Original Research Article

Multidisciplinary Approach to Evaluation of Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients in a Newly Established Tertiary Care Centre

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Abstract

Background: Obstructive sleep apnea syndrome (OSAS) is characterized by episodes of partial or complete obstruction of the upper airway during sleep, interrupting (apnea) or reducing (hypopnea) the flow of air, followed by transient awakening that leads to the restoration of upper airway permeability. The present study was conducted for assessing Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients in a Newly Established Tertiary Care Centre.**Materials & Methods:** A total of 50 patients with presence of OSAS and 50 healthy controls were enrolled. Complete demographic and clinical details of all the subjects were obtained. Autonomic function test was carried out in all the patients. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Student t test and Mann Whitney U test were used for evaluation of level of significance. **Results:** Heart rate response to standing (30:15 ratio) was 1.23 among patients of the OSAS group and 1.05 among the patients of the control group. Heart rate response to deep breathing (E:I ratio) was 1.14 among patients of the OSAS group and 1.01 among the patients of the control group. Valsalva maneuver (ratio) was 1.29 among patients of the OSAS group and 1.15 among the patients of the control group. Isometric hand-group exercise test was 8.12 among patients of the OSAS group and 10.08 among the patients of the control group. Cold pressor test results showed 7.26 value in OSAS group and 9.28 value in the control group. Significant results were obtained while comparing the autonomic function test among subjects of the study group and the control group.**Conclusion:** There is significant reduction in the values of Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients.

Keywords: Obstructive Sleep Apnea Syndrome, Autonomic Function Test.

Introduction

Obstructive sleep apnea syndrome (OSAS) is characterized by episodes of partial or complete obstruction of the upper airway during sleep, interrupting (apnea) or reducing (hypopnea) the flow of air, followed by transient awakening that leads to the restoration of upper airway permeability. These cycles of apnea/hypopnea are repeated several times every hour, producing fragmented and scantly repairing sleep[1,2].Within the upper airway, the pharynx, and particularly the oropharynx and hypopharynx, is the region where most obstructive processes leading to OSAS are found. OSAS has a negative impact on the health and behavior of millions of adolescents throughout the world. It is an independent risk factor for many diseases, such as hypertension, heart failure, heart attack, cardiovascular events and arrhythmias. Unfortunately, it is a common chronic disease that greatly conditions the life of the patient[3,4]. Patients with Obstructive Sleep Apnea have high levels of sympathetic nerve traffic, caused by chemoreceptor reflexes triggered by repetitive episodes of hypoxia, hypercapnia and obstructive apnea. This elicits humoral vasoconstrictor responses and manifests as raised blood pressure. The autonomic alterations are carried over into wakefulness, and the increase in blood pressure persists due to baroreflex and chemoreflex dysfunction, vasoconstrictor effect of nocturnal endothelin and endothelial dysfunction.

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The carrying over of autonomic nervous system alterations into wakefulness contributes to the cardiovascular disorders associated with OSA. Although the chronic sympathetic activation is considered the main link between OSA and cardiovascular disorders factors like inflammation, hypercoagulability, stimulation of the renin-angiotensin system, increased oxidative stress and metabolic dysregulation too contribute[5-8]. Hence; the present study was conducted for assessing Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients in a Newly Established Tertiary Care Centre.

Materials & Methods

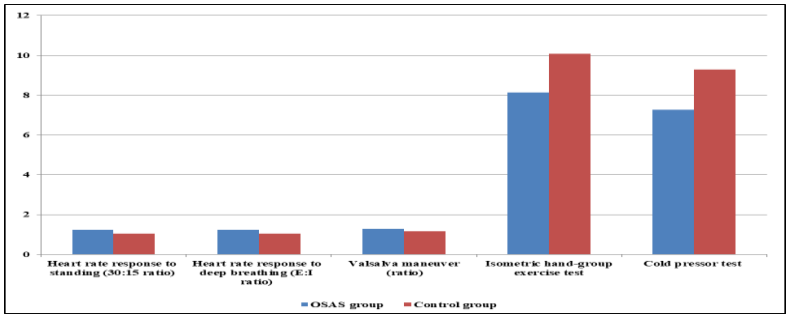
The present study was conducted in the department of physiology, Human anatomy and general surgery for assessing Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients in a Newly Established Tertiary Care Centre. A total of 50 patients with presence of OSAS and 50 healthy controls were enrolled. Complete demographic and clinical details of all the subjects were obtained. Autonomic function test was carried out in all the patients. In the heart rate response to standing test, the 30:15 R-R ratio was calculated from ambulatory ECG recording. In the heart rate response to deep breathing test, participants were asked to take deep breaths and the E:I ratio was calculated. ECG and EEG were done and the patients were then asked to perform the Valsalva manoeuvre by which Valsalva Ratio. In the isometric hand-grip exercise test, the change in diastolic pressure was calculated. The blood pressure was recorded in the opposite limb and the difference in diastolic blood pressure compared to the resting value was determined. All the results were recorded in Microsoft excel sheet and were analyzed by SPSS software. Student t test and Mann Whitney U test were used for evaluation of level of significance.

