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Clinical and Polysomnographic Differences in Elderly Obstructive Sleep Apnea Patients

Yaşlı Obstrüktif Uyku Apneli Hastalarda Klinik ve Polisomnografik Farklılıklar

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Abstract

Objectives: Although sleep-related complaints are common in the community, knowledge about clinical and polysomnographic differences in elderly patients with obstructive sleep apnea (OSA) is limited. The aim of this study was to compare the clinical and polysomnographic characteristics of OSA patients who were older than 65 years and those younger than 65 years.

Materials and Methods: We retrospectively reviewed the polysomnography data of 216 (100 F/116 M) OSA patients who underwent polysomnography between 2011 and 2014. The patients were divided into two groups: <65 years (Group 1), ≥65 years (Group 2). We evaluated symptoms, comorbidities, and polysomnographic findings of the two groups of patients.

Results: There were 185 patients (82 F/103 M) in Group 1 and 31 patients (18 F/13 M) in Group 2. There were no differences in gender distribution, OSA-related symptom frequency and Epworth sleepiness scale rates between two groups. The comorbidities, including hypertension (p=0.05), atherosclerotic heart disease (p=0.005), diabetes mellitus (p=0.002), depression (p=0.007), and COPD (p=0.035), were more frequent in Group 2. Although statistically non-significant, TST, sleep efficiency and average oxygen saturation at sleep were lower (p=0.129, p=0.127, p=0.063, respectively) whereas the AHI and the arousal index were higher (p=0.699, p=0.545, respectively) in Group 2. There was no difference between the two groups in terms of mean apnea duration.

Conclusion: OSA patients had similar symptoms and polysomnographic findings independent from age. OSA should not be ignored in elderly patients when comorbidities are considered.

Key Words: Obstructive Sleep Apnea, OSA, Elderly

Öz

Amaç: Toplumda uyku ile ilgili şikayetler yaygın olarak bulunsa da yaşlı obstrüktif uyku apneli (OSA) hastalardaki klinik ve polisomnografik farklılıklar hakkındaki bilgiler sınırlıdır. OSA tanısı konmuş hastalarda yaşın klinik ve polisomnografik bulgular üzerindeki etkisini araştırmak amaçlandı.

Gereç ve Yöntem: Retrospektif olarak 2011-2014 yılları arasında gözetimli polisomnografi yapılarak OSA tanısı (AHİ≥ 5/sa) konulan 216 (100 K/116 E) hasta çalışmaya dahil edildi. Hastalar genç-orta yaşlı (<65 yıl) (Grup 1) ve yaşlı (≥65 yıl) (Grup 2) olmak üzere iki gruba ayrıldı. Hastaların semptomları, eşlik eden hastalıkları ve polisomnografik bulguları karşılaştırıldı.

Bulgular: Grup 1'de 185 (82 K/103 E), Grup 2'de 31 (18 K/13E) hasta vardı. Her iki grupta cinsiyet dağılımı, OSAS ile ilişkili semptom sıklığı ve Epworth uykululuk skalası açısından fark yoktu (sırasıyla; p=0,156, p>0,05, p=0,761). Grup 2'de istatistiksel olarak hipertansiyon, atherosklerotik kalp hastalığı, diabetes mellitus, depresyon ve KOAH (sırasıyla p=0,05, p=0,005, p=0,002, p=0,007, p=0,035) daha sıktı. Polisomnografik bulgular açısından istatistiksel anlamlılığı olmamakla birlikte Grup 2'de TST daha kısa, uyku etkinliği daha düşük, N1 %'si daha yüksek (sırasıyla; p=0,129, p=0,127, p=0,209), Grup 1'de ise uyku başlangıcı daha geç, arousal indeksi daha yüksekti (p=0,468, p=0,545). Benzer şekilde istatistiksel anlamlılığı olmamakla birlikte AHİ yaşlı grupta daha yüksek, gece boyu ortalama total SpO2 ise daha düşüktü (sırasıyla; p=0,699, p=0,063). Ortalama apne süreleri açısından iki grup arasında fark yoktu (p=0,634).

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Sonuç: Yaşlı OSA sayısı az olmakla birlikte, yaştan bağımsız olarak OSA'lılar benzer semptom ve polisomnografik bulgulara sahiptir. Eşlik eden hastalıklar da dikkate alındığında yaşlı hastalarda OSA'nın göz ardı edilmemesi gerekmektedir.

