ORIGINAL ARTICLE

Sleep Assessment by Actigraphy in Obstructive Sleep Apnea Patients after Positive Airway Pressure Therapy

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Background: The initial phase of positive airway pressure (PAP) therapy in patients with obstructive sleep apnea (OSA) can significantly influence sleep and treatment compliance.

Objective: To assess clinical sleep parameters using actigraphy, the Epworth Sleepiness Scale (ESS), and the Pittsburgh Sleep Quality Index (PSQI) in OSA patients comparing before and after a one-week PAP therapy period.

Materials and Methods: The present study was a prospective observational study conducted at the Central Chest Institute of Thailand (CCIT). Adult OSA patients diagnosed using standard criteria following the International Classification of Sleep Disorders, third ed., text revision (ICSD-3-TR) and achieving optimal PAP titration from split-night polysomnography (PSG) were recruited. Participants wore actigraphy devices for one week before and after PAP therapy. Clinical sleep parameters, including time in bed (TIB), total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), the number of wake bouts (NWB), sleep latency (SL), ESS, and PSQI were collected and analyzed.

Results: Twenty OSA patients participated in the present study. The majority were male at 55%, and 45% had comorbidities, including hypertension and dyslipidemia. The median age, body mass index (BMI), ESS, PSQI, apnea-hypopnea index (AHI), and nadir SpO_2 were 42.5 years, 27.9 kg/m^2, 10.5, 8, 37.8 events/hour, and 86%, respectively. Sleep assessment by actigraphy comparing before and after one week of PAP treatment revealed a significant reduction in NWB at 45.4 versus 37.6 events (p=0.002) and SL of 29.6 versus 19.4 minutes (p=0.017) after PAP therapy. Additionally, ESS was at 10.5 versus 7.5 (p=0.003) and PSQI at 8 versus 4 (p=0.001) scores improved significantly, days used PAP for four hours or more was 100% and achieving good PAP compliance in 80%.

Conclusion: Short-term use of PAP therapy in newly treated severe OSA patients resulted in meaningful improvement in sleep continuity, daytime sleepiness, and sleep quality, within one week, with good PAP adherence.

Keywords: Obstructive sleep apnea (OSA); Positive airway pressure (PAP); Actigraphy

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Obstructive sleep apnea (OSA) is a common sleep disorder characterized by repetitive episodes of upper airway obstruction during sleep, resulting in disrupted sleep and intermittent hypoxia. The condition is associated with significant comorbidities, including cardiovascular disease, metabolic dysfunction, and impaired quality of life. Positive airway pressure (PAP) therapy is the standard treatment for OSA, effectively reducing the apnea-hypopnea index (AHI) and improving sleep quality[1]. Current methods for monitoring OSA include subjective questionnaires such as the Epworth Sleepiness Scale (ESS)[2,3] and the Pittsburgh Sleep Quality Index (PSQI)[4,5], which are widely used in research and clinical practice worldwide. Actigraphy, a non-invasive method for monitoring sleep-wake patterns, provides objective data including time in bed (TIB), total sleep time (TST), sleep efficiency (SE), wake after sleep onset (WASO), the number of wake bouts (NWB) and sleep latency (SL). According to the systemic review by the American Academy of Sleep Medicine (AASM), the role of actigraphy may vary based on the specific sleep disorder and sleep assessment procedure such as insomnia, circadian rhythm

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sleep-wake disorders, sleep-disordered breathing (SDB) with home sleep apnea test, central disorders of hypersomnolence with the multiple sleep latency test (MSLT) and insufficient sleep syndrome[6]. The overall sensitivity and specificity to identify sleep was 89% and 69%, respectively. The agreement ranged from 86% in normal subjects to 86%, 84%, and 80% in the patients with mild, moderate, and severe OSA, respectively[7]. There was also a tight agreement between actigraphy and polysomnography (PSG), a gold standard objective assessment for OSA diagnosis, in determining SE, TST, and SL[7]. In the other study, actigraphy had overall sensitivity and specificity to identify sleep at 94.6% and 40.6%, respectively[8]. There was fair agreement between actimetry and PSG in subjects with or without OSA (kappa of 0.38), which means that actigraphy still has limitation in capturing accurate sleep data. The accuracy of actigraphy decreased with decreased SE and it tended to underestimate WASO as measured by PSG[8]. Currently, actigraphy is not a diagnostic tool for OSA.

