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Supine Isolated Positional OSA versus Non-Positional OSA: Key Demographic Differences

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Abstract

Background: Obstructive sleep apnea (OSA) is the most common sleep disorder affecting 3% to 10% of the adult population. One of the contributing factors to development of OSA is the sleep position. The aim of this study is to investigate the characteristics and demographics features of patients with supine isolated obstructive sleep apnea (siOSA) and discuss the differences between non positional OSA (NPOSA) groups.

Methods: A retrospective review of the polysomnography records of 1,100 individuals, who were admitted to the Sleep Laboratory of Sureyyapaşa Chest Diseases and Thoracic Surgery Training and Research Hospital between January 2011 and December 2013, was indicated in the study. Nine hundred seventy subjects (88.8%) who were diagnosed as an obstructive sleep apnea (OSA) were included in the study. Supine isolated obstructive sleep apnea (siOSA) was defined as a total Apnea-Hypopnea Index (AHI) greater than 5, non-supine AHI lower than 5 and an AHI in the supine position twice as high or more when compared with AHI in non-supine position. Characteristics of siOSA and non-positional OSA groups were compared statistically.

Results: In the study group, 269 (27.7%) were considered to have supine isolated OSA (siOSA) and 701 (72.3%) were non positional OSA (NPOSA). siOSA patients had lower body mass index than NPOSA patients (p<0.01). Also they were less sleepy and had less additional disease than the NPOSA patients (p<0.01).

Conclusion: This study showed that sup in isolated OSA was interpreted as a different clinical entity. Patients in the siOSA group had lower weight, less sleepy and had less additional diseases.

Keywords: Obstructive sleep apnea subtypes; Demographic differences; Positional OSA

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Introduction

Obstructive sleep apnea (OSA) is a highly prevalent disease affecting, approximately 3% to 10% of the adult population [1,2]. It is characterized by recurrent episodes of complete or partial obstruction in the upper airway during sleep. The result of this obstruction is intermittent hypoxia and sleep fragmentation [3]. Therefore, OSA has serious clinical consequences such as daytime somnolence, systemic hypertension, diabetes mellitus, and cerebrovascular diseases [4].

Age, male gender, overweight, smoking, upper airway anatomy and hyper-reactivity, and the sleep position are regarded as contributing factors to the development of OSA [5]. Some of OSA patients have approximately 50% to 60% higher apnea-hypopnea index in supine position. Supine positioning is associated with an increase in upper airway collapsibility and thus an increase in apnea frequency and duration [6,7].

The effect of sleeping position among OSA was observed in many studies with small groups or patients whom had predominant positional OSA [8,9]. However, in this study, we aimed to investigate the characteristics and demographics features of patients with supine isolated Obstructive Sleep Apnea (siOSA) and discuss the differences between nonpositional OSA (NPOSA) in large study groups.

Methods

A retrospective review of the polysomnography records of 1,100 individuals who admitted to the Sleep Laboratory of Sureyyapaşa Chest Diseases and Thoracic Surgery Training and Research Hospital between January 2011 and December 2013 was performed. Medical records of nine

Table 1: The characteristics of the patients in study group.

Variables	Mean ± SD
Age	49.75 ± 10.86
Gender (Male/Female)	681 (70.2%)/289 (29.8%)
Body Mass Index (BMI)	32.50 ± 6.35
Epworth Sleepiness Scale (ESS)	9.55 ± 4.8
Additional Disease	671 (69.2%)

SD: Standard Deviation

Table 2: The distributions of major symptoms in study group.

	N	%
Snore	954	98.4
Witness apnea	866	89.3
Daytime Sleepiness	791	81.5

hundred seventy subjects (88.8%) who were diagnosed as obstructive sleep apnea (OSA) and one hundred thirty subjects (11.2%) who did not have OSA were retrieved. Central apnea, periodic limb movement syndrome, narcolepsy, and patients who slept less than 30 minutes in each position were excluded. The demographic variables (age, gender, and Body Mass Index (BMI)) of the patients were collected from the patients' files. BMI was calculated as the ratio of dry weight in kilograms to height in meters squared. The subjects with BMI 18.5 kg/m^2 to 24.9 kg/m^2 were defined as normal, BMI 25 kg/m^2 to 29.9 kg/m^2 as overweight, BMI 30 kg/m^2 to 39.9 kg/m^2 as obese and BMI ≥ 40 kg/m^2 as morbid obese. Daytime sleepiness was evaluated with the Epworth Sleepiness Scale (ESS). Also their additional diseases such as diabetes Mellitus, hypertension, cerebrovascular disease etc. were recorded.

