

ORIGINAL PAPER

THE EFFECT OF CONTINUOUS POSITIVE AIRWAY PRESSURE ON BLOOD PRESSURE IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA SYNDROME

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ABSTRACT

Introduction. Obstructive sleep apnea syndrome (OSAS) is a disease with increasing prevalence nowadays, being associated with multiple cardiovascular diseases, such as arterial hypertension.

The objective of the study was to evaluate the effect of continuous positive airway pressure (CPAP) on blood pressure values.

Materials and methods. We performed a prospective interventional study on 52 patients with obstructive sleep apnea syndrome. The patients were divided into 2 groups: Group A (who received both pharmacological and CPAP treatment) and Group B (who received only pharmacological treatment), and were followed up at 3 and 6 months. The statistical analysis was made with SPSS and Microsoft Excel. At the same time, using the surrogate marker -RDW, we tried to evaluate the persistence of systemic inflammation, knowing that OSAS is associated with inflammation.

Results. The systolic blood pressure values decreased at 6 months in all OSAS patients who have used CPAP, including patients with normal values of blood pressure. At the same time, the lack of OSAS treatment led to increased values of blood pressure by

RÉSUMÉ

L'effet de la pression positive continue des voies respiratoires sur la pression artérielle chez les patients avec le syndrome d'apnée obstructive du sommeil

Introduction Le syndrome d'apnée obstructive du sommeil (SAOS) est une maladie de plus en plus prévalente de nos jours, associée à de multiples maladies cardiovasculaires telles que l'hypertension artérielle. Le but de l'étude était d'évaluer l'effet de la pression positive continue des voies respiratoires (CPAP) sur les valeurs de la pression artérielle.

Matériels et méthodes. Nous avons réalisé une étude interventionnelle prospective sur 52 patients atteints du syndrome d'apnée obstructive du sommeil. Les patients ont été répartis en deux autres groupes: le groupe A (qui a reçu un traitement pharmacologique et un traitement CPAP) et le groupe B (qui a reçu uniquement un traitement pharmacologique) et ont été suivis à 3 et 6 mois. L'analyse statistique a été faite avec SPSS et Microsoft Excel. En même temps, en utilisant le marqueur de substitution - RDW, nous avons essayé d'évaluer la persistance de l'inflammation systémique, sachant que le SAOS est associé à l'inflammation.

approximately 10 mmHg. We noticed a link between RDW, age and blood pressure values, respectively the increase of RDW and age may result in increasing of blood pressure.

Conclusions. The OSAS treatment can decrease the blood pressure values. A higher RDW may be considered a negative prognosis factor for these patients, reflecting the role of systemic inflammation in the appearance of cardiovascular disorders.

Key words: blood pressure, obstructive sleep apnea, continuous positive airways pressure, RDW.

INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) is a disease with increasing prevalence nowadays, being associated with multiple cardiovascular diseases, such as arterial hypertension. At the moment, the effect of obstructive sleep apnea syndrome on the cardiovascular system and metabolic processes is increasingly studied. The pathophysiological mechanisms involved are increased sympathetic tone, intermittent hypoxia and systemic inflammation, which are all associated with OSAS. Arterial hypertension is present in 50% of patients with OSAS¹. It is very important to assess the dipper/nondipper profile, especially in patients with resistant arterial hypertension². There are case studies which showed the antihypertensive effect of CPAP therapy in hypertensive patients with OSAS. In patients with OSAS and arterial hypertension, the use of CPAP is mandatory in order to avoid target organs injury or vascular dysfunction, which are frequently associated with OSAS. According to Framingham study, the association of OSAS with cardiovascular risk factors increases the cardiovascular risk by 30% at 10 years³. Therefore, the screening of cardiovascular risk factors among these patients is very important, namely measuring the serum glucose, glycosylated hemoglobin in diabetic patients, lipids, ambulatory monitoring of blood pressure values, intima - media thickness measurement, echocardiography.

THE OBJECTIVE OF THE STUDY was to evaluate the effect of CPAP on blood pressure values.