In laboratory PSG (in lab PSG) is more expensive and burdensome than actigraphy, and in lab PSG may cause a "first night" phenomenon and does not provide information about home sleep habits[9]. However, actigraphy might be used for individual sleep-wake monitoring in OSA patients because it provides objective sleep information about daily variability and sleep quality in the home sleep environment. It is not influenced by patient expectations about sleep, recall bias, or memory impairments as compared to subjective sleep data from sleep log and sleep diary[9]. Although nowadays the AASM, the Thai Academy of Sleep Medicine (TASM), and the Sleep Assembly of Thoracic Society of Thailand have not yet provided clear recommendation regarding the use of actigraphy for monitoring patients with OSA, the use of wrist-worn actigraphy, which provides objective sleep measures, may enhance the effectiveness of tracking patients during the initial adaptation period to PAP therapy. Additionally, it can be utilized to study changes in sleep-wake patterns, which may be abnormal in OSA patients before treatment and monitored post-treatment. However, no definitive studies on this topic have been conducted in Thailand. Therefore, the present study aimed to evaluate sleep parameters in OSA patients before and after PAP therapy using actigraphy, along with subjective assessments through the ESS and the PSQI in short-term period for early monitoring of PAP compliance.

Materials and Methods

Study design and sample size

The present study was a prospective observational study conducted at the Central Chest Institute of Thailand (CCIT) between April 2023 and April 2025, building upon a prior pilot investigation that examined changes in sleep-wake patterns measured by actigraphy following PAP therapy[10]. The current study employed an appropriately powered sample size and incorporated both objective and subjective sleep assessments using actigraphy, the ESS, and the PSQI. Sample size estimation was informed by preliminary effect sizes derived from the pilot study. Assuming a medium-to-large effect size, using Cohen's $d \approx 0.7$ for a two-tailed paired t-test and effect size $r \approx 0.7$ for a two-tailed Wilcoxon signed-rank test, with a significance level (α) of 0.05 and statistical power of 80%, the minimum required sample size was estimated at 19 participants[11-13]. To account for potential dropouts and to preserve statistical power, 20 participants were enrolled.

At the CCIT Sleep Disorders Center, the split-night PSG protocol was implemented in accordance with the AASM Clinical Practice Guidelines. PAP titration during the same night as diagnostic testing was initiated when the following criteria were met, 1) moderate to severe OSA was observed during at least two hours of the diagnostic portion of the study, and 2) a minimum of three hours remained available for PAP titration[14]. The diagnosis of OSA was established based on an AHI of five or more events/hour in the presence of associated clinical symptoms. OSA severity was classified according to the AHI thresholds defined in the International Classification of Sleep Disorders, third edition, text revision (ICSD-3-TR)[15] as mild OSA for an AHI of 5 to less than 15 events/hour, moderate OSA for an AHI of 15 to less than 30 events/hour, and severe OSA for an AHI of 30 or more events/hour.

Their respiratory events were defined according to the AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications, version 3[16]. Apnea was defined as a 90% or more reduction in airflow from baseline lasting for at least 10 seconds, measured via a thermal sensor. Hypopnea was defined as a 30% or more reduction in airflow lasting for at least 10 seconds, associated with either a 3% or more oxygen desaturation from pre-event baseline or an arousal. The airflow was measured using a nasal pressure transducer, and oxygen saturation was monitored by pulse oximetry. All respiratory events were manually

scored by certified sleep technologists and verified by board-certified sleep physicians.

Inclusion and exclusion criteria

Inclusion criteria included adults aged 18 years or older who were diagnosed with OSA via standard in-laboratory split-night PSG and achieved optimal PAP titration during the same night. All participants provided written informed consent to initiate PAP therapy for one week and agreed to undergo actigraphy monitoring for the entire duration of the study, comprising one week prior to, and one week following PAP therapy. Exclusion criteria included the presence of severe comorbidities that could interfere with actigraphy use, current pregnancy, prior use of continuous positive airway pressure (CPAP) therapy within the past three months, or use of central nervous system depressants within one week prior to study enrollment. Written informed consent was obtained from all participants before study entry. The present study protocol was reviewed and approved by the Research Ethics Committee of the CCIT (REC No. CRC-63-052, COA No. 051/2566).

