

Original article**TREATMENT OUTCOME OF OBSTRUCTIVE SLEEP APNEA ON ATRIAL FIBRILLATION**

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Abstract

Background: Obstructive sleep apnea is usually associated with obesity with increasing incidence. Apart from many medical complications, cardiac arrhythmias are common, with non-valvular atrial fibrillation in particular. This study was conducted to confirm this finding in our population and to experience treatment outcome.

Methods: Prospective, random sample, hospital-based study. Subjects with obstructive sleep apnea, with atrial fibrillation were selected. Diagnosis of obstructive sleep apnea was made on the basis of clinical history, examination and sleep studies. Response to treatment with continuous positive airway pressure was meticulously observed.

Results: Participants included 21 individuals (18 males, 3 females) with mean age of 58.23±1.23 years. 3 subjects lost to follow up, finally 18 patients were studied and monitored. Atrial fibrillation was confirmed on electrocardiography in all. Among study subjects body weight, day time alertness and quality of life improved in all. Blood pressure normalized and atrial fibrillation abolished is statistically highly significant proportion.

Conclusion: Study demonstrated clear association of obstruction sleep apnea and atrial fibrillation that improved on treatment with continuous positive airway pressure.

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INTRODUCTION

Amongst various cardiac arrhythmias associated with sleep apnea syndrome, atrial fibrillation (AF) is the commonest observed in clinical practice. Both obstructive and central sleep apnea have been associated with AF in many previous studies, with 2-4 fold increased risk compared to those without these disorders¹. Usually anti-arrhythmic drugs and catheter ablation with pulmonary vein isolation (PVI) constitute the mainstay of therapies to maintain normal sinus rhythm in patients with AF, however, some patients remain resistant to these therapeutic modalities and continue to have recurrent AF^{2,3}. Obstructive Sleep Apnea (OSA) is one such risk factor associated with new onset and recurrent AF^{4,5}. It is predicted that by 2050, more than 10 million Americans will have AF and possibly upto 16 million if the increase in incidence happens due to more diagnosis, as many cases remain undiagnosed⁶. It has been observed that AF is observed in central sleep apnea (CSA) as well, especially in patients with underlying heart failure and neuromuscular disease, although of the lesser magnitude compared to OSA⁷. It has been studied that physiologic changes of sleep disordered breathing including intermittent hypoxemia, hypercarbia and intrathoracic pressure fluctuations predispose to arrhythmias through electrical and structural remodeling, and alteration of sympathetic tone⁸. The use of continuous

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Key words

Sleep apnea, cardiac arrhythmias, atrial fibrillation, continuous positive airway pressure.

positive airway pressure (cPAP) is associated with significant reduction in recurrence of AF in patients with OSA, irrespective of PVI.

The results supported by several previous studies and meta-analysis prompted us to study this observation among our patients with sleep disordered breathing, and to our knowledge, represents first study of its kind from Jammu and Kashmir State of India.

MATERIAL AND METHODS

This was a prospective, random sample study conducted at the Department of Medicine and associated Super-specialty hospital of the Government Medical College Srinagar – a tertiary health care institution of the state, from March 2018 to February 2020. The study included 21 subjects, 18 males and 3 females in the age group of 56 to 72 (mean + SD, 58.23 + 1.23) years. These subjects approached to us with cardiovascular disease like hypertension, type 2 diabetes mellitus with electrocardiographic evidence of atrial fibrillation and ventricular premature complexes. Diagnosis of OSA was made on basis of clinical history of witnessed snoring, day time somnolence, fatigue and headaches. Epworth sleepiness score was suggestive of possible obstructive sleep apnea in all. Examination with particular emphasis on weight, neck circumference and Mallampati Class III or IV was determined in all. Those patients having poor cooperation to undergo sleep evaluation and treatment of possible sleep apnea syndrome were excluded from the study. The subjects finally selected were interviewed in detail regarding sleep habits supported by witnessed observation of bed partners. They were subjected to sleep studies and reports were furnished by sleep specialist, board certified in the subject and meeting standard American Academy of Sleep medicine guidelines. All demographic characteristics were record in a proforma designed for the study. After confirming diagnosis of OSA, the subjects were meticulously followed up for future course with particular attention to cardiac arrhythmias. The apnea-hypopneas index (AHI) was calculated as the sum of all apnea plus hypopnea events per hour of sleep during estimated sleep time, and AHI > 5/hour was considered diagnostic of obstructive sleep apnea.

