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SLEEP APNEA SYNDROME AND SNORING IN PATIENTS WITH HYPOTHYROIDISM WITH RELATION TO OVERWEIGHT

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The relation between snoring and obstructive sleep apnea as well as hypothyroidism is the object of interest of many authors. The respiratory disturbances during sleep are often observed in patients suffering from hypothyroidism. The relation of snoring to overweight in those patients has not been taken into account. The aim of the study was to evaluate the relations between hypothyroidism and quantitative and qualitative respiratory disturbances during sleep. Additional aim was to establish the relations of sleep apnea syndrome, snoring, hypothyroidism and overweight. The subjects included 15 patients (11 females and 4 males) aged from 28 to 73 (mean 50.3) suffering from hypothyroidism. All of them underwent thyroid testing before and after the hormonal treatment. TSH and fT4 concentrations were determined. At the same time the sleep assessment (PolyMESAM) was performed twice. Data were obtained from sleep studies and questionnaires (Epworth sleepiness scale). After the thyroid hormones stabilization significant decrease of snoring severity was observed. On the contrary, the respiratory disturbance index (RDI), desaturation index (DI), the lowest saturation (LSAT) did not change significantly, however, the Epworth scale score showed significant improvement. The correlations showed the strong relation between loud snoring and TSH ($r=0.73$, $p<0.01$) and fT4 ($r=-0.66$, $p<0.003$) concentrations before the treatment. The analysis showed no correlation between body mass (BMI) and snoring. The hormonal stabilization in patients suffering from hypothyroidism causes improvement in snoring severity. Based on our investigation the relationship between hypothyroidism and severity of snoring and excessive daytime somnolence was confirmed. It indicates a possible connection between hypothyroidism and upper airway resistance syndrome.

Key words: *sleep apnea, snoring, overweight, hypothyroidism*

INTRODUCTION

Obstructive sleep apnea syndrome (OSAS) is well known disorder in which sleep-disorders breathing causes sleep fragmentation and other medical and social implications. Patients with OSAS often present with symptoms of excessive daytime somnolence, fatigue, snoring, decreased libido, depressed mood, headache, impaired concentration and obesity (1, 2). Those symptoms can also accompany hypothyroidism.

Periorbital and peripheral edema are usually associated with hypothyroidism, but also are frequently seen in OSAS (3). That is the reason, OSAS and hypothyroidism can easily be confused or misdiagnosed. In patients with hypothyroidism disordered breathing appears to be very common; yet in patients with OSAS, hypothyroidism is very uncommon (4 - 8). It has been suggested that hypothyroidism development might be related to the OSAS. The mechanism is not quite clear, however, the deposition of mucopolisacharides and proteins extravasation into the tissues of the face, tongue and pharyngeal structures seem to be a cause of myxedematous swelling which can lead to upper airway obstruction (9, 10). The prevalence of coexistent hypothyroidism with OSAS still remains unsolved and presents a challenge for laryngologists, pulmonologists and endocrinologists. A definitive answer for this question will allow for proper diagnosis and treatment.

OSAS remains undiagnosed in at least 80% of affected men and 90% of affected women (11). Relation of overweight with OSAS and hypothyroidism and the influence of BMI on OSAS treatment efficacy requires further investigations.

The aim of the present study was to establish a possible relationship between hypothyroidism, respiratory disturbances during sleep and body weight.

MATERIAL AND METHODS

Fifteen patients (11 females and 4 males) aged from 28 to 73 (mean 50.3) suffering from hypothyroidism underwent the investigations. The hypothyroidism was recognized based on clinical symptoms (fatigue, cold intolerance, bradycardia) and as having an elevated thyroid-stimulating hormone (TSH). TSH concentration and free thyroxine (fT4) concentration were determined in the clinical laboratory using sensitive radioimmunoassay techniques. The normal range for TSH is 0.49 - 4.6 mIU/L. The normal range for fT4 is 0.6 - 1.8 ng/dl. The patients with diagnosed hypothyroidism underwent PolyMESAM (Medizintechnik für Arzt und Patient GmbH) evaluation twice, before the treatment and after hormones stabilization as a result of thyroxine substitution, five to six months later.

The following parameters were assessed during sleep and analyzed later on: respiratory disturbance index (RDI), desaturation index (DI), lowest saturation (LSAT), snoring. The RDI includes the sum of hypopnea and apnea incidences lasting more than 10 seconds per hour. The diagnosis of sleep apnea syndrome was based on the presence of at least ten apneas per hour of sleep

(12, 13). DI is defined as reduction of oxygen saturation of 4 percent or more from the baseline. The severity of snoring is assessed based on the percent of snoring, loud snoring and real time without snoring during sleep.