Data collection and analysis

Participants were instructed to wear actigraphy devices (Actiwatch Spectrum Plus, Philips Respironics, USA) for one week before initiating PAP therapy and again for one week during the first week of therapy. Objective sleep parameters from actigraphy, including TIB, TST, SE, WASO, NWB, and SL were recorded. The Actiwatch is a wrist-mounted accelerometer with an internal piezoelectric sensor that monitors the occurrence and extent of movement. The authors used a default medium sensitivity setting, a count of at least 40 activities within a 30-second period Epoch, as same as in PSG setting, was designated as wakefulness[17]. Sleep data from Actiwatch Spectrum Plus was analyzed using algorithm supplied by the Actiware software, version 6.3 (Philips Respironics, USA).

All OSA patients were on CPAP device (ResMed AirSense 10, Sydney, Australia) using the same pressure as that obtained during the PAP titration in lab spit-night PSG. Subjective sleep assessments were conducted using the Thai versions of the ESS and the PSQI. An ESS score of 10 or more was indicative of excessive daytime sleepiness[2,3], while a PSQI score of more than 5 reflected poor sleep quality[4,5]. Demographic and clinical data, including age, body mass index (BMI), comorbidities, AHI, and nadir SpO_2, were also collected. Data was analyzed using standard statistics. Category data were presented as number (%), whereas continuous variables were presented as medians with interquartile ranges (IQR) because the data were not normally distribution. Pre- and post-therapy comparisons were performed using the Wilcoxon matched-pair signed-rank test for continuous paired data. A p-value of less than 0.05 was considered statistically significant.

Table 1. Baseline characteristics of OSA patients

Baseline characteristics	Values (n=20)
Age (year); median (IQR)	42.5 (31.5 to 58.5)
Sex: male; n (%)	11 (55)
STOP-Bang; median (IQR)	4 (3.5 to 5)
BMI (kg/m^2); median (IQR)	27.9 (25.9 to 31)
Neck circumference (cm); median (IQR)	39 (37 to 42)
Waist circumference (cm); median (IQR)	94 (88 to 105.5)
Hip circumference (cm); median (IQR)	104.5 (102.5 to 112.5)
SBP (mmHg); median (IQR)	133 (125.5 to 139)
DBP (mmHg); median (IQR)	79 (72 to 90.5)
HR (beats/min); median (IQR)	81 (72 to 91.5)
Subjective sleep parameters; median (IQR)	
ESS	10.5 (6.5 to 14.5)
PSQI	8 (6.5 to 9.5)
Objective sleep parameters (split night polysomnography); median (IQR)	
Sleep efficiency (%TST/TIB)	73.7 (64.9 to 84.2)
TST (minute)	109 (93.7 to 122.7)
Sleep latency (minute)	12.2 (7.5 to 18.5)
REM latency (minute)	0 (0 to 81.5)
WASO (minute)	14.2 (5.7 to 24.7)
AHI (events/hour)	37.8 (28.1 to 65.9)
RDI (events/hour)	40.4 (29.1 to 65.9)
Arousal index (events/hour)	52.1 (37.4 to 79.1)
PLMI (events/hour)	0 (0 to 0.3)
ODI 3%* (events/hour)	7.5 (1 to 32)
Nadir SpO_2 (%)	86 (81 to 92.5)
T90 (minute)	0 (0 to 6.5)

BMI=body mass index; SBP=systolic blood pressure; DBP=diastolic blood pressure; HR=heart rate; ESS=Epworth Sleepiness Scale; PSQI=Pittsburgh Sleep Quality Index; TST=total sleep time; TIB=time in bed; REM=rapid eye movement; WASO=wake after sleep onset; AHI=apnea-hypopnea index; RDI=respiratory disturbance index; PLMI=periodic limb movement index; SpO_2=pulse oxygen saturation; ODI=oxygen desaturation index; T90=time below SpO_2 90%; IQR=interquartile range