Polysomnography (PSG)

All subjects were monitored with a nocturnal polysomnography, which was performed with multichannel monitoring that includes neurophysiological electrodes (electroencephalography electrodes), chest wall motion, abdominal motion, arterial oxygen saturation and electrocardiography electrodes (Grass-Tele factor Cephalo, An Astro-med Inc. Product Group, 2005, USA). Oronasal airflow was measured by a thermistor. The oxyhemoglobin saturation was monitored with a finger pulse oximeter with a sampling rate of 1 Hz. The body position was measured by a position sensor attached to the anterior chest wall. Signals recorded in the sleep period were manually analyzed [10]. Apneas were scored when the airflow decreased by at least 90% from baseline for at least 10 seconds and classified as central, mixed or obstructive depending on occurrence of thoraco-abdominal movements [10]. Hypopneas were scored when airflow decreased by at least 30% for ≥ 10 seconds and were associated with a SO_2 (oxygen saturation) fall ≥ 3%. Apnea-Hypopnea Index (AHI) was calculated as the average number of apneas and hypopneas per hour of recording in the sleep period. An AHI ≥ 5/h was used to diagnose OSA [11]. The two definitions are accepted for positional OSA. One of them is supine isolated obstructive sleep apnea (siOSA) which is defined as an total AHI greater than 5, non-supine AHI lower than 5, and an AHI in the supine position twice as high or more when compared with AHI in non-supine positions. The second one is supine predominant OSA (spOSA) which is defined as overall AHI is greater than 5events/h, the supine AHI is greater than two times the non-supine AHI [12]. SO_2 in the sleep period was automatically analyzed and after manual elimination of possible artifacts: mean SO_2, and minimum nocturnal SO_2 values were detected.

Table 3: The characteristics of the study group according to position.

	Group 1(siOSA)	Group 2 (NPOSA)	p
Age			
17-39	57 (33.9%)	111(66.1%)	**[a]0.091**
40-59	174 (27.2%)	466(72.8%)	
≥ 60	38 (23.5%)	124 (76.5%)	
Normal	27 (10.0%)	43 (6.1%)	**[a]0.001****
Overweight	130(48.3)	166 (23.7%)	
BMI Obese	91 (33.8%)	260 (37.1%)	
Morbid Obese	21 (7.8%)	232 (33.1%)	
Additional Disease (+)	157 (58.4%)	514 (73.3%)	**[a]0.001****
Additional Disease (-)	112 (41.6%)	187 (26.7%)	
ESS	9.30 ± 5.39	10.35 ± 5.83	**[b]0.015***
AHI	19.15 ± 11.51	40.86 ± 28.33	**[b]0.001****

[a]Pearson Chi Square test; [b]Mann Whitney U test ;*p<0.05; **p<0.01

Statistical analyses

Number Cruncher Statistical System (NCSS) 2007 & Power Analysis and Sample Size (PASS) 2008 Statistical Software (Utah, USA) was used to perform the statistical analysis of the data. Descriptive statistics were described as frequencies, percentages, mean values ± standard deviations (SDs) or median values (min-max). Differences between the groups were examined using the Mann Whitney U-tests for non-parametric continuous variables or the Student's t-tests for parametric continuous variables. The chi-square test was used for dichotomous variables. A value of $p<0.05$ was considered significant.

Results

Nine hundred seventy patients; 681 males (70.2%) and 289 females (29.8%) were included in this study. The mean age of the patients was 49.75 ± 10.86 (range 18-70). The mean BMI of the patients was 32.50 g/m^2 ± 6.35 g/m^2 (range 19.03 kg/m^2 to 63.73 kg/m^2). Patients 671 (69.2%) had at least one additional disease. The characteristics of the study group are shown in Table 1. The distribution of major symptoms; snore, witness apnea and daytime sleepiness were shown in Table 2. In the study group, 269 (27.7%) were considered to have supine isolated OSA (siOSA) (group 1), and 701 (72.3%) were non positional OSA (NPOSA) (group 2). The characteristics of the study group according to position are shown in Table 3. There was no significant difference in age between group 1 and group 2 ($p>0.05$). Patients in group 1 had lower ESS scores, and lower AHI compared to patients in group 2. In group 1; 27 (10%) patients were normal weight, 130 (48.3%) patients were overweight, 91 (33.8%) patients were obese, 21 (7.8%) patients were morbid obese. There was significant difference in BMI between group 1 and group 2 ($p<0.01$). The patients in group 1 had lower BMI. The frequency of additional disease was higher in group 2 than in group 1 ($p<0.01$) (Table 3).

