Original Article

Sleep-Disordered Breathing in a Group of Heart Transplantation Candidates

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Abstract

Background and Objective: Sleep-Disordered Breathing (SDB) is associated with increased morbidity and mortality in patients with heart failure (HF). We assessed the prevalence and the pattern of SDB in HF patients who were candidates for heart transplantation.

Materials and Methods: Twenty heart transplantation patients with ventricular ejection-fraction < 25% were recruited consecutively in a cross-sectional study in Iran during 2009-2010. Full-night polysomnography was performed for them.

Results: The participants consisted of 14 males and 6 females with the mean ± SD age of 45.6 ±13.3 and the mean ± SD Body Mass Index (BMI) of 24.1±5.5. Seventeen patients (85%) were diagnosed with sleep breathing disorder, among which, four had central sleep apnea.

Conclusions: Sleep apnea is prevalent in heart transplantation candidates.

Keywords: Heart failure, Heart transplantation, Obstructive sleep apnea, Central sleep apnea

Introduction

Sleep-Disordered Breathing (SDB) is characterized by repeated pauses in breathing (apnea) or decreased breathing (hypopnea) during sleep. Apnea includes Obstructive Sleep Apnea (OSA) which is due to upper airway collapse and Central Sleep Apnea (CSA) that is caused by cessation of thoraco-abdominal movements (1). SDB is relatively common in general population and with increased frequency in patients with Heart Failure (HF) (2). The prevalence of SDB in congestive HF (CHF) patients with reduced ejection-fraction (EF) is estimated to be 40-70% (3). CHF and OSA have similarities in pathophysiology (4) and SDB, mainly CSA, has been considered as a consequence of CHF and as a marker of its severity (5-7). In contrast, the evidence show that SDB contributes to the progression of CHF by mechanisms such as myocardial hypoxemia and increased oxygen demand (2,8).

While it has been shown that SDB increases morbidity and mortality of CHF (9, 10), studies on prevalence and pattern of sleep-related breathing disorders are scarce (2). To the best of our knowledge there is no data regarding prevalence and associated

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factors of SDB among HF patients in Iran. Studying the comorbidity of these disorders may be useful to have a better image of the course of heart disease and improve the prognosis by screening and treatment of comorbid sleep-related breathing disorders. Cardiac transplantation is considered as treatment of choice for patients with end-stage HF who remain symptomatic despite optimal medical therapy.

In the present study, we aimed to evaluate the prevalence and pattern of SDB in patients hospitalized in Masih Daneshvari Hopital with HF and EF less than 25% who were candidate for heart transplantation.

Materials and Methods

This cross-sectional study was conducted in Masih Daneshvari Hospital during 2009-2010. Patients referred to cardiology clinic for heart transplantation due to severe HF were enrolled in this study by consecutive sampling. The inclusion criteria included heart transplant candidates with EF less than 25% and BMI less than 32. The patients referred to the sleep clinic to evaluate their conditions were enrolled in the study. Patients who had co-morbid pulmonary diseases, liver diseases, hypothyroidism, acromegaly or myopathy were excluded from the study. History of Cerebrovascular Accident (CVA), previous thoracic surgery and opium or opiate drug use were other exclusion criteria. In addition, the patients had to have no internal pacemakers to be able to perform polysomnography (PSG).

Thirty eligible participants entered the study and underwent full-night attended PSG in sleep laboratory or coronary care unit (CCU) or post-CCU ward. Ten patients were unable to sleep adequate at the study night, so the data were completed on 20 patients. Age and BMI of these ten patients were not significantly different from the other patients.

The Ethics Committee of Shahid Beheshti University of Medical Sciences approved this study.

Independent t-test and Mann-Whitney test were used for data analysis. SPSS version 16 was used to analyze data. Summary statistics of the participants and frequency of OSA and CSA/hypopnea were calculated.