* ≥3% oxygen desaturation

Results

Baseline characteristics and clinical sleep parameters

The baseline characteristics of the study population comprising 20 OSA patients who underwent PAP therapy are summarized in Table 1. The median (IQR) age of participants was 42.5 years (31.5 to 58.5), with a predominance of males at 55%

(11 participants). The median STOP-Bang score was 4 (3.5 to 5), suggesting a high pre-test probability for moderate to severe OSA in the present study cohort[18,19]. The median BMI was 27.9 kg/m² (25.9 to 31), indicating that most participants were classified as overweight. Anthropometric measurements included a median neck circumference of 39 cm (37 to 42), waist circumference of 94 cm (88 to 105.5), and hip circumference of 104.5 cm (102.5 to 112.5). Cardiovascular parameters showed a median systolic blood pressure (SBP) of 133 mmHg (125.5 to 139), diastolic blood pressure (DBP) of 79 mmHg (72 to 90.5), and heart rate (HR) of 81 beats per minute (72 to 91.5).

Subjective and objective sleep parameters were assessed using validated questionnaires and polysomnographic data. Daytime sleepiness was evaluated using ESS, with a median score of 10.5 (6.5 to 14.5), indicating excessive daytime sleepiness. Sleep quality was assessed using the PSQI, yielding a median score of 8 (6.5 to 9.5), consistent with poor subjective sleep quality among participants. Polysomnographic findings demonstrated reduced SE and evidence of severe SDB. The median SE (%TST/TIB) was 73.7% (64.9 to 84.2), and the TST was 109 minutes (93.7 to 122.7). SL was 12.2 minutes (7.5 to 18.5), rapid eye movement (REM) latency was 0 minutes (0 to 81.5), and WASO was 14.2 minutes (5.7 to 24.7). The median AHI was 37.8 events/hour (28.1 to 65.9), which was similar to the respiratory disturbance index (RDI) at 40.4 events/hour (29.1 to 65.9), with mostly 13 participants classified as having severe OSA and the other seven participants classified as having mild to moderate OSA. The arousal index was 52.1 events/hour (37.4 to 79.1) indicating frequent sleep fragmentation. Periodic limb movements were rare, with a median (IQR) periodic limb movement index (PLMI) of 0 (0 to 0.3) events/hour. Oxygenation metrics indicated mild intermittent hypoxemia, with a median oxygen desaturation index (ODI 3%) of 7.5 events/hour (1 to 32), a nadir SpO_2 of 86% (81 to 92.5), and time spent below 90% oxygen saturation (T90) of 0 minutes (0 to 6.5).

Several comorbid conditions were identified among the study participants, as illustrated in Figure 1. Hypertension and dyslipidemia were the most prevalent, each affecting 45% (nine participants) of the cohort. Other reported comorbidities included diabetes mellitus for 15%, arrhythmia for 15%, gastroesophageal reflux disease for 10%, allergic rhinitis for 10%, asthma for 5%, and coronary artery disease for 5%.

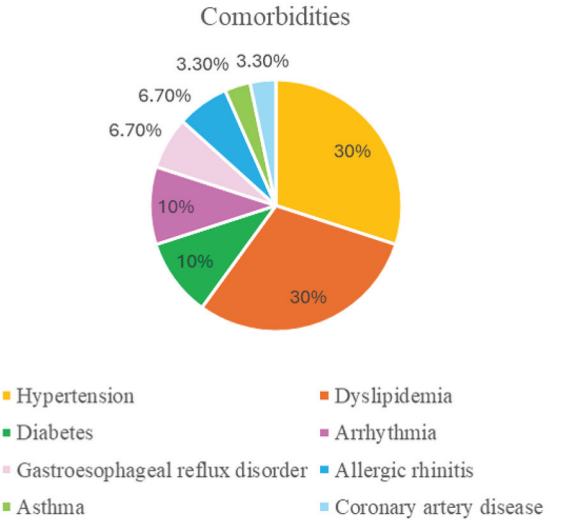

Figure 1. Comorbidities distribution in OSA patients.