Results

In the present study, a total of 50 subjects with OSAS and 50 healthy controls were enrolled. Mean age of the patients of the OSAS group and control group was 45.8 years and 41.6 years respectively. 60 percent of the subjects of the OSAS group and 66 percent of the subjects of the control group were males. Heart rate response to standing (30:15 ratio) was 1.23 among patients of the OSAS group and 1.05 among the patients of the control group. Heart rate response to deep breathing (E:I ratio) was 1.14 among patients of the OSAS group and 1.01 among the patients of the control group. Valsalva maneuver (ratio) was 1.29 among patients of the OSAS group and 1.15 among the patients of the control group. Isometric hand-group exercise test was 8.12 among patients of the OSAS group and 10.08 among the patients of the control group. Cold pressor test results showed 7.26 value in OSAS group and 9.28 value in the control group. Significant results were obtained while comparing the autonomic function test among subjects of the study group and the control group.

Table 1: Comparison of autonomic function test among study group and control group

Variable	OSAS group	Control group	p- value
Heart rate response to standing (30:15 ratio)	1.23	1.05	0.008 (Significant)
Heart rate response to deep breathing (E:I ratio)	1.14	1.01	0.010 (Significant)
Valsalva maneuver (ratio)	1.29	1.15	0.027 (Significant)
Isometric hand-group exercise test	8.12	10.08	0.016 (Significant)
Cold pressor test	7.26	9.28	0.037 (Significant)



Graph 1: Comparison of autonomic function test among study group and control group

Discussion

Obstructive sleep apnea syndrome (OSAS) is a disorder in which repetitive apneas during sleep produce hypoxemia, arousals and fragmentation of sleep. Reflexes mediated by the Muller effect (a negative intrathoracic pressure due to inspiratory effort against an occluded airway) are initially involved in this bradycardia. These reflexes are routed through the aortic baroreceptors. The hypoxia occurring late in an apnea stimulates a bradycardic reflex routed through the carotid body. The degree of bradycardia is proportional to the degree of hypoxemia and contributes to a fall in cardiac output, which may be around 30%. There is also a reduction in systemic blood pressure (BP) at the beginning of an apnea, and during apnea there is a fall in left ventricular stroke volume in relation to negative intrathoracic pressure[6-10]. Hence; the present study was conducted for assessing Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients in a Newly Established Tertiary Care Centre.In the present study, a total of 50 subjects with OSAS and 50 healthy controls were enrolled. Mean age of the patients of the OSAS group and control group was 45.8 years and 41.6 years respectively. 60 percent of the subjects of the OSAS group and 66 percent of the subjects of the control group were males. Heart rate response to standing (30:15 ratio) was 1.23 among patients of the OSAS group and 1.05 among the patients of the control group. Heart rate response to deep breathing (E:I ratio) was 1.14 among patients of the OSAS group and 1.01 among the patients of the control group. Valsalva maneuver (ratio) was 1.29 among patients of the OSAS group and 1.15 among the patients of the control group. Our results were in concordance with the results obtained by D Veale et al who also reported similar findings. In their study, authors examined autonomic cardiovascular responses in 33 patients undergoing polysomnography for suspected OSAS. They examined these responses in the evening and at arousal in the morning. Autonomic nervous system (ANS) test results were scored as abnormal if a subject had a score > 1 which included at least one abnormal test. The total scores for evening and morning tests combined showed 11/24 sets of scores > 1 in 12 severe OSAS patients compared to 3/22 in non-OSAS (p = 0.04). The response to deep breathing, expressed as an expiratory to inspiratory ratio (E/I), was the test most often found abnormal. A significant difference between normal abnormal autonomic stress test (AST) groups was observed in the evening and the morning as regards cumulative time spent under 90% SaO2 and minimal SaO2. They conclude that abnormal autonomic stress responses are common in OSAS and are probably a secondary defect[11].In the present study, isometric hand-group exercise test was 8.12 among patients of the OSAS group and 10.08 among the patients of the control group. Cold pressor test results showed 7.26 value in OSAS group and 9.28 value in the control group. Significant results were obtained while comparing the autonomic function test among subjects of the study group and the control group. In another study conducted by Uno C et al, authors examined the response of blood pressure (BP) and cardiovascular autonomic function to head-up tilt (HUT) test in patients with OSAS. In their study, 14 patients with diagnosed OSAS by overnight polysomnography and 84 healthy subjects underwent HUT test. Autonomic functions were evaluated by spectrum analysis of blood pressure and heart rate variability. In healthy subjects, systolic BP was unchanged by HUT test due to the enhancement of sympathetic nerve activity and the inhibition of parasympathetic nerve activity. In contrast, autonomic responses were unchanged and systolic BP tended to be decreased by HUT test in OSAS patients. In conclusion, the results of their study suggested that baroreflex function is impaired in patients with OSAS[12].

Conclusion

From the above results, the authors concluded that there is significant reduction in the values of Autonomic Function Test in Obstructive Sleep Apnea Syndrome (OSAS) Patients.

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