Sleep Medicine 16 (2015) 1497–1501

Contents lists available at ScienceDirect

Sleep Medicine

journal homepage: www.elsevier.com/locate/sleep

Original Article

Supine sleep and obstructive sleep apnea syndrome in Parkinson's disease

Valérie Cochen De Cock [a,b,c,*], Nicolas Benard-Serre [d], Valérie Driss [c], Manon Granier [d], Mahmoud Charif [d], Bertrand Carlander [d], Matthieu Desplan [a], Muriel Croisier Langenier [d], Didier Cugy [e,f], Sophie Bayard [a,b,c]

[a] Pôle Sommeil, Clinique Beau Soleil, Montpellier, France
[b] EuroMov, Laboratoire Movement to Health (M2H), University of Montpellier-1, France
[c] Centre d'Investigation Clinique, Hôpital Saint Eloi, Montpellier, France
[d] Service de Neurologie, Hôpital Gui de Chauliac, Montpellier, France
[e] Clinique du Sommeil, CHU Pellegrin, Bordeaux, France
[f] Unité Hypnologie et Chronobiologie Clinique, Pavillon de la Mutualité, Pessac, France

ARTICLE INFO

Article history:
Received 27 June 2014
Received in revised form 29 August 2014
Accepted 9 September 2014
Available online 14 April 2015

Keywords:
Parkinson's disease
Obstructive sleep apnea syndrome
Akinesia
Position changes
Supine sleep position

ABSTRACT

Objective: Supine sleep is associated with increased obstructive sleep apnea. People with Parkinson's disease (PD) complain about difficulties turning around in bed. The relationship between supine sleep and sleep-disordered breathing has never been explored in people with Parkinson's disease.
Methods: Fifteen consecutive people with PD with severe Obstructive Sleep Apnea Syndrome (OSAS) were compared to: (1) 15 age-matched, gender-matched, body mass index-matched and Unified Parkinson's Disease Rating Scale-III score-matched people with PD without sleep-disordered breathing; (2) 11 age-matched and gender-matched people with severe obstructive sleep apnea syndrome (OSAS) alone; and (3) 11 age-matched and gender-matched healthy controls. Outcomes were: number of position changes during the night and per hour of sleep, and the percentage of sleep time spent in supine.
Results: People with PD and severe OSAS spent most of their sleep time in the supine position (93 ± 11%); while people with PD without OSAS (61 ± 24%, $p < 0.001$), people with isolated, severe OSAS (50 ± 28%, $p < 0.001$), and the controls (40 ± 21, $p < 0.001$) spent significantly less time on their back. People with PD and severe OSAS changed their position in bed per hour of sleep (0.4 ± 0.5) less frequently than those with PD without OSAS (1.1 ± 0.8, $p = 0.002$), those with isolated OSAS (1.2 ± 1.0, $p = 0.006$) and the controls (1.5 ± 0.5, $p < 0.001$).
Conclusion: PD and severe OSAS are associated with a major reduction in the number of position changes and an increased supine sleep position during the night. For people with PD, alleviating the difficulties of turning around in bed might reduce the supine sleep position and improve sleep-disordered breathing.

1. Introduction

Obstructive sleep apnea syndrome (OSAS) is common in the middle-aged to elderly general population and has severe consequences on sleep, health, and quality of life. It is frequently encountered in people with Parkinson's disease (PD).

The supine posture exacerbates obstructive sleep apnea because of a gravity-driven collapse of the tongue and pharyngeal soft tissue, which occludes the airway. The apnea–hypopnea index decreases significantly when changing from the supine to the lateral position [1–6].

People with PD suffer from progressive motor disability, with rare and slow movements, and muscle rigidity, leading to difficulties turning in bed [7,8]. Furthermore, it has recently been demonstrated that sleep apnea is more frequent and severe in the most disabled people with PD [9].

In the present study, it was hypothesized that people with PD and severe OSAS might have an increased time spent in the supine position during sleep. The aim of the present study was to assess sleep body posture and sleep position changes in people with PD and with severe OSAS, compared to: (1) age-matched, gender-matched, body mass index-matched and Unified Parkinson's Disease Rating Scale-III (UPDRS-III) score-matched people with PD without sleep-disordered breathing; (2) age-matched and gender-matched people with OSAS alone; and (3) age-matched and gender-matched healthy controls.

* Corresponding author. Clinique Beau Soleil, 119 Avenue de Lodève, 34 070 Montpellier, France. Tel.: +33 (0)4 67 75 98 47; fax: +33 (0)4 67 75 98 83.
E-mail address: valerie.cochen@gmail.com (V. Cochen De Cock).

http://dx.doi.org/10.1016/j.sleep.2014.09.014
1389-9457/

2. Patients and methods

From March 2009 to July 2013, 15 consecutive people with PD and severe OSAS (apnea/hypopnea index ≥30/h; PD + OSAS+) were recruited and matched for age, gender, body mass index (BMI) and severity of disease to: (1) 15 people with PD without sleep-disordered breathing (PD + OSAS–); (2) 11 age-matched and gender-matched people with severe OSAS alone (OSAS+); and (3) 11 age-matched and gender-matched healthy controls. The study was performed in the neurological unit of the University Hospital of Montpellier.