Résultats. Les valeurs de pression artérielle systolique ont diminué à 6 mois chez tous les patients SAOS qui ont utilisé la PPC, y compris les patients avec une tension artérielle normale. Dans le même temps, l'absence du traitement par SAOS a entraîné une augmentation de la pression artérielle d'environ 10 mmHg. Nous avons remarqué un lien entre RDW, l'âge et la pression artérielle, respectivement, l'augmentation de RDW et l'âge peuvent entraîner une augmentation de la pression artérielle.

Conclusions. Le traitement par SAOS peut réduire les valeurs de tension artérielle. Un RDW plus élevé peut être considéré comme un facteur pronostique négatif pour ces patients, reflétant le rôle de l'inflammation systémique dans l'apparition de troubles cardiovasculaires.

Mots clés: tension artérielle, apnée obstructive du sommeil, pression positive continue des voies respiratoires, RDW.

MATERIALS AND METHODS

This was a prospective interventional study, undertaken between June 2013-September 2017. 52 patients with obstructive sleep apnea syndrome were included.

The inclusion criteria of the study were the following:

- high suspicion of sleep apnea syndrome based on the presence of snoring, described by entourage;
- diurnal drowsiness;
- obesity;
- signing the informed consent.

The exclusion criteria of the study were the following:

- The presence of cranio-facial deformities.
- Mental illness.
- Thyroid dysfunction.
- Hemodynamic instability.
- Consumption of sedatives or alcohol.
- Age > 85 years old.
- Lack of informed consent.

We evaluated the effect of CPAP on blood pressure values in patients with OSAS. Among the included patients, 17 were women and 35 men. The diagnosis of OSAS was made by cardio-respiratory polygraphy with 6 channels (nasal flow monitoring, rib cage movements, continuous pulse oximetry, position of the body, snoring monitoring).

The patients included in the study were divided into 2 groups, on the basis of the treatment adherence and CPAP delivery option:

- Group A: patients who received both pharmacological therapy (beta blockers) and CPAP.
- Group B: patients who received only pharmacological therapy (beta blockers).

The need of using CPAP was explained to all the patients, as well as the risks of noncompliance to treatment.

Patients who were included in the study have been assessed at T0 (the moment of inclusion in the study), T1 (at 3 months after the inclusion in the study) and T2 (at 6 months after the inclusion in the study).

Investigations performed at T0, T3 and T6 were as follows:

- Medical history.
- Evaluation of smoking/ nonsmoking status.
- Clinical examination/ anthropometric measurements (height, weight, body mass index – BMI, abdominal circumference, waist/hip ratio, neck circumference).
- Lipids profile.
- Inflammatory markers.
- Cardio-respiratory polygraphy.
- Electrocardiogram (ECG), Holter ECG, 24 hours automatic ambulatory monitoring of the blood pressure.
- Oxygen saturation of the oxyhemoglobin.
- Epworth Questionnaire.

RESULTS

The statistical analysis was done using SPSS soft and Microsoft Excel. We tested the differences between the average values of systolic blood pressure (SBP) and diastolic blood pressure (DBP) depending on the treatment type (Table 1). The decrease of SBP values at 6 months in OSAS patients using CPAP (p-value < 0.05) can be noticed (Fig. 1).

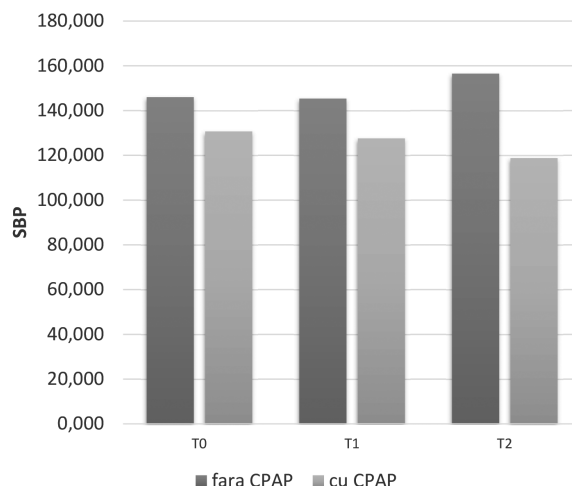


Figure 1. The differences between the SBP average values depending on treatment type.