Anahtar Kelimeler: Obstrüktif Uyku Apnesi, OSA, Yaşlılık

Introduction

Obstructive sleep apnea (OSA) is a syndrome characterized by recurrent partial or complete collapse of the pharynx during sleep (1,2). OSA affects 2-4% of the adult population (2). It is a very progressive chronic disease which is responsible for multiple comorbidities. In the last two decades, the percentage of people over the age of 60 has increased more than other age groups worldwide (1). The relationship between OSA and aging has been better defined today with a progressive increase in the prevalence of OSA in the elderly due to physiological changes associated with aging (1). The prevalence of OSA is increasing in the elderly and aging is thought to be a risk factor for the development of OSA (3-5). However, the underlying mechanism is not clear.

Although complaints about sleep quality are common in the community, information about clinical and polysomnographic differences in elderly OSA patients is limited. Indeed, it is still unclear whether OSA in older patients is completely similar or completely different to younger patients. In this study, differences in clinical and polysomnographic findings of the adult patients with OSA according to age groups were evaluated.

Materials and Methods

Ethical approval was obtained from Ankara University Clinical Research Ethics Committee (İ6-374-20). Written informed consent was obtained from all subjects participating in the study. Two hundred and sixteen (100 F/116 M) patients with OSA diagnosis [apnea-hypopnea index (AHI) ≥5/h] by supervised polysomnography between 2011 and 2014 were evaluated retrospectively. Patients with AHI 5-15/h were defined as mild, 16-30/h as moderate, and >30/h as severe OSA.

Before the polysomnography test in our sleep laboratory, each patient was informed that clinical data and polysomnography records can be used for scientific data, providing that their identity information will remain confidential. Polysomnographic findings, symptoms, body mass index (kg/m^2) Epworth sleepinees scores (ESS), accompanying diseases such as systemic arterial hypertension, coronary artery disease, chronic obstructive pulmonary disease, diabetes mellitus, depression, gastroesophageal reflux and arrhythmia were recorded.

All consequtive patients underwent polysomnography in the laboratory (Grass Comet-Plus, Natus Neurology Incorporated, WI 53562, USA). Polysomnography recordings of the patients were scored by a single operator trained in sleep diseases according to standard criteria including sleep stages and respiratory events (6).

The recording montage comprised of EEG (C3-M2, C4-M1, O1-M2, O2-M1), left and right electro-oculogram (E1-M2, E2-M2), chin electromyogram, electrocardiogram, oronasal thermistor, thoracic and abdominal respiratory effort (inductive plethysmography), and pulse oximetry.

Among the polysomnographic findings, total sleep time (TST) (minutes), sleep activity (TST/total time spent in bed x100) (%), sleep latency (time from the beginning of sleep recording to the epoch of the first sleep phase, min), percentage of sleep time, arousal index (total arousal number x60/TST), average oxygen saturation during the all night (average SpO_2), minimum SpO_2 detected overnight, presence of nocturnal oxygen desaturation (SpO_2 <90% of night) was recorded. For respiratory events; apnea was defined as the interruption of oronasal respiratory flow for at least 10 seconds. Hypopnea was defined as a 50% reduction for at least 10 seconds and an arousal on EEG or a decrease in oxygen saturation of 3% or more (6).

Patients with a TST of less than 240 minutes were excluded from the study. Pregnant women, patients with active cancer and /or patients receiving treatment due to cancer, sedative drug use and patients with alcohol dependence were excluded from the study. Patients were divided into two groups: <65 years (Group 1) and ≥65 years (Group 2). The clinical characteristics and polysomnographic findings of the two groups were compared.

Statistical Analysis

SPSS version 22.0 package program was used for statistical evaluation of the data obtained in the study (IBM Corp. Armonk, NY, USA). If continuous numerical data were distributed normally, mean ± standard deviation was given. Categorical data such as gender were given in numbers and percentages. Mann-Whitney U test was used for the comparison of the non-normally distributed variables in independent groups. Chi-square (χ^2) test was used for two categorical independent groups. Student's t-test was used to compare the means of two independent groups. Statistical significance was taken as $p<0.05$.

Results

One hundred and eighty-five patients with OSA were included in Group 1 (<65 years) and 31 patients were included in Group 2 (≥65 years). There was no difference between the two

groups in terms of gender distribution, ESS score, body mass index (BMI) and OSA-related symptoms (Table 1). The ratios according to OSA severity were similar between the two groups (p=0.983) (Table 1).