Results

The data set were completed on 20 patients. Fourteen Patients were male. The mean (SD) age was 45.6 (13.3) years and the mean (SD) BMI was 24.1 ± 5.5kg/m^2. Age and BMI were not significantly different between men and women. Among patients three (15%) had normal PSG and 17 (85%) other were diagnosed with SDB. Nine patients (45%) were diagnosed with mild (AHI≤5), 5 (25%) with moderate (5<AHI≤15), and 3 (15%) with severe (AHI>15) OSA. Details of sleep test results in males and females are shown in Table 1. Prevalence of obstructive apneas was more than central apneas in participants. As it is shown in Table 1, men had significantly greater AHI than women while age and BMI were not significantly different in two groups.

All of the participants were hospitalized in CCU or post-CCU ward; Epworth Sleepi-

Table1. Basic characteristics and sleep tests results of heart transplantation candidates.

	Male (n=14) (Mean±SD)	Female (n=6) (Mean±SD)	Total (n=20) (Mean±SD)	*P* value
Age (year)	49.2 ± 12.5	37 ± 12	45.6 ± 13.3	0.057[a]
BMI (kg/m^2)	24.1 ± 5.5	21 ± 5.9	25.5 ± 5	0.09[a]
AHI	19.5 ± 14.6	9.5 ± 6.1	16.5 ± 39.1	0.04[a]
OAI	5 ± 8.3	1.7 ± 3.7	11.5 ± 8.2	0.09[b]
CAI	5.1 ± 8.4	0.1 ± 0.1	3.1 ± 7.5	0.09[b]
ODI	18.2 ± 12.9	9.5 ± 6.5	15.5 ± 11.5	0.06[a]

[a] Obtained by Independent t-test, [b] Obtained by Mann-Whitney test
BMI: Body Mass Index, AHI: Apnea-Hypopnea Index, OAI: Obstructive Apnea Index, CAI: Central Apnea Index, ODI: Oxygen Desaturation Index

ness Scale (ESS) score could not be calculated for 14 patients because of losing more than 3 out of 8 questions. Among six patients who completed the questionnaire, five had excessive daytime sleepiness. Pattern of Cheyne Stokes respiration (CSR) was not seen in any of the patients.

Discussion

We assessed the sleep breathing disorders among heart transplant candidates with severe HF and found the prevalence of 85% (17 out of 20). Also 4 (20%) patients had more than five central apneas per hour. Current findings are consistent with most previous studies (3,4,11).

Schulz and colleagues studied 203 CHF patients and found the rate of 71% for sleep-related breathing disorder which was more prevalent among men than women which is in agreement with the results of this study (3).

Although CSA is the most prevalent sleep breathing disorder in patients with more severe HF and it usually takes the form of CSR (12,13), in this study CSA was seen less than OSA and was not accompanied by CSR. This could be due to our specified sample which were hospitalized in CCU and post-CCU and were under optimized medical therapy which could decrease severity of CSA and CSR (13).

Small sample size and selecting participants among end-stage hospitalized patients limit the generalizability of the results to all patients with co-morbid HF and OSA. Cross-sectional design and correlational nature also limit any conclusions about directionality. Ten patients dropped out of the study due to inadequate sleep time in PSG; although the age and BMI were not different from the other 20 patients, dropout more than 20% of the study subjects might downgrade the results' accuracy.

SDB is highly prevalent in patients with HF and its symptoms such as excessive daytime sleepiness, morning fatigue and headaches and frequent arousals during sleep may be partially masked by the manifestations of HF(14). Diagnosis and treatment of OSA in end-stage HF patients will improve the patient's symptoms and may postpone the need for heart transplantation (14). Thus, performing sleep study to diagnose sleep breathing disorders in sleep may be beneficial for CHF patients with reduced EF.

Further study is needed to longitudinally examine the possible improvement of SDB after heart transplantation in patients with severe HF.

Conflict of interest: All authors report no conflicts of interest.

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