Table 2. CPAP compliance of OSA patients with CPAP therapy for 1 week

CPAP parameters	Values (n=20)
CPAP pressure usage (cmH_2O); median (IQR)	8 (7 to 10.5)
Day used (%); median (IQR)	100 (83 to 100)
Average usage on all days (minute); median (IQR)	371.5 (256.5 to 437)
Average usage on days used (minute); median (IQR)	386 (303 to 434)
Days used for ≥4 hours (%); median (IQR)	100 (77 to 100)
95th percentile leak (LPM); median (IQR)	4.8 (2.1 to 15.7)
Residual AHI (events/hour); median (IQR)	1.1 (0.7 to 2.5)
Good compliance; n (%)	16 (80)

AHI=apnea-hypopnea index; CPAP=continuous positive airway pressure; IQR=interquartile range

Data was reported from ResMed AirSense 10 CPAP (ResMed, Sydney, Australia)

Good PAP compliance defied as days used for ≥4 hours is not less than 70%[20,21]

Collectively, the baseline characteristics prior to initiating PAP therapy indicated that the study population primarily comprised middle-aged, overweight individuals with moderate to severe OSA, as evidenced by elevated AHI, increased RDI, and frequent nocturnal oxygen desaturation. Comorbid hypertension and dyslipidemia were notably common in this group.

Continuous positive airway pressure usage outcome

Compliance with CPAP therapy during the one-week treatment period is summarized in Table 2. The median therapeutic pressure was 8 cmH_2O (7 to 10.5). Patients used their CPAP devices 100% (83

Table 3. Compared clinical parameters of OSA patients with CPAP therapy for 1 week

Sleep parameters	Pre-CPAP; median (IQR)	Post-CPAP; median (IQR)	p-value* (n=20)
SBP (mmHg)	133 (125.5 to 139)	124.5 (119 to 134.5)	0.140
DBP (mmHg)	79 (72 to 90.5)	82.5 (71 to 85)	0.640
HR (beats/minute)	81 (72 to 91.5)	80 (74 to 94.5)	0.911
Subjective sleep parameters			
ESS	10.5 (6.5 to 14.5)	7.5 (3.5 to 11.5)	0.003
PSQI	8 (6.5 to 9.5)	4 (4 to 6.5)	0.001
Objective sleep parameters (actigraphy data)			
TIB (minute)	474.5 (451 to 510)	483 (438.5 to 514)	0.191
TST (minute)	371.5 (363 to 417)	390 (368.5 to 436)	0.097
Sleep efficiency (%)	81.8 (77.3 to 85.3)	83.9 (79.5 to 89.3)	0.126
WASO (minute)	35.8 (24.5 to 45.6)	27 (21.6 to 41.2)	0.313
Sleep latency (minute)	29.6 (12.2 to 34)	19.4 (9.7 to 27.4)	0.017
NWB (events)	45.4 (38.6 to 64.8)	37.6 (33.7 to 45.6)	0.002

SBP=systolic blood pressure; DBP=diastolic blood pressure; HR=heart rate; ESS=Epworth Sleepiness Scale; PSQI=Pittsburgh Sleep Quality Index; TST=total sleep time; TIB=time in bed; WASO=wake after sleep onset; NWB=number of wake bouts (nocturnal awakenings); CPAP=continuous positive airway pressure; IQR=interquartile range

Actigraphy data was reported from Actiwatch Spectrum Plus

* p-value was calculated from Wilcoxon signed-rank test

to 100) of the days, with a median average usage duration of 371.5 minutes (256.5 to 437) across all days. On days when the device was used, the median usage duration increased to 386 minutes (303 to 434). A key marker of adherence, defined as the percentage of days with CPAP use of four hours or more, was 100% (77 to 100) indicating high treatment compliance. The 95th percentile leak rate was 4.8 L/minute (2.1 to 15.7), suggesting an effective mask seal in most patients. Residual AHI was well-controlled, with a median value of 1.1 events/hour (0.7 to 2.5), indicating successful therapeutic efficacy. Based on standard adherence criteria such as CPAP use of four hours or more on 70% or more of nights[20,21], 80% of participants (16 participants), were classified as good PAP compliance. All compliance and usage data were collected from ResMed AirSense 10 CPAP devices (ResMed, Sydney, Australia). These findings demonstrated that short-term CPAP therapy was well tolerated and resulted in high adherence and effective control of OSA in the present study cohort.