Hypertension, atherosclerotic heart disease, diabetes mellitus, depression and COPD were more common in Group 2 (p=0.05, p=0.005, p=0.002, p=0.007, p=0.015, respectively) (Table 2). The rate of depression was higher in older and female patients (p=0.022, p=0.041, respectively)

Although there was no statistical significance in terms of polysomnographic findings, TST was shorter, sleep efficiency was lower, N1% was higher (p=0.129, p=0.127, p=0.209, respectively) in Group 2. In Group 1, the onset of sleep was later and the arousal index was higher (p=0.127, p 0.545, respectively). Similarly, although there was no statistical significance, AHI was higher in Group 2 and average total SpO_2 was lower throughout the night. Although not statistically significant, the presence of nocturnal oxygen desaturation (Spo_2<90% at 30% of the night) was higher in Group 2 (p=0.699, p=0.063, p=0.320, respectively).

There was no difference between the two groups in terms of mean apnea and hypopnea duration (p=0.634, p=0.648, respectively), central apnea index and the number of central apnea (p=0.551) (Table 3).

Discussion

Although OSA is common in the general population, knowledge about OSA is limited especially in the elderly population. In this single-center retrospective study, we found that OSA patients under and older 65 years of age had similar symptoms and polysomnographic findings, but cardiovascular diseases were significantly higher in elderly patients with OSA. The low number of elderly patients was the most important limiting factor of this study.

The prevalence of OSA increases with age. While the prevalence of OSA is 4% in middle-aged men and 2% in women. Prevalance of OSA varies between 30-80% in the elderly, and also the difference between men and women disappears after menopause (5,7,8). Ancoli-Israel et al. (3) studied with 427

Table 1: Comparison of sex, body mass index, symptoms and Epworth sleepiness score results in patients with OSA according to age groups

	Group 1 (<65 y) n=185	Group 2 (≥65 y) n=31	p-value
Age, y	51.1±0.7	70.6±0.9	
Female	82 (44)	18 (25.8)	0.156
ESS	11.8±5.2	11.5±5.8	0.761
BMI (kg/m²)	34.4±8.2	35.6±9.4	0.515
Snore	179 (96.7)	28 (90.3)	0.104
Witnessed apnea	150 (81)	26 (83.9)	1.00
Excessive daytime sleepiness	124 (67)	25 (80.6)	0.178
Headache in the morning	44 (23.8)	5 (16,1)	0.207
Sweating in the neck area	42 (22.7)	8 (25.8)	0.940
Waking up with the feeling of breathlessness	26 (14)	7 (22.5)	0.320

Results were given as Mean ± SD or n (%)
ESS: Epworth sleepiness score, BMI: Body mass index, SD: Standard deviation, OSA: Obstructive sleep apnea

Table 2: Distribution of comorbid diseases according to age groups in patients with OSA

	Group 1 (<65 y) n=185	Group 2 (≥65 y) n=31	p
Hypertension	45 (24.3)	13 (41.9)	0.05*
CAD	10 (5.4)	6 (19.3)	0.005*
Diabetes mellitus	17 (9.2)	9 (29)	0.002*
Depression	7 (3,8)	5 (16)	0.007*
COPD	7 (3,8)	4 (12.9)	0.035*
GERD	13 (7)	4 (12.9)	0.271
Arrythmia	5 (2.7)	2 (6.4)	0.288

Results were given as n (%)
CAD: Coronary artery disease, COPD: Chronic obstructive pulmonary disease, GERD: Gastroesophageal reflux disease, OSA: Obstructive sleep apnea
*p<0.05

adults over 65 years of age and showed that 24% of them had an apnea index >5/h. In the Sleep Heart Study (9), 19% of adults aged 60-69 years were found to have AHI>15/h and 21% of adults aged 70-79 were found to have AHI>15/h. In our study, such a ratio could not be given because the present study was not conducted as a prevalence research.

One of the mechanisms which may be responsible for increasing the prevalence of sleep apnea with ageing is the age-related changes that affect bones, soft tissue and muscles, which are responsible for the patency of the upper airway during sleep (1,5). As a result of these changes, a narrowed pharyngeal airway develops in the elderly (5,10-12). Based on the retrospective design of the study, the upper respiratory tract examination findings of both age groups were not evaluated, and this is another of the limitation of our study. Epidemiological studies showed that the number of respiratory events have been increased during sleep regardless of the diagnostic methods used in elderly patients and that central apnea and hypopneas were recorded more frequently in sleep studies compared to middle-aged subjects (5). In our study, similar to the literature, we found that the mean AHI of ≥65 years old patients was higher than the AHI of <65 years old OSA patients, but this result wasn't statistically significant. Due to aging, sleep becomes more fragmented and the elderly population spend a large percentage of TST in N1 and N2 sleep stages (5,13). Although there was no statistical significance in our study, total sleep duration, sleep efficiency were lower and percentage of N1 sleep stage was higher in elderly patients. This may cause respiratory instability which is characterized by periodic respiration and central apneas in patients (5,13). Since the hypercapnic ventilatory response does not change much in elderly patients, the main reason for the development of central events more frequently in elderly patients is predominantly ventilatory instability during sleep (5). However, in our study, no difference was found between the number of central apnea in both groups.

