiness than those with SS. The prevalence of excessive daytime sleepiness (EDS) is very high among the general population and may be secondary to multiple causes, the most frequent being insufficient sleep syndrome, which may affect more than 20% of the population.[20-23] Some authors,[19] however, show the low predictive value of hypersleepiness questionnaires in predicting apnoea during sleep.

It is accepted that some anatomical differences are associated with the narrowing of the upper respiratory tract and predispose patients for OSA. In our study, the nasal examination showed that 48.73% of our patients presented some sort of nasal disorder, but without statistical significance to evaluate its incidence in RDI/hour (P=.06).

These results coincide with those of other authors[39,40] who also failed to find a good correlation between nasal obstruction and RDI in their studies. Maurice et al[41] found that the opening of the mouth in normal subjects increments the collapsibility of the upper respiratory tracts, and can contribute to the onset of sleep-related respiratory anomalies. Thus, even when nasal resistance does not contribute directly to the appearance of OSA, it may lead patients to breathe through the mouth during sleep, that then results in a series of facts that give rise to OSA. We have also observed a higher rate of RDI in patients with an abnormal pharyngeal examination than in those with a normal examination. Thus, we agree that the pharynx should be examined exhaustively in patients suspected of OSA. We sometimes find examinations that will be normal, in which case the likelihood of facing OSA is lower.

Endoscopic studies of the upper respiratory tract have been well-used for the evaluation of this region in patients with sleep apnoea, with the goal of finding the point of collapse.[42,43] The problem has always resided in the fact that it is an examination performed in conditions different to those in which the condition occurs (in wakefulness and with the patient seated). Endoscopic studies during the day have been developed and combined with polysomnography and the use of sedatives. In this sense, the endoscopic studies meant to evaluate the pharyngeal shape before and after placing a prosthesis to advance the maxillary seem more interesting.[42]

Müller's manoeuvre has often been used in an attempt to simulate pharyngeal closing during sleep (inspiratory effort against the closed mouth and nose) and to observe it through endoscopy.[42] In our study we found that 73.84% of the patients present some degree of velopharyngeal and/or hypopharyngeal collapse.

We also proved that RDI is higher in patients that had some degree of pharyngeal collapse. In this sense we agree with the authors[44] who state that it is necessary to perform an endoscopy as part of the otorhinolaryngological examination in order to furnish a greater evaluation of the rhinopharynx and the hypopharynx to determine whether or not there is collapse. However, with respect to the predictive value in detecting patients with OSA, some authors[45] have shown their scant utility arguing that such a manoeuvre is performed in awake patients and that it moreover requires their excellent co-operation. This test has never been validated. In addition, the manoeuvre does not objectively evaluate the amount of inspiratory effort made.

Ideally, the examination of the upper respiratory tract (anterior rhinoscopy, oropharyngoscopy, examination of the oral cavity, indirect laryngoscopy and nasopharyngolaryngeal endoscopy, visual examination of the morphotype, and maxillomandibular discrepancies) should be performed by an otorhinolaryngology specialist before any therapeutic planning.

All the centres acknowledge they perform a basic otorhinolaryngological examination that includes an examination of the nasal fossae and the oropharynx, as well as the palate. If there are relevant alterations or the patients have an otorhinolaryngological problem, they are referred to a specialist. The same happens when the patient has problems tolerating forced ventilation with continuous positive air pressure (CPAP) due to secondary otorhinolaryngological effects. No centre refers patients to the otorhinolaryngologist before performing a CPAP test. Patients will also be referred to the otorhinolaryngologist when they want to receive a surgical alternative to CPAP or when nasal surgery is necessary for the patient to tolerate it.[1]

The consensus document[1] recommends the performance of a basic examination of the upper respiratory tract and the otorhinolaryngeal area in any patient suspected of OSA.

Patients should be referred to an otorhinolaryngological, dental, or maxillofacial specialist if specific alterations in these areas are detected or if they wish to submit to a surgical treatment and/or a device to advance the jaw. All patients with CPAP intolerance should be evaluated by an otorhinolaryngologist.

The otorhinolaryngological evaluation is recommended before the prescription of CPAP, although this will depend on the availability at each centre.

CONCLUSIONS

Patients with OSA are older, more obese, and have a greater cervical perimeter. These patients present daytime sleepiness, altered pharyngeal examination, and pharyngeal collapse. These clinical parameters better reflect the presence of OSA in younger patients and in patients with an elevated BMI. The analysis of the anthropometric, epidemiological and clinical parameters is useful for the diagnostic evaluation of patients with OSA.

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