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REVIEW ARTICLE

Obstructive sleep apnea in patients scheduled for endarterectomy – preliminary study

Authors' Contribution:
A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

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ABSTRACT:

Introduction: The association between obstructive sleep apnea and atherosclerosis has been confirmed for a long time, but the pathomechanism is still unknown. The aim of this study was to investigate the prevalence of OSA in patients scheduled for endarterectomy and the influence of this procedure on sleep parameters and sleepiness.

Materials and methods: 46 patients scheduled for open carotid endarterectomy were enrolled in the study. Sleep study was carried out and Epworth Sleepiness Scale (ESS) was used preoperatively . In 11 out of 46 patients, sleep study was performed both before and after surgery.

Results: The mean age of the group was 69.9 years (± 8.6), 21 patients (45.7%) were female. For 46 patients mean pAHI, ODI, pRDI and %snoring were 16.2 (± SD=15.2), 10.4 (± SD=12.2), 18.9 (± SD=14.9) and 9,9 (± SD=17), respectively. Normal pAHI was noticed in 14 patients (30%), while mild (pAHI 5-15), moderate (pAHI 15-30) and severe (pAHI>30) OSA was observed in 13 (38%), 11 (24%), and 8 (18%) subjects, respectively. The mean ESS score for 27 out of 46 patients was 6.3 (± SD=5.6). The postoperative results of sleep study in 11 patients showed no significant change.

Conclusions: This study revealed the prevalence of moderate to severe OSA in 42% of patients scheduled for endarterectomy, while no excessive daytime sleepiness was observed in this group. The results of the study show that patients with carotid atherosclerosis should undergo sleep diagnosis in order to rule out obstructive sleep apnea.

KEYWORDS: obstructive sleep apnea, snoring, atherosclerosis, atherosclerotic plaque, endarterectomy

INTRODUCTION

Obstructive sleep apnea is a common disorder characterized by pauses in regular breathing [1]. It results from repetitive closure of the upper airways with concomitant breathing cessation. Most apneas and hypopneas lead to oxygen saturation drops and therefore, to intermittent hypoxia. OSA is an important risk factor for development of hypertension, coronary artery disease, arrhythmias and other cardiovascular diseases [2], which is proved by well-designed studies [3].

The pathogenesis of atherosclerosis includes imbalanced lipid metabolism and maladaptive immune response, which lead to chronic inflammation of the arterial wall. It results in cerebrovascular disease and coronary artery disease through lesion forming and luminal narrowing of arteries. The most common manifestations of it are acute coronary syndrome, myocardial infarction or stroke [4]. The association between obstructive sleep apnea and atherosclerosis has been confirmed for a long time, but the pathomechanism is still not known [5]. The studies using imaging such as magnetic resonance, computed tomography and ultrasound show early stage of atherosclerosis or its advanced type more often in OSA patients than controls [6,7,8]. The aim of this study was to investigate the prevalence of OSA in patients scheduled for endarterectomy and the influence of this procedure on sleep parameters and sleepiness in a part of this group.

MATERIALS AND METHODS

The study was approved by the Bioethical Committee of the Medical University of Warsaw. Oral and written consent were obtained from every participant in the study.

A total of 46 patients scheduled for open carotid endarterec-

Tab. I. Mean pre- and postoperative sleep parameters of the patients (n=11) in whom endarterectomy was performed.

	pAHI	ODI	pRDI	% SNORING
Pre-op	14,7	9,5	16,8	4,1
Post-op	21,2	14,1	25,5	16,8

Pre-op – preoperatively; post-op – postoperatively;
pAHI – peripheral arterial tone apnea/hypopnea index;
ODI – oxygen desaturation index;
pRDI – peripheral arterial tone respiratory disturbance index; %snoring - % of sleep time, when patient snores;

Tab. II. Detailed sleep parameters in each of 11 patients, performed pre- and postoperatively, in whom endarterectomy was performed.

PATIENT	RDI	AHI	ODI	% SNORING
1	4,9	4,9	1,2	10,2
	7,7	7,7	3,4	42
2	43,9	43	31,8	5,1
	42,4	42,1	31,3	15
3	12,3	7,6	2,2	0,8
	10,1	9,3	2,4	4,6
4	24,3	23,3	16,3	2,9
	43	42,3	34,5	25,8
5	17,3	17,2	6,5	5,3
	20,9	17,1	7,4	23,1
6	9,5	7,4	2,5	3,3
	6	5,7	3,1	28,3
7	7,7	4,5	1,2	2,6
	6,6	3,8	1,9	3,8
8	6,3	2,3	0,9	0,7
	20,9	17,1	7,4	23,1
9	33,9	32,2	30	10,5
	48,4	46,5	39,2	2,4
10	21,7	19,1	11,8	2,1
	38,7	38,5	24	2,7
11	3,2	0,3	0	2,1
	3	2,6	0,5	13,7