Clinical parameters before and after one week of CPAP therapy

Table 3 presents a comparative analysis of clinical parameters before and after one week of CPAP therapy in the same OSA patients. The data were obtained from 20 OSA participants, with objective sleep parameters assessed using actigraphy (Actiwatch Spectrum Plus, Philips Respironics, USA) and subjective sleep quality measures evaluated through standardized questionnaires by ESS and PSQI. SBP showed a slight reduction of median from 133 (125.5 to 139) to 124.5 (119 to 134.5) mmHg (p=0.140), DBP slightly increased from 79 (72 to 90.5) to 82.5 (71 to 85) mmHg (p=0.640) and HR remained relatively stable, changing from 81 (72 to 91.5) to 80 (74 to 94.5) beats per minute (p=0.911). Even though these were not statistically significant changes, they showed a downward trend of SBP after CPAP therapy after just one week.

Interestingly, there was a significant improvement in subjective and objective sleep parameters following one week of CPAP therapy as shown in Figure 2. The median ESS score significantly decreased from 10.5 (6.5 to 14.5) to 7.5 (3.5 to 11.5) (p=0.003), suggesting a reduction in daytime sleepiness. Similarly, the PSQI score improved from 8 (6.5 to 9.5) to 4 (4 to 6.5) (p=0.001), indicating enhanced overall sleep quality. Notably, SL (time taken to fall asleep) improved significantly, decreasing from 29.6 (12.2 to 34) to 19.4 (9.7 to 27.4) minutes (p=0.017), indicating that patients fell asleep faster after starting PAP therapy.

Furthermore, a significant reduction was observed in NWB, decreasing of median from 45.4 (38.6 to 64.8) to 37.6 (33.7 to 45.6) events (p=0.002), suggesting that PAP therapy contributed to fewer nocturnal awakenings. The other sleep parameters from actigraphy data showed trends of improvement with PAP therapy. The TST increased from 371.5 (363 to 417) to 390 (368.5 to 436) minutes, but this

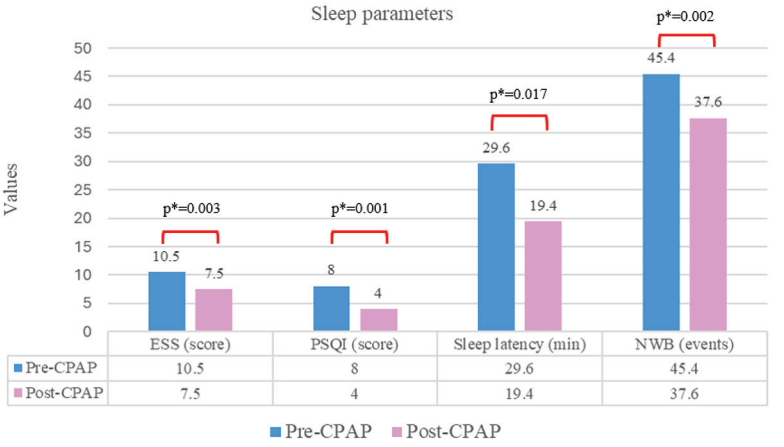

Figure 2. Comparison of significant improvement in sleep parameters.

ESS=Epworth Sleepiness Scale; PSQI=Pittsburgh Sleep Quality Index; NWB=number of wake bouts (nocturnal awakenings); CPAP=continuous positive airway pressure

* p-value was calculated from Wilcoxon signed-rank test.

improvement did not reach statistical significance (p=0.097). Similarly, the TIB slightly increased from 474.5 (451 to 510) to 483 (438.5 to 514) minutes (p=0.191). SE improved slightly from 81.8 (77.3 to 85.3) to 83.9 (79.5 to 89.3) percent, though this change was not statistically significant (p=0.126). WASO, which represents the amount of time spent awake after initially falling asleep, decreased from 35.8 (24.5 to 45.6) to 27 (21.6 to 41.2) minutes, but this difference was not statistically significant (p=0.313).