Discussion

A significant consequence of this retrospective analysis is that 27.7% of OSA patients are determined as supine-isolated OSA (siOSA). Furthermore, siOSA patients have lower medical comorbidities (including hypertension, coronary artery disease and cerebrovascular disease), lower BMI, and Epworth sleep scores than the nonpositional OSA patients. Community based studies have shown that the male to female ratio for OSA is in the range of 2:1 or 3:1 [13]. In this study, it was observed that there was a similar gender distribution in the literature (681 males (70.2%) and 289 females (29.8%) out of 970 patients). As we know, the main symptoms of OSA are snoring, witnessed apnea and excessive daytime sleepiness [14-16]. Clinical symptoms of the study group were consistent with the results in the literature.

One of the important factors affecting OSA development is the sleeping position. In the supine position, with the effect of gravity, the tongue and soft palate are displaced towards the pharynx and it causes to airway narrowing. Also the supine position increases the tendency to collapse by making the upper airways more circular [3,17]. For these reasons, in some patients the AHI may be higher in the supine position than in other positions.

The prevalence of the supine dependent or supine isolated positional OSA is variable. Around 50% to 60% of OSA patients are reported supine related OSA [18,19]. In the same population 25% to 30% of patients are determined as supine isolated OSA [9,19]. In this study, 970 patients were evaluated as OSA and269 (27.7%) were considered to have siOSA, similar to the literature. Overall AHI was significantly lower in the siOSA group than in the NPOSA group.

Prevalence in obstructive sleep apnea increased in the 40-65 age group and decreased after the age of 65 [20]. Aging changes the body fat distribution, tissue elasticity, respiratory control, lung and cardiovascular functions [21]. There is insufficient evidence regarding the relationship between age and sleep position. Reports that the siOSA group was younger than the NPOSA group, however, claims that any correlation cannot be found between the age and sleep positions [9,18]. Due to being a reference hospital, our patients are older and more complicated. Therefore in this study we found no correlation between the two groups in regards to age and sleeping position.

In obese patients, the increase in the fat which surrounds the neck and pharynx, results in the obstruction of the upper airway [22]. Obesity also tends to close the upper airway [23]. Obesity is an important risk factor for OSA. In this study, all OSA patients had BMI value which is 32.50 kg/m^2 ± 4.8 kg/m^2. In siOSA group 58.3% of the patients had BMI below 29.9 kg/m^2. The relationship between supine position and obesity is uncertain. When we compare BMI values of siOSA and NPOSA patients, there was a significant difference indicating that the siOSA group had lower BMI, as in the literature [9].

In the literature, different results have been reported for daytime sleepiness for positional OSA. It has been reported that predominant OSA patients were sleepier than the other OSA group [19]. On the other hand, patients with siOSA had similar daytime sleepiness to that of other OSA patients [9]. Similarly, our siOSA group had lower ESS than NPOSA group. This result could be explained by the patients in siOSA group had less severe disease than NPOSA group.

Sleep fragmentation and intermittent hypoxemia caused by OSA influence all systems, resulting in cardiac, pulmonary, urinary, and neurocognitive complications [24]. In our study group 671 patients (69.2%) had at least one additional disease. The frequency of additional disease was lower in siOSA group than in the NPOSA group. The relation between severity of AHI and comorbidities are investigated in many studies. Some of them showed that by increase in AHI, severity of comorbidities are consequently affected [25]. We reported less AHI in the SiOSA group and similarly the frequency of comorbidities was lower than in the NPOSA group.

One of the limitations of this study is being designed as retrospective. Another limitation is supine predominant OSA could be stated as a different group. If it was planned prospectively, we might have compared between supine predominant OSA and siOSA group, thus our suggestions might have been stronger [26].

In conclusion, siOSA group differ from both OSA and positional dependency OSA group according to other aspects of clinical features. This study showed that supine isolated OSA might be interpreted as a different clinical entity. Therefore it should not be forgotten that this group of patient might be overlooked at the first examination and also the result of the retardation of the diagnosis and the treatment, the possible complications of the OSA could be seen. We suggest that more prospective studies should be done regarding this subject.

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