The Epworth sleepiness scale, an eight-item questionnaire that asks the patient if she or he would doze in a variety of sedentary situations, was also applied twice. It is a well known tool, which serves for excessive daytime somnolence assessment. On this scale, a score of less than 7 is considered normal, while a score above 10 is suggestive of pathologic sleep-disordered breathing (14, 15). Body mass index (BMI) was calculated by dividing the patient's mass (kg) by the square of the height (meters). A value grater than 30 was considered obese (6). All patients had been consulted by laryngologist before they underwent PolyMESAM examination. In no case the reason of snoring and sleep apnea from nose, throat and larynx was confirmed. The pulmonological consultations excluded any lower airway impairments.

The obtained results in field of breathing disturbances during sleep (PolyMESAM) before the treatment and after the hormone levels stabilization were compared. In the same way the TSH and fT4 concentrations, Epworth sleepiness scale results and BMI values were also compared.

Data were analyzed with computer software. The nonparametric tests were used. The Wilcoxon matched pairs test was applied. For interaction of different parameters the Spearman rank correlation was introduced. In statistical tests, the significance level was set at 0.05.

RESULTS

The fT4 concentration was out of range in eight patients (mean value 0.74 before and 1.35 after the treatment), while TSH was normal in only one patient before the treatment (mean value 39.05 and 2.04 after the treatment). In all of the patients a significant raising of hormone concentration was achieved five to six months after thyroxine replacement was started.

Table 1. Parameters measured during sleep before and after hormonal treatment.

Parameters	Before Mean (min; max)	After Mean (min; max)	Differences Mean (min; max)	P
Age (years)	50.3 (30.0; 70.0)	-	-	-
BMI (kg/m^2)	29.2 (21.3; 41.0)	27.6 (20.8; 39.2)	-1.6 (-3.9; 0.8)	**0.0024**
EPWORTH (score)	8.6 (7.0; 13.0)	7.8 (7.0; 11.0)	-0.8 (-2.0; 0.0)	**0.0077**
RDI (score)	11.5 (0.0; 41.0)	6.2 (0.0; 26.0)	-5.3 (-23.0; 5.0)	NS
DI (score)	12.8 (2.0; 55.0)	10.5 (1.0; 51.0)	-2.3 (-27.0; 9.0)	NS
LSAT (%)	77.2 (52.0; 87.0)	81.2 (65.0; 90.0)	-2.3 (-27.0; 9.0)	NS
Loud snoring (%)	68.0 (0.0; 99.0)	41.1 (0.0; 81.0)	-26.9 (-69.0; 15.0)	**0.0019**
Snoring (%)	13.4 (0.0; 38.0)	24.0 (2.0; 60.0)	10.6 (-16.0; 42.0)	**0.0303**
Without snoring (%)	18.5 (0.0; 100.0)	34.9 (3.0; 98.0)	16.4 (-18.0; 82.0)	**0.0131**
fT4 (ng/dL)	0.74 (0.11; 1.17)	1.35 (0.98; 1.80)	0.62 (0.06; 1.07)	**0.0007**
TSH (mIU/L)	39.05 (5.98; 104.7)	2.04 (0.51; 4.20)	-37.01 (-100.50; -5.16)	**0.0007**

Abbreviations: BMI - body mass index, RDI - respiratory disturbance index,
DI - desaturation index, LAST - lowest saturation