STATISTICAL ANALYSIS

The data regarding demographic characteristics, electrocardiography findings, sleep study parameters and treatment indicators after CPAP therapy were analyzed by experienced statistician, using statistical package for social sciences (SPSS Ver. 22). Chi-square and p values were analyzed and

p value of < 0.05 was considered as statistically significant. Treatment outcome measures were analyzed and conclusions derived by the statistician.

Table 1: Demographic profile of Study Group (n=21).

Demographic Profile		p value
Males	18 (85.71%)	< 0.001
Females	3 (14.29%)	> 0.05
Age in years (mean±SD)	58.23±1.23	< 0.02
BMI (kg/m ²)	31.12±2.22	< 0.001
Smoking	14 (66.66%)	< 0.010
Mean blood pressure (mmHg)	98.8±1.67	< 0.04
Epworth Score > 10	21 (100%)	< 0.001
Atrial fibrillation	21 (100%)	< 0.001
Ventricular premature complexes	3 (14.28%)	> 0.05
AHI 5-14 / hour	6 (28.57%)	< 0.005
AHI 15-29 / hour	8 (38.09%)	< 0.001
AHI > 30 / hour	7 (33.33%)	< 0.003

RESULTS

Among a small sample of 21 patients, majority were males (85.71%) with mean age of 58.23±1.23 years (Table 1). 3 patients were lost to follow up. Hence the remaining exact study population included 16 males and 2 females only. Among the important demographic characters, hypertension was noted in 98.2% patients. Atrial fibrillation was found in all study subjects as confirmed on electrocardiography. Obstructive sleep apnea with AHI >5/hour was confirmed in all. Weight loss measured and dietary control habits were explained to all and CPAP was prescribed to all after proper titration by the board certified technologists. All subjects were meticulously followed for adherence to treatment and response.

When compared to baseline demographic characteristics, statistically highly significant improvement was observed particularly blood pressure, weight and resolution of improvement in alertness and quality of life as assessed by Epworth Sleepiness Scores (Table 2).

Table 2: Outcome of treatment of OSA with CPAP (n=18)

Characteristics	Treatment with CPAP		p value
	After 1 month	After 3 months	
Epworth Score > 10	8 (44.44%)	2 (11.11%)	< 0.001
Mean Weight (kg)	84.26±1.18	72.23±2.22	< 0.05
Blood pressure (mmHg)	140.3 ± 1.22 90.0 ± 3.16	130.3 ± 3.11 83.2 ± 1.11	< 0.005
AF	7 (38.88%)	2 (11.11%)	< 0.001
Ventricular premature complexes	1 (5.55%)	0 (0)	< 0.001

DISCUSSION

As per the latest published data, it has been observed that with growing obesity, the global burden of AF and OSA is increasing at an alarming rate. Non-valvular AF is the most common arrhythmia affecting nearly 3 million adult Americans⁹. Also it is predicted that by 2050, nearly 12-15 million adults in the US will have AF. Also, OSA, the most common form of sleep-disordered breathing is showing upward trend, making OSA and AF as global public health problems^{10,11}. OSA is one risk factor that is associated with new onset-AF and also with its recurrence after catheter ablation¹². While observing OSA in our clinical practice and high prevalence of AF in them and scientific background, we were prompted to confirm this finding in our population. Several mechanisms are proposed by which OSA increases the risk of AF. These include wide fluctuations in intrathoracic blood pressure during apnea episodes that leads to left atrial stretch through pressure and volume overload. Additionally there are intermittent periods of hypoxemia and hypercapnia that lead to atrial remodeling with regions of fibrosis with loss of atrial myocytes and areas of dissociation in conduction, as confirmed by electrophysiological studies. On the basis of published data from meta-analyses, patients with OSA can have 25% to 31% increased risk of AF recurrence after catheter ablation compared to those without sleep apnea¹³⁻¹⁵. Additional mechanisms of development of AF in OSA include autonomic nervous system activation, hypertension, left ventricular hypertrophy and diastolic dysfunction¹⁶.

Besides weight reduction and surgical correction, CPAP is currently the mainstay of available therapy for adults with OSA. As supported by huge data from meta-analyses, CPAP use reduces or abolishes the frequency of respiratory events during sleep, decreases daytime sleepiness, and improves quality of life^{17,18}. Although our study sample was very small, we observed tremendous improvement in overall quality of life after CPAP use. Lowering of blood pressure and alleviation of bradyarrhythmias are often known effects of CPAP use. The use of CPAP has been found associated with a significant reduction in AF recurrences across many published studies^{19,20}. While we observed only a random sample of OSA patients with atrial fibrillation, CPAP use result in reduction of hypertension as well. For further clarification, we suggest large sample studies to be conducted in future.

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