The clinical diagnosis of PD was based on the United Kingdom Parkinson's Disease Society Brain Bank criteria [10]. Data concerning demographic characteristics, medical history, PD course, and treatment (with particular attention to dopamine agonists, analgesics and psychoactive drugs) were collected during face-to-face interviews. The levodopa equivalent dose (LED) taken before 12:00, between 12:00 and 19:00, and after 19:00 was measured. The motor disability of the people was assessed using the UPDRS-III as well as the Hoehn and Yahr stage in people at the optimal effect of the antiparkinson treatment, levodopa ("on" condition). All people with PD performed a Mini Mental State Examination (MMSE), with all scores above the 10th percentile regarding their level of education; none met the diagnostic criteria of PD dementia [11]. An excessive daytime sleepiness complaint was evaluated using the Epworth Sleepiness Score (ESS) and subjective sleepiness was defined by an ESS score over 10 [12]. Restless Legs Syndrome (RLS) was diagnosed if the participants fulfilled the four clinical criteria of RLS, as defined by the International RLS study group [13]. Clinical rapid eye movement (REM)-sleep behavior disorder (RBD) was defined when the bed partner reported significant, purposeful limb or body movements (as if they were acting out their dreams) and when these movements were associated with a dream recall upon awakening. Depressive symptoms were explored with the Beck Depression Inventory, and a score of 19 or above defined moderate or severe depressive symptoms [14]. Insomnia was evaluated using the Insomnia Severity Index, and a score of more than 8 defined subthreshold insomnia [15].

2.1. Standard protocol approvals, registrations and consents

The present study was approved by the local ethics committee (University Hospital, Montpellier, France) and all participants gave informed consent prior to the start of the study.

2.2. Sleep monitoring

All participants had an audio and video polysomnography (PSG) performed during a single night study in the sleep unit. The monitoring included: O2-Cz, FP1-Cz and C3-A2 electroencephalography; right and left electro-oculogram; electromyography (EMG) of the chin and tibialis anterior muscles; nasal pressure monitoring through a cannula; thoracic and abdominal belts for assessing respiratory efforts; electrocardiography; and pulse oxymetry. The sleep stages, microarousals, respiratory events, and periodic leg movements were scored through visual inspection, according to the standard criteria [16]. Severe OSAS was defined as an apnea/hypopnea index over 30/h. The measure of tonic muscle activity during REM sleep was defined as the sum of REM sleep epochs with at least 50% of the duration of the epoch having enhanced chin EMG amplitude. Enhanced phasic chin muscle activity in REM sleep was defined as the percentage of 30-s epochs containing at least five 3-s mini-epochs with bursts of transient muscle activity [16]. RBD was diagnosed on PSG if excessive tonic muscle activity during REM sleep reached more than 30% of REM sleep, if phasic chin EMG was more than 15%, or if an abnormal REM sleep behavior was observed on the video. Body position and position changes were recorded using a position sensor placed on the thorax. Body position changes were confirmed using the video signal by NB blinded to the diagnosis.

2.3. Statistical analysis

Categorial variables were presented as percentages, and quantitative variables as medians with ranges or mean and standard deviation (SD), depending on the normality of their distribution. Normality of the continuous variables was tested according to the Shapiro–Wilk test. The Mann–Whitney test was used for continuous variables, and Chi-squared test for qualitative variables. The Kruskal–Wallis test was used to compare continuous variables of more than two groups. Significance level was set at $p < 0.05$.

3. Results

3.1. Clinical characteristics

As expected, because all groups were matched for age and gender, no significant group differences were noted for these two characteristics (Table 1). The PD + OSAS+ and PD + OSAS– groups were matched for BMI ($p = 0.90$), but the control and OSAS+ groups were not. It was observed that the BMI score was significantly higher in the OSAS+ group (32 ± 4) than in the PD + OSAS+ group (27 ± 6, $p = 0.01$), the PD + OSAS– group (25 ± 3, $p < 0.001$), and the control (27 ± 4, $p = 0.02$), without any difference between these last three groups.

As expected, because the two PD groups were matched for UPDRS-III they did not differ regarding motor disease severity. Comparing these two groups, it was also observed that they did not differ for disease duration, MMSE score, dopaminergic and non-dopaminergic treatments, and time schedule of dopaminergic treatment. None of the participants had dyskinesia involving the upper airways, or stridor. Complaints of depression, RLS, sleepiness and insomnia were not significantly different in the two PD groups. Participants with PD + OSAS– reported more frequent clinical RBD ($p = 0.02$) than those with PD + OSAS+.

3.2. Sleep parameters

No significant difference was found between the PD + OSAS+ and OSAS+ groups for the apnea/hypopnea index ($p = 0.20$; Table 1), mean sleep oxygen saturation (94 [91–96] vs 94 [90–97], respectively;

Table 1
Demographic-, clinical- and sleep-matched characteristics of people with Parkinson's disease and severe obstructive sleep apnea syndrome, Parkinson's disease and without obstructive sleep apnea syndrome, severe obstructive sleep apnea syndrome alone, and controls.

	PD + OSAS+	PD + OSAS–	OSAS+	Controls	*p*-value
Number	15	15	11	11	
Age (years)	66 ± 6	66 ± 6	63 ± 3	65 ± 5	0.7
Gender (% male)	87	87	90	90	1.0
BMI (kg/m^2)	27 ± 6	25 ± 3	32 ± 4[a]	27 ± 5	0.005
Motor disability UPDRS-III/108	25.6 ± 11.9	23.3 ± 10.6	NA	NA	0.6
Apnea–hypopnea	37 [30–56][b]	1 [0–4]	34 [31–55][b]	2 [1–4]	<0.0011

BMI, body mass index; OSAS, Obstructive Sleep Apnea Syndrome; OSAS+, severe obstructive sleep apnea syndrome alone; PD, Parkinson's Disease; PD + OSAS+, Parkinson's disease with severe obstructive sleep apnea syndrome; PD + OSAS–, Parkinson's disease without OSAS; UPDRS-III/108, Unified Parkinson's Disease Rating Scale.

[a] $p < 0.05$ for OSAS+ compared to all other groups.

[b] $p < 0.05$ for OSAS+ compared to controls and PD + OSAS+ to PD + OSAS–.