Unlike studies in elderly patients which suggest a decrease in the perception of apnea and stimulus triggering arousal in comparison to younger patients in the literature we found that the mean duration of apnea and hypopnea were similar in both age groups (14). We thought that this result was especially due to small number of the elderly patient group and to the equal male and female ratio in both groups.

The prevalence of OSA in women who did not receive postmenopausal hormone replacement therapy was found to be similar to that of men of the same age (5). In our study, we did not find any statistically significant difference in terms of gender in both age groups with OSA. While all women in the elderly patient group were in the postmenopausal period, 74 (90.2%) of the women in the middle-young OSA group were in

Table 3: Comparison of polysomnographic findings according to age groups in patients with OSA

	Group 1 (<65 y) n=185	Group 2 (≥65 y) n=31	p-value
TST (min)	282.9±5.8	259.7±13.7	0.129
SE (%)	75.1±13.7	70.8±17.1	0.127
SO (min)	19.1±31.2	14.9±14.6	0.468
N1 TST%	13.9±11.4	16.7±12.1	0.209
N2 TST%	62.1±13.9	60.8±14.7	0.647
N3 TST%	14.8±10.1	13.7±13.0	0.567
REM TST%	9.1±6.2	9.8±7.7	0.596
ArI (. /h)	22.4±16.1	20.5±17.9	0.545
AHI (. /h)	34.1±29.3	36.3±29.3	0.699
OSA severity			
Mild	62 (33.5)	10 (32,3)	
Moderate	51 (27.6)	9 (29)	0,983
Severe	72 (38.9)	12 (38,7)	
Mean duration of apnea (s)	16.7±5.7	17.4±5.2	0.634
Mean duration of hypopnea (s)	16.1±3.9	15.7±3.4	0.648
No. of central apnea	4.1±0.9	2.6±1.4	0.551
Mean nocturnal SpO_2 (%)	89.3±5.9	87.2±6.3	0.063
NOD positive	72 (38.9)	15 (16.1)	0.320

Results were given as Mean ± SD or n (%)
TST: Total sleep time, SE: Sleep efficency, SO: Sleep latency, Sleep stages N1, N2, N3, REM (percentages to TST), ArI: Arousal index, AHI: Apne-Hypopnea index, SpO_2: Arterial oxygen saturation, OSA: Obstructive sleep apnea, NOD positive: Nocturnal oxygen desaturation (SpO_2<90% in more than 30% of the night)

the postmenopausal period. Due to the effects of sex hormones on upper respiratory muscle activity, upper respiratory resistance and ventilatory control during sleep in women; deficiency of these hormones in postmenopausal women contributes to the pathogenesis of OSA (5). Whether the patients in the postmenopausal period received hormone replacement therapy could not be obtained from the file information.

Snoring during sleep, nocturnal drowning sensation, nocturia, excessive daytime sleepiness and a history of witnessed apnea are typical OSA-related symptoms in overweight men. Cardiovascular outcomes associated with OSA may occur, especially in untreated cases. The general health status of elderly OSA patients may vary from dementia to fully active healthy condition and may be quite heterogeneous due to concomitant diseases. Therefore, the diagnosis of potential OSA can be omitted by overlooking existing and sleep-related symptoms (5). The most common complaints in our patients were snoring and witnessed apnea, and there was no significant difference between the two groups in terms of the distribution of all OSA-related symptoms in accordance with the literature.

All-night polysomnography is accepted as the gold standard diagnostic method in the diagnosis of OSA, but portable sleep tests are also used recently (5,15). Although the variability of sleep breathing indexes from night to night has been shown to be acceptable in large epidemiological studies in elderly patients, it has been found to be defective in assessing the severity of respiratory events, especially due to individual differences in patients (5,16). The same is true for the sleep tests at home (5,17).