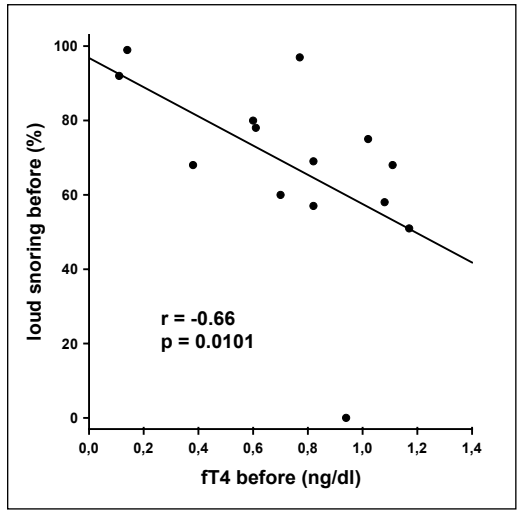

Fig. 1. Correlation between loud snoring and fT4 concentration before treatment

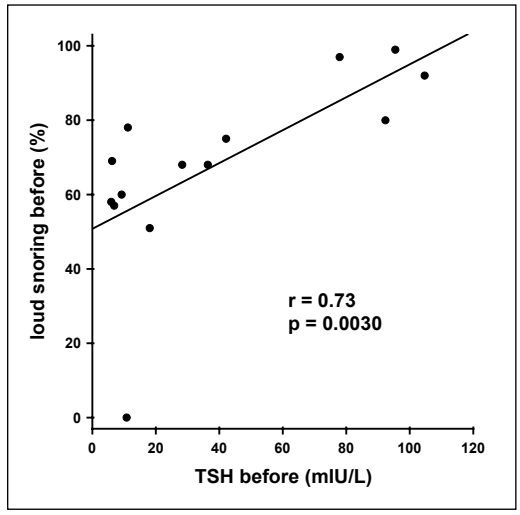

Fig. 2. Correlation between loud snoring and TSH concentration before treatment

From fifteen patients only two did not complain about snoring and sleep breathing disorders before the analysis. Six out of fifteen were obese at presentation (BMI grater than 30). After the treatment three of them still remained obese. In five patients the sleep apnea syndrome (RDI garter than 10) was shown before the treatment. It persisted in two of them. In one case the RDI increased from 8 to 13 after the treatment.

After the treatment of hypothyroidism the following parameters changed significantly, ($p<0.05$): BMI, Epworth scale score, fT4, TSH, loud snoring, snoring and percent of sleep time without snoring. No significant changes were shown in RDI, DI, LSAT after the treatment (*Table 1*).

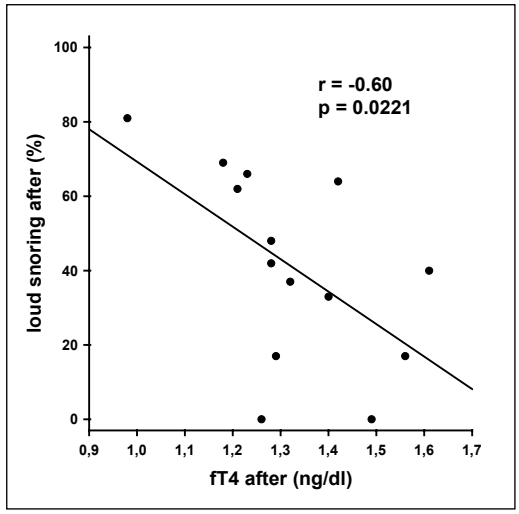

Fig. 3. Correlation between loud snoring and fT4 concentration after treatment

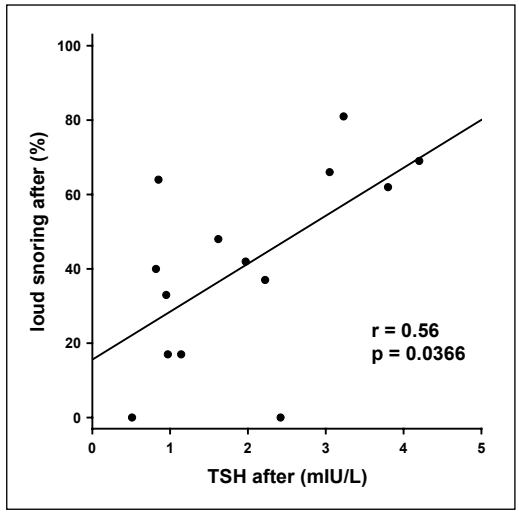

Fig. 4. Correlation between loud snoring and TSH concentration after treatment

The correlation between loud snoring and fT4 and TSH concentrations before and after the treatment were found. The higher fT4 concentration the smaller percentage of loud snoring during sleep time before the treatment (r= -0.66) and after the euthyroid achievement (r=-0.60). The higher TSH concentration the bigger the percentage of loud snoring before the treatment (r=0.73) and after the treatment, respectively (r=0.56) (*Figs 1 - 4*).

The correlation was found between snoring and Epworth sleepiness scale score after the treatment (*Figs 5* and *6*). The mean value of Epworth sleepiness scale score diminished significantly after the hormonal therapy, however, it persisted in a range between 7.0-10.0. Nobody had the Epworth score lower

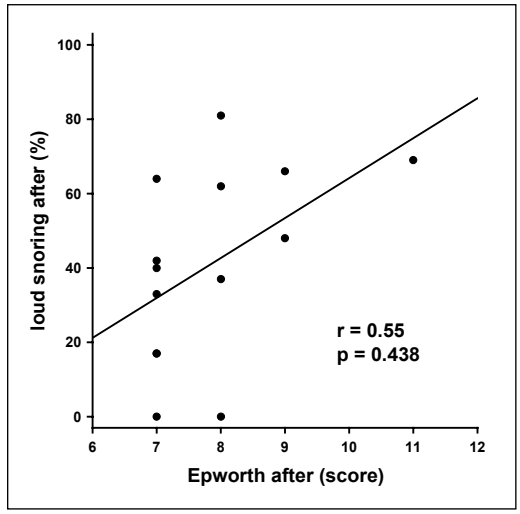

Fig. 5. Correlation between loud snoring and Epworth sleepiness scale after treatment

