

The Effect of Continuous Positive Airway Pressure Treatment in Subacute Stroke Patients with OSA

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Objective

Sleep-disordered breathing can cause acute neurologic deterioration and prolonged hospital stay in stroke patients, which affects short-term and long-term prognosis after stroke. Obstructive sleep apnea (OSA) in stroke patients is associated with worsening functional and cognitive status during inpatient rehabilitation. Continuous positive airway pressure (CPAP) is the primary treatment for obstructive apnea. The aim of this study was to evaluate the effectiveness of CPAP treatment in stroke patients during inpatient rehabilitation period using neuropsychological and functional assessments.

Materials and Methods

We performed a randomized controlled trial in subacute stroke patients (ischemia and hemorrhage) admitted to department of rehabilitation medicine after November 2017. To diagnose OSA, we performed sleep examination by portable polysomnography (Stardust II™, Respironics Inc. USA). Obstructive sleep apnea was diagnosed when Apnea-Hypopnea index (AHI) is higher than 20/h. Patients were randomly divided to 2 groups as follow : control group (rehabilitation treatment as usual) or CPAP group (CPAP treatment). Baseline clinical data were evaluated at the time of admission to department of rehabilitation medicine. We assessed stroke severity, neurologic function, cognitive impairment, and quality of life. Quality of sleep was assessed by using Epworth Sleepiness Scale (ESS). Tests were performed at baseline and after the two-week of intervention period.

Results

Thirty nine patients participated in this study, 16 patients were excluded from the study. Because they were not OSA patients. Twenty three OSA patients were included. There was no difference in improvement of National Institute of Health Stroke Scale (NIHSS), modified Rankin scale (mRS), functional ambulation categories (FAC), Korean version modified Barthel Index (K-MBI), Berg balance scale (BBS) and EuroQol 5 dimensions questionnaire (EQ-5D) between two groups (CPAP vs control group). The CPAP group showed improvement in daytime sleepiness and cognitive function (Table 2 and 3). In polysomnographic study, the CPAP group showed improvement in obstructive apnea, hypopnea and Apnea-Hypopnea index compared with the control group (Table 2).

Conclusion

Continuous positive airway pressure treatment improved cognitive status, quality of sleep and daytime sleepiness in stroke patients with OSA. Additional patient enrollment is

required to determine the effects of CPAP treatment on cognitive and functional status in subacute stroke patients.

Table 1. Clinical characteristics of intervention group and non-O SA patients

	CPAP (n=13)	Control (n=10)	Non-O SA (n=16)	Total (n=39)	<i>p</i> value
Age (years)	63.8±13.8	71.4±11.7	58.1±16.4	63.4±15.0	0.088
Sex, n (men/women)	8/5 (61.5/38.5%)	7/3 (70.0/30.0%)	12/4 (75.0/25.0%)	27/12 (69.2/30.8%)	0.736
Type of stroke, n (ischemic/hemorrhagic)	8/5 (61.5/38.5%)	9/1 (90.0/10.0%)	12/4 (75.0/25.0%)	29/10 (74.4/25.6%)	0.300
Lesion type, n (Supratentorial/ Infratentorial)	10/3 (76.9/23.1%)	7/3 (70.0/30.0%)	16/0 (100.0/0.0%)	33/6 (84.6/15.4%)	0.077
HTN (+/-)	4/9 (30.8/69.2%)	2/8 (20.0/80.0%)	9/7 (56.3/43.8%)	15/24 (38.5/61.5%)	0.142
Diabetes (+/-)	10/3 (76.9/23.1%)	8/2 (80.0/20.0%)	13/3 (81.3/18.8%)	31/8 (79.5/20.5%)	0.959
MoCA-K	16.0±9.1	13.2±10.9	13.1±10.7	14.1±10.1	0.718
NIHSS	7.0±4.1	5.7±5.4	6.5±4.5	6.5±4.5	0.801
MMSE	18.2±8.7	18.7±8.6	15.7±10.8	17.3±9.4	0.678
FAC	1.4±1.7	1.7±1.9	2.3±1.7	1.8±1.8	0.373
mRS	3.9±1.3	3.5±1.3	3.4±1.2	3.6±1.2	0.538
BBS	16.5±19.2	25.5±23.1	33.8±21.8	25.9±22.0	0.109
K-MBI	40.5±30.3	51.3±33.1	52.9±25.5	48.3±29.0	0.494
EQ-5D	0.2±0.3	0.4±0.3	0.5±0.2	0.4±0.3	0.165
ESS	6.1±6.6	7.3±6.6	4.2±2.8	5.6±5.4	0.340
Obstructive apnea	29.4±17.6	15.1±9.8	3.7±3.4	15.2±15.8	0.000*
Hypopnea	9.4±9.6	9.9±5.8	2.2±3.2	6.6±7.4	0.005*
Total apnea	48.0±17.9	29.3±9.1	7.2±5.1	26.5±21.2	0.000*

O SA, Obstructive sleep apnea; MoCA-K, Korean version of Montreal Cognitive Assessment; NIHSS, Korean version of the National Institute of Health Stroke Scale; MMSE, Korean version of Mini-Mental State Examination; FAC, functional ambulation categories; mRS, modified Rankin Scale; BBS, Berg Balance Scale; K-MBI, Korean version modified Barthel index; EQ-5D, EuroQol-5 Dimension; ESS, Epworth Sleepiness Scale

Table 2. Comparison of daytime sleepiness index and polysomnographic data between CPAP and control group

	CPAP (n=13)	Control (n=10)	Total (n=23)	p value
Δ ESS	2.3 \pm 2.4	-1.3 \pm 4.4	0.7 \pm 3.8	0.019*
Δ obstructive apnea	12.8 \pm 14.0	1.4 \pm 7.6	7.8 \pm 12.8	0.031*
Δ Hypopnea	1.8 \pm 8.9	4.8 \pm 5.2	3.1 \pm 7.5	0.356
Δ AHI	18.0 \pm 14.8	4.5 \pm 11.2	12.1 \pm 14.8	0.026*

CPAP, Continuous positive airway pressure; ESS, Epworth Sleepiness Scale; AHI, Apnea-Hypopnea index

Table 3. Comparison of clinical outcome between CPAP and control group

	CPAP (n=13)	Control (n=10)	Total (n=23)	p value
Δ NIHSS	1.4 \pm 1.0	0.9 \pm 1.3	1.2 \pm 1.2	0.330
Δ MMSE	3.8 \pm 2.8	2.2 \pm 2.3	3.1 \pm 2.7	0.079
Δ FAC	0.7 \pm 0.9	0.8 \pm 1.0	0.7 \pm 1.0	0.797
Δ mRS	0.8 \pm 0.7	0.7 \pm 0.8	0.7 \pm 0.8	0.833
Δ BBS	6.8 \pm 5.9	9.9 \pm 11.8	8.2 \pm 8.8	0.423
Δ K-MBI	15.2 \pm 11.5	15.2 \pm 9.5	15.2 \pm 10.4	0.992
Δ EQ-5D	0.2 \pm 0.2	0.2 \pm 0.3	0.2 \pm 0.2	0.752

CPAP, Continuous positive airway pressure; NIHSS, Korean version of the National Institute of Health Stroke Scale; MMSE, Korean version of Mini-Mental State Examination; FAC, functional ambulation categories; mRS, modified Rankin Scale; BBS, Berg Balance Scale; K-MBI, Korean version modified Barthel index; EQ-5D, EuroQol-5 Dimension