Pre-op – preoperatively; post-op – postoperatively; AHI – apnea/hypopnea index; ODI – oxygen desaturation index; RDI – respiratory disturbance index; %snoring - % of sleep time, when patient snores;
The first row in each patient is for preoperative results, while the second one is for postoperative results.

tomy were enrolled in the study in 2014-2016. Demographic data (age, sex) were collected. Sleep study was conducted and Epworth Sleepiness Scale was used preoperatively. In 11 out of 46 patients, sleep study was performed both before and after the surgery (with mean postoperative time 4.5 months).

SLEEP STUDY

Sleep study was performed using WatchPAT™ (Itamar Medical) portable sleep apnoea diagnostic system, which registers peripheral arterial tonometry, oximetry, heart rate, actigraphy, body position and snoring. The WatchPAT sleep study report showed real sleep time, peripheral arterial tonometry apnoea/hypopnoea index (pAHI), peripheral arterial tonometry, respiratory disturbance index (pRDI), oxygen desaturation index (ODI), heart rate, body position, snoring intensity (in decibels), and rapid eye movement and non-rapid eye movement sleep [9].

EPWORTH SLEEPINESS SCALE

The Epworth Sleepiness Scale is widely used in primary care and sleep medicine for screening patients with a high risk of OSA. It contains questions on the probability of taking a nap in common daily situations [10].

RESULTS

The mean age of the studied group was 69.9 years (standard deviation, ± SD=8.6). Of the 46 participants, 21 (45.7%) were female. Body mass index (BMI) was collected only for 36 out of 46 patients and the mean of it was 27.6 (± SD=3.4).

The mean Epworth sleepiness score for 27 out of 46 patients was 6.3 (± SD=5.6), which indicated normal range, while in 7 out of 27 it exceeded the normal range.

For 46 patients mean pAHI, ODI, pRDI and %snoring were 16.2 (± SD=15.2), 10.4 (± SD=12.2), 18.9 (± SD=14.9) and 9,9 ((± SD=17), respectively. Normal pAHI was noticed in 14 patients (30%), while mild (pAHI 5-15), moderate (pAHI 15-30) and severe (pAHI>30) OSA was observed in 13 (38%), 11 (24%), and 8 (18%) subjects, respectively. The results of study parameters in 11 patients, where sleep study was conducted pre- and postoperatively, are shown in Table I. Surprisingly, deterioration in these parameters was observed. When analyzing them in each subject alone (Table II.) we found that in 7 patients pre- and postoperative sleep study was comparable, while in other 4 the post-op study results deteriorated.

DISCUSSION

First, our study revealed a high prevalence of moderate or severe OSA in a group of advanced carotid atherosclerosis patients. In our study this was 42% (52% in males and 33.3% in

females), as compared to general population of Polish adults, i.e. 16.7% in men and 5.4% in women [11]. This group should be perceived as a high-risk group and OSA screening should be performed in patients with carotid atherosclerosis scheduled for endarterectomy. Especially that OSA is an independent risk factor for developing atherosclerosis [12].

Second, pre- and postoperative results of sleep study may seem confusing. In our small group of 11 patients we noticed deterioration in sleep parameters in 4 subjects. This is in contrast to a study by Sonkova et al. which showed an improvement in sleep parameters in some patients following endarterectomy [13]. In their also small group of 17 patients the pre-surgery AHI was 14 (+/-SD=17.0), while post-surgery AHI 8.3 (+/-9.0).

We assume that these differences may be caused just by a night-to-night variability in sleep parameters in a single patient [14]. We performed the postoperative sleep study 3 to 11 months after endarterectomy, so general health condition of the patients should have returned to normal following surgery. Considering this bias, it seems the best option for those patients to perform a sleep study few months following endarterectomy and introduce the treatment as soon as possible to avoid the potential atherosclerosis recurrence.

LIMITATIONS OF THE STUDY

Pre- and postoperatively sleep study was performed in 11 patients only, which is a small group.

Epworth Sleepiness Scale was introduced only preoperatively, therefore no conclusions on subjective symptoms of OSA could be drawn.

CONCLUSIONS

This study revealed the prevalence of moderate to severe OSA to be 42% among patients scheduled for endarterectomy, while no excessive daytime sleepiness was observed in this group. The results of the study show that patients with carotid atherosclerosis should undergo sleep diagnosis in order to rule out obstructive sleep apnea.

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