It has been noticed that in patients from Group A, the average SBP values decreased at 6 months, unlike the average SBP values of patients from Group B, which have increased by 10 mmHg during the study. In the group of study, there were no patients with resistant arterial hypertension. It has been noticed that the SBP values in patients from Group A decreased even in patients who have reached the target blood pressure values under medication.

A variation of SBP, according to age and RDW (red cell distribution width), has been noticed in our study, being known that increased RDW represents an important cardiovascular risk factor. For the patients remaining in the study at T1, the most important statistical determinants of SBP were the age and the RDW level. Using these parameters, the model explains 40.2% of the variation of the variable dependencies. The validity of the model has been verified using ANOVA,

Table 1. The differences between SBP and DBP average values depending on treatment type

			GROUP STATISTICS			
Time			N	Mean	Std. Deviation	Std. Error Mean
T0	TAS	fără CPAP	23	146.000	29.3072	6.1110
		cu CPAP	24	130.667	27.5755	5.6288
	TAD	fără CPAP	23	84.261	14.2644	2.9743
		cu CPAP	24	76.708	10.1531	2.0725
T1	TAS	fără CPAP	8	145.375	21.4738	7.5921
		cu CPAP	17	127.588	20.5580	4.9861
	TAD	fără CPAP	8	85.000	15.1186	5.3452
		cu CPAP	17	70.882	20.9341	5.0773
T2		fără CPAP	4	156.500	21.8098	10.9049
		cu CPAP	8	118.750	14.5774	5.1539
		fără CPAP	4	72.500	5.0000	2.5000
		cu CPAP	8	68.750	8.3452	2.9505

the test providing enough evidence to consider the obtained model valid ($F_2; 19=6,393$, $\text{sig.}=0,008$). Both factors have a direct connection to the SBP, the latter

increasing with age, respectively 1.008 mmHg for each added year ($t=3,139$ $\text{sig.}=0,005$) and with 6.258 mmHg for an increase of 1% of the RDW ($t=2,465$, $\text{sig.}=0,020$).

Table 2, 3. Correlation of SBP with age and RDW.

Time	R	R Square	Adjusted R Square	Std. Error of the Estimate
T1	.634	.402	.339	18.7102

ANOVA

Time		Sum of Squares	df	Mean Square	F	Sig.
T1	Regression	4475.990	2	2237.995	6.393	.008
	Residual	6651.328	19	350.070		
	Total	11127.318	21			

COEFFICIENTS

Time	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
T1	(Constant)	-21.720	46.118	-.471	.643	-118.246	74.806
	Age	1.088	.347	.576	3.139	.363	1.814
	RDW	6.258	2.539	.453	2.465	.020	.945

DISCUSSION

Our results are similar with other studies from the literature, according to which CPAP decreases the blood pressure values in patients with arterial hypertension, even with resistant arterial hypertension⁴. The HIPARCO trial concluded that the CPAP use for a 12-week period leads to a decrease of resistant arterial hypertension in OSAS patients⁴. Another study has found a modest decrease of blood pressure values in patients who have been adherent to CPAP therapy⁵.

In patients with OSAS and arterial hypertension, CPAP may be an important therapy in order to avoid target organ damage. There are case-control studies that show the antihypertensive effect of CPAP therapy in patients with OSAS and hypertension⁶.

Sleep apnea syndrome is a pathology that promotes systemic inflammation. There is a great number of meta-analysis sustaining the hypothesis that inflammatory markers can be used to monitor the response to therapy. RDW is considered a predictor of the severity of OSAS in some studies⁷, being also considered a predictor of cardiovascular mortality.

CONCLUSIONS

Using CPAP therapy in OSAS patients has a beneficial effect on the systolic blood pressure values. At the same time, the hypothesis according to which

arterial hypertension in OSAS patients is linked to age and RDW, an inflammatory marker which is described in literature as a cardiovascular mortality predictor, has been raised.

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