In conclusion, after one week of PAP therapy, patients experienced significant improvements in subjective sleep quality measured by PSQI and ESS scores, reduced SL, and fewer nighttime wake bouts, with less nocturnal awakenings. While TST, SE, and WASO showed trends of improvement even though they did not reach statistical significance within the short study duration. Similarly, SBP showed a downward trend, but no significant changes in blood pressure or HR were observed. These findings suggested that short-term PAP therapy enhanced sleep quality, decreased excessive daytime sleepiness, and reduced nocturnal disruptions, with potential long-term benefits on cardiovascular parameters.

Discussion

The present study demonstrates the clinical outcome of actigraphy in assessing sleep patterns in patients with OSA before and after initiating PAP therapy. The significant reductions in NWB and SL observed via actigraphy, alongside improvements in subjective measures such as the ESS and PSQI, highlight the utility of actigraphy as an objective monitoring tool in OSA management. The findings align with previous research emphasizing actigraphy's role in sleep monitoring, while also providing additional insights into its application in early PAP therapy assessment.

Gagnadoux et al. (2004)[22] examined the use of actigraphy (SleepWatch sleep analysis software, Cambridge Neurotechnology Ltd) to estimate TST under nasal continuous positive airway pressure (nCPAP) therapy. Their study found a strong correlation (r=0.9) between actigraphy-derived total sleep time (aTST) and PSG-derived total sleep time (pTST) in 24 suspected OSA patients who underwent in lab PSG. They also found a marked improvement in excessive daytime sleepiness in 28 OSA patients who received nCPAP therapy with an average usage of five months without sleep quality assessment. In addition, they found a significant correlation (r=0.8) between long term nCPAP compliance and % sleep time under nCPAP estimated by a short 3-day use of actigraphy but remarkable individual variations. Their study suggested that actigraphy could provide a better practical means to estimate sleep duration in OSA patients under nCPAP therapy in home settings than only simple nCPAP device data. The present study extended the actigraphy monitor in OSA patients from three to seven days before and after PAP therapy for assessing sleep parameters together with daytime sleepiness and sleep quality outcome.

Otake et al. (2011)[23] used actigraphy for three days before and after a month of PAP therapy to monitor sleep-wake rhythms in 18 CPAP-treated OSA

patients. Their study confirmed good agreement of TST and SE between PSG and actigraphy data. They found a significant improvement of TST, SE, sleep stability, sleep fragmentation and movement, using the actigraphy three days before and after the PAP therapy, which lasted one month. However, there was no assessment on daytime sleepiness and sleep quality. Their study suggested actigraphy as an alternative for PSG to re-evaluate sleep-wake rhythm of OSA patients who received home CPAP. The present study extended these findings by incorporate both objective sleep data from actigraphy and subjective sleep data from ESS and PSQI questionnaires, reflecting sleep quantity, daytime sleepiness and sleep quality, with reinforcing the value of actigraphy as an adjunct tool for early sleep monitoring for at least one week of PAP therapy, especially in home settings where PSG is impractical.

Tachikawa et al. (2017)[24] investigated changes in habitual sleep duration of 57 newly diagnosed OSA by using 7-day actigraphy and sleep diaries information before and after a three-month CPAP therapy. Their study reported significant improvements in ESS, PSQI, daytime nap, fragmentation index and SE but CPAP did not affect night sleep duration from actigraphy in entire group analysis, suggesting that improved sleep quality is more meaningful than sleep quantity. However, subgroup analysis showed significant improvement of WASO, fragmentation index, SE, daytime naps, and ESS only in the restorers, defined as participants with increased habitual night sleep time after 3-month CPAP therapy compared with baseline, whereas sleep quality was improved in non-restorers. The present study results are consistent with these findings and found significant improvement of daytime sleepiness (ESS) and sleep quality (PSQI) particularly in demonstrating reductions in SL and nocturnal awakenings after one-week PAP therapy from the actigraphy information.

