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EFFECT OF THE CONTINUOUS POSITIVE AIRWAY PRESSURE ON THE NOCTURNAL URINE VOLUME IN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA SYNDROME

Hypothesis / aims of study

Nocturia is common in the elderly, and is one of the most troublesome urological symptoms.[1] Multiple factors contribute to the occurrence of nocturia, and nocturnal polyuria is one of many causes of nocturia. Obstructive sleep apnea syndrome (OSAS) is highly prevalent in older men and is thought to be one of the causes of nocturnal polyuria.[2] Continuous positive airway pressure (CPAP) treatment is the one of the effective treatment for OSAS. CPAP treatment improves not only the sleep disorder but also night time frequency.[3] However, the underlying mechanisms by which CPAP treatment improves night time frequency in OSAS patients has not been fully understood. The aim of this study was to elucidate the clinical features of patients with OSAS and investigate the impact of CPAP treatment on nocturnal urine volume.

Study design, materials and methods

Fifty-three patients with severe OSAS, an apnea-hypoxia index (AHI) more than 20/h, were prospectively enrolled. Data were collected on age, sex, body mass index (BMI), blood pressure, concentrations of electrolytes in urine, brain natriuretic peptide (BNP), and medications. Before polysomnography, measurement of the International Prostate Symptom Score-QOL (IPSS) score, the International Consultation on Incontinence Modular Questionnaire-Nocturia QOL (ICIQ-NQOL), Epworth Sleepiness Scale (ESS) were carried out to evaluate the lower urinary tract symptoms and sleeping disorders. During polysomnography, a frequency volume chart was determined. Only patients who continued CPAP treatment 3 months were included in the analysis. Change in those data was assessed 3 months after CPAP treatment.

Results

Forty patients (33 men and 7 women) completed the study (75.5%). The mean ± SD age was 56.7 ± 14.6 years, BMI was 28.2 ± 4.2 kg/m^2, and AHI was 55.5 ± 2.7 /h (Table). The mean number of night time frequency to void before CPAP was 2.2 times; after CPAP, it was 1.2 time ($P < 0.01$). The mean number of ESS before CPAP was 8.5; after CPAP, it was 6.1 ($P < 0.01$). The mean diastolic blood pressure before CPAP was 79.9 mmHg; after CPAP, it was 77.5 mmHg ($P < 0.05$). The mean IPSS score before CPAP was 7.8; after CPAP, it was 5 ($P < 0.01$). The mean ICIQ-NQOL before CPAP was 74.9%; after CPAP, it was 89.6% ($P < 0.01$). However, BNP was not changed after CPAP treatment (26.1 vs 28.1). In a frequency volume chart, hours of undisturbed sleep was significantly prolonged from 183.9 min to 287.3 min after CPAP treatment. In addition, nocturnal voided volume was significantly decreased ($P < 0.01$) from 724.3 ml to 453.6 ml after CPAP treatment. Nocturnal polyuria index was also significantly decreased ($P < 0.01$) from 35.3% to 28.6% after CPAP treatment. However, 24h-voided volume and voided volume during night time did not change after CPAP treatment.

Table. Changes in the QOLs and biochemical findings after CPAP tratment

profile	Before CPAP treatment (Mean ± SD)	After 3 monthhs of CPAP treatment (Mean ± SD)	P Value
AHI (events/h)	55.5 ± 27.7	-	-
pO_2 (mmHg)	88.3 ± 8.9	-	-
concentrations of electrolytes in urine	1.019 ± 0.008	-	-
eGFR (ml/min/1.73m^2)	75.3 ± 16.4	-	-
HbA1c (%)	5.9 ± 0.9	-	-
BMI (kg/m^2)	28.2 ± 4.2	28.2 ± 4.0	0.11
Blood pressure (mmHg)			
systolic	137.7 ± 19.6	135.3 ± 16.6	0.09
diastolic	79.9 ± 14.8	77.5 ± 9.2	< 0.05
BNP (pg/mL)	26.1 ± 51.7	28.1 ± 51.8	0.52
ESS	8.5 ± 5.1	6.1 ± 3.8	< 0.01
IPSS total	7.8 ± 5.5	5.0 ± 4.3	< 0.01
QOL index	3.5 ± 1.5	1.9 ± 1.5	< 0.01
ICIQ-NQOL (%)	74.9 ± 17.7	89.6 ± 12.5	< 0.01
night timr frequency (times)	2.2 ± 1.2	1.2 ± 1.1	< 0.01
hours of disturbed sleep (min)	183.9 ± 132.9	287.3 ± 136.4	< 0.01
nocturnal voided volume (mL)	724.3 ± 492.0	453.6 ± 251.4	< 0.01
24h-voided volume (mL)	2225.1 ± 1557.6	1729.6 ± 877.3	0.06
nocturnal polyuria index (%)	35.3 ± 16.1	28.6 ± 14.7	< 0.05
voided volume during night time (mL)	322.3 ± 158.5	289.4 ± 154.1	0.31

Interpretation of results

In this study, we found that CPAP treatment decreased night time urinary frequency by reducing nocturnal urine volume and improved QOL in OSAS patients. However, BNP level was not changed by the decrease of nocturnal urine volume. One possible speculation to explain this discrepancy is that most of the participants were relatively young in the present study and might not have affected BNP level, which is a marker of heart pump failure. One reasonable explanation for the positive impact of CPAP treatment on nocturia is normalization of atrial natriuretic peptide (ANP), although changes in serum ANP were not assessed in

this study. Another explanation for it is that hypoxia by OSAS prevents reabsorption of sodium in the renal tubules, which results in nocturnal polyuria during night time, while CPAP treatment reverses it.

Concluding message

CPAP treatment decreases night time urinary frequency by reducing nocturnal urine volume and improves QOL in OSAS patients.

References

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Disclosures

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