Moreover, single-night studies can be considered as adequate in the diagnosis of OSA in both young and old patients (5,18). However, it may be preferable to monitor sleep records in supervised sleep laboratories especially in elderly patients because of more frequent parameters such as central events, periodic leg movements, and more frequent comorbidities that may cause sleep fragmentation (1,5). It is recommended that some questionnaires can be used in elderly patients in order to direct the right patients to sleep centers and to follow up the patients (1). However, in accordance with the social security system rules in our country, we are conducting supervised sleep studies independent of age for patients to diagnose sleep apnea and plan treatment. The question of whether OSA causes similar adverse outcomes in young and old adults is extremely important in whether or not sleep apnea is considered a specific issue in the elderly. Because today we are still using the same thresholds and treatment indications defined for middle-aged adult OSA patients and elderly OSA patients. Possible differences about (a) frequency of central events, (b) accompanying medical conditions, (c) age-related sensitivity or resistance to intermittent hypoxia, (d) recurrent sleep fragmentation and its consequences can be responsible from OSA-related outcomes between young and old OSA patients (5). Studies which were published in the last four decades, there were different results regarding the effect of OSA on mortality in the elderly. In some of them sleep apnea was considered to be associated with increased mortality in this age group, particularly due to cardiovascular deaths (19), while others reported increased mortality in patients with only severe OSA before the age of 50 years old (20,21). The mortality rate in elderly OSA patients is found similar to that in patients without sleep apnea in the same age group. In our study, it was not aimed to determine the mortality rate. However, systemic hypertension, atherosclerotic heart disease, diabetes mellitus, depression and COPD were more common in elderly OSA patients, especially when comorbidities were considered. The literature shows that middle-aged OSA patients have a higher risk of cardiovascular morbidity than elderly OSA patients. Especially in the 50 to 80 age group, a relationship has been shown between sleep breathing disorders and hypertension and this situation is related to the severity of hypoxemia (22). However, there are still deficient points between elderly OSA patients and cardiovascular outcomes (5).

Daytime sleepiness and cognitive impairment are two important symptoms in patients with OSA. It is important to remember that these two symptoms are not specific to nocturnal respiratory events. Moreover, these two symptoms are quite common in the elderly population (5). Excessive daytime sleepiness is also frequently reported in elderly patients with OSA, which contributes to impaired cognitive function, poor quality of life, and even depression. In our study, the frequency of complaints from excessive daytime sleepiness and Epworth sleepiness scores were similar in both age groups. However, the rate of patients receiving treatment for depression was higher in the elderly patient group. Various publications have shown that the more common symptoms of women with OSA are fatigue, depression, and anxiety (1,23). In our study, we found that depression was much more frequent in elderly and female patients. Indeed, depression is accompanied by sleep apnea in the general population.

There is no data on whether aging makes people more susceptible to the effects of intermittent hypoxia or sleep fragmentation that contribute to sleepiness and cognitive dysfunction. In our study, although not statistically significant, elderly patients had both lower mean nocturnal oxygen saturation and higher nocturnal oxygen desaturation. The lack of oxygen desaturation index was considered as a limitation of this study.

Similarly, although an association between OSA and abnormal glucose metabolism has been demonstrated, this issue has not been specifically investigated in the elderly sleep apnea patient group (5). We demonstrated that the rate of diabetes mellitus is

higher in elderly patients with OSA. However, no additional tests were performed to evaluate glucose metabolism in patients. There are two different opinions in the literature regarding sleep apnea in the elderly. First, sleep apnea is more common in the elderly, but has better clinical outcomes. Secondly, sleep apnea is a more serious disease in this age group. In fact, the basis of these two different ideas which is the threshold used for the definition of OSA, is the AHI (5). Our study showed only the clinical and polysomnographic information of our patients at the time of diagnosis and did not include long-term clinical results and information about treatment. Since we could not find out how long the symptoms of sleep apnea were present in our patients, this data could not be used.

Study Limitations

We couldn't include long-term clinical results and information about treatment which was the main limitation of this study.

Conclusion

As a result; although the number of elderly patients with OSA was low in this study, it was found that OSA patients had similar symptoms and polysomnographic findings regardless of age. Considering the concomitant diseases, we thought that diagnosis and treatment of OSA should not be ignored in elderly patients.

Ethics

Ethics Committee Approval: Ethical approval was obtained from Ankara University Clinical Research Ethics Committee (İ6-374-20).

Informed Consent: Written informed consent was obtained from all subjects participating in the study.

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Authorship Contributions

Surgical and Medical Practices: F.Ç., B.G., M.E.I., T.A., Concept: F.Ç., B.G., B.B., M.E.I., Z.P.Ö., T.A., Design: F.Ç., B.G., Z.P.Ö., T.A., Data Collection or Processing: F.Ç., B.G., B.B., M.E.I., T.A., Analysis or Interpretation: F.Ç., B.G., B.B., M.E.I., Z.P.Ö., T.A., Literature Search: F.Ç., B.G., Writing: F.Ç., B.G.

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