In contrast to the aforementioned studies, the present study focused on early-phase PAP adaptation assessed by using a seven-day actigraphy combined with ESS and PSQI to monitor treatment outcomes in terms of sleep quantity, sleep quality, and adherence to PAP therapy in the same OSA patients for a shorter period of just one-week, which reflect improved daytime sleepiness, sleep quality, sleep continuity of early PAP compliance, whereas previous studies emphasized longer-term adherence outcomes. As compared to others similar studies, the present research is strong in its focus on short-term actigraphy monitoring and dual-objective-subjective assessment.

The significant improvements observed in both subjective from the ESS and PSQI and objective from the actigraphy-derived SL and NWB parameters within just one week of PAP therapy underscore the rapid effectiveness of treatment in newly diagnosed severe OSA patients. Several mechanisms may account for this early improvement. First, effective airway patency achieved through PAP therapy immediately reduces apnea and hypopnea events, thereby minimizing nocturnal arousals and improving sleep continuity. This contributes to shorter SL and fewer awakenings, as demonstrated in the present study of actigraphy data. Second, the prompt alleviation of respiratory disturbances improved oxygenation and reduced sympathetic overactivation, both of which are known to impair sleep quality. Consequently, participants experienced measurable reductions in excessive daytime sleepiness and enhanced subjective sleep quality. The early gains in sleep restoration may have positively reinforced adherence, as reflected by high compliance rates, as 80% of patients met the standard criterion of good PAP compliance. Moreover, short-term improvements in sleep may increase patient motivation to maintain therapy, establishing a positive feedback loop between perceived benefit and long-term adherence. Taken together, the present study findings emphasize the utility of early follow-up and monitoring strategies in clinical practice to enhance treatment engagement and optimize therapeutic outcomes in OSA management.

Despite the advantages of actigraphy as an objective tool for evaluating sleep-wake patterns, limitations should be acknowledged. One major barrier is the relatively high cost of the device, which ranges from 50,000 to 100,000 Thai Baht depending on the brand, model, and version. This cost restricts widespread access and availability. As a result, only a single unit was available for clinical and research use at the CCIT Sleep Disorders Center. In addition, participants were required to receive basic instruction and demonstrate an understanding of actigraphy operation. They were expected to wear the device continuously on their non-dominant wrist, replacing their personal wristwatch, for up to two consecutive weeks. Participants were also required to return to the study center weekly for collection of clinical sleep parameters by the research team. These requirements necessitated the careful selection of participants who not only met the inclusion criteria but were also capable of adhering to device usage protocols and complying with the

study schedule. As a result, some degree of selection bias may have been unavoidable. These practical constraints contributed to the prolonged recruitment period required to reach the target sample size of 20 participants. This challenge highlights that, although actigraphy provides robust objective data, its routine implementation in real-world clinical practice may be limited due to feasibility concerns. In contrast, subjective assessments such as the ESS and the PSQI are low cost, easy to administer, and more feasible in most clinical settings. Nevertheless, interpretation of subjective sleep data should be approached with caution due to the potential for reporting bias and interindividual variability in perception of sleep quality. Further research is warranted to optimize actigraphy-based sleep assessments and explore its integration with emerging digital health technologies for personalized OSA management.

Conclusion

Short-term use of PAP therapy in newly treated severe OSA patients led to significant improvements in both subjective and objective sleep parameters, indicating a robust early treatment response in sleep continuity, daytime sleepiness, and overall sleep quality within one week, accompanied by high adherence to therapy.

What is already known about this topic?

The effectiveness of PAP therapy is well established in reducing the AHI and improving sleep quality in OSA patients. Actigraphy, a non-invasive tool for monitoring sleep-wake patterns, has shown promise in evaluating sleep parameters but has not been widely implemented in OSA management.

What does this study add?

This study provides novel insights into the use of actigraphy for short-term monitoring of sleep parameters in OSA patients initiating PAP therapy. The findings demonstrate significant improvements in dual subjective-objective sleep parameters after just one week of CPAP therapy, as measured by ESS, PSQI, and actigraphy. Marked improvement of daytime sleepiness, sleep quality, SL and nocturnal awakenings reinforcing the potential of actigraphy as a complementary tool in early assessment of PAP therapy outcomes.

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Conflicts of interest

The author declares no conflict of interest.

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