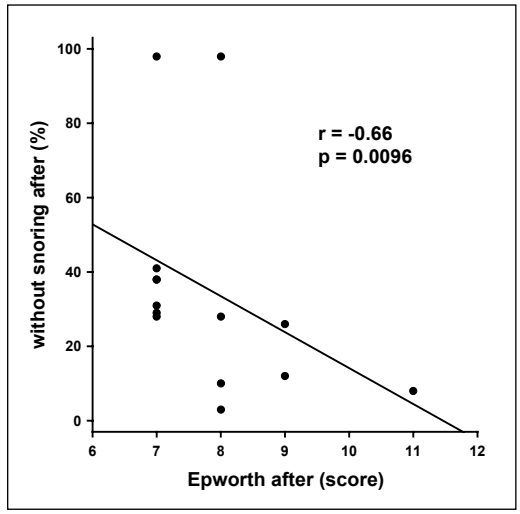

Fig. 6. Correlation between time without snoring and Epworth sleepiness scale after treatment

than 7.0. In three patients the Epworth score after the therapy was higher than 10.0. Their BMI was higher than 30.0. Any correlation was found between BMI and snoring.

DISCUSSION

The association between hypothyroidism and obstructive sleep apnea syndrome was a subject of several reports. This relation is not clear enough. Unfortunately, OSAS and hypothyroidism can easily be confused. The basic

symptoms of both disorders are similar. The lack of energy, sleepiness, fatigue, depressed mood, decreased libido, impaired concentration are the primary problems (1, 16). The Winkelman *et al*. found 1.6% of sleep clinic patients had hypothyroidism, and 2.9% with confirmed OSAS also had hypothyroidism (8).

To distinguish between this two disorders is made more difficult because hypothyroid patients are also at risk for secondary sleep-disordered breathing. Obesity and airway obstruction as a result of respiratory myopathy can appear in hypothyroid individuals and also in primary OSAS patients (17).

Snoring is a compliant observed universally in patients with OSAS and hypothyroidism (4). In our group of patients all of them suffered from snoring, however, only in five individuals OSAS was recognized. After hormone stabilization it persisted in two of them. Those patients were obese. In three cases RDI diminished significantly, below 10. Hence it was no reason to maintain earlier diagnosis - OSAS. The probability is very high, that it was a "secondary sleep apnea." Too small amount of OSAS patients did not allow to conclude about the real relation between OSAS and hypothyroidism. Our results obtained after thyroxine therapy caused significant reduction in snoring severity for obese and non-obese patients. Looking for the relation between the reduction of snoring severity and weight loss in those patients no correlation was found, however the mean value of BMI changed significantly after hormonal therapy. The loud snoring showed positive correlation with TSH concentration before and after the treatment and negative correlation with fT4 concentration after the treatment. It indicates the connection between hypothyroidism and breathing disorders during sleep. Grunstein *et al*. reported a high incidence OSAS in patients with untreated hypothyroidism in contrast to Lin et al. showing only 25% of incidence (4, 6). This discrepancy may be explained by different factors: age, gender, criteria of OSAS. Our group of patients can be defined as a heavy snores with hypersomnolence. That is why it was easier to estimate the relationship between hypothyroidism and severity of snoring. Additionally, changes in Epworth sleepiness scale after the treatment and positive correlation with loud snoring and negative correlation with percentage of time without snoring in whole sleeping time evaluated by PolyMESAM express this relation.

The obtained results show, that all patients were snorers with excessive daytime somnolence expressed by Epworth score in moderate degree. It allows to recognize or at least suspect the upper airway resistance syndrome (15).

Even though the BMI changed significantly after the treatment there was no correlation between BMI and any of hormonal or PolyMESAM's parameters found, however, Rollheim *et al*. present a higher prevalence of OSAS in obese patients (18).

Taking into account that snoring and excessive daytime somnolence were clinical signs of the patients with hypothyroidism and are symptoms of developing OSAS, it is possible to expect the relationship between hypothyroidism and

OSAS. In our study it was not proved directly. The connection of hypothyroidism and upper airway resistance syndrome seems to be an interesting observation.

CONCLUSIONS

1. Based on our investigation the relationship between hypothyroidism and severity of snoring and excessive daytime somnolence was confirmed. It indicates a possible connection between hypothyroidism and upper airway resistance syndrome.
2. No influence of overweight on sleep-disordered breathing was found in group of patients with hypothyroidism.

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