Sleep in adult-onset idiopathic focal cervical dystonia (AOIFCD): an evaluation using self-reported and accelerometer derived measures

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Introduction

Sleep disturbances are an important component of the phenotypic profile of adult-onset idiopathic focal cervical dystonia (AOIFCD), reported in up to 70% of patients. Given the chronic nature of dystonia, greater understanding of potential sleep disturbances would require minimally intrusive monitoring and minimal input from the patients themselves. Coupled with actigraphy, patient reported outcomes (PROs) can capture longitudinal monitoring.

Aims & Objectives

1. To analyse sleep stages in detail amongst individuals diagnosed with AOIFCD using wrist-worn accelerometers and subjective PROs
2. Evaluate concordance between subjective PROs and objective accelerometer measures

Method

Individuals with AOIFCD (n = 50) and age- and sex-matched controls (n = 47) wore a consumer grade triaxial wrist device (Garmin vivosmart 4, Figure 1) continuously over seven days, whilst completing a daily sleep diary, and standardised sleep and non-motor symptom questionnaires (Figure 2). Sleep measures were derived from the raw triaxial acceleration and heart rate values captured from the wrist-worn device, using a previously published algorithm.[1]

Figure 1. Garmin vivosmart 4 device

Timeline (days):	0	1	2	3	4	5	6	7
Questionnaires								
PSQI	●							
ESS	●							
DNMSQuest	●							
Sleep diary		●	●	●	●	●	●	●
Sleep scale		●	●	●	●	●	●	●
Pain scale		●	●	●	●	●	●	●
Anxiety scale		●	●	●	●	●	●	●
Quality of Life scale		●	●	●	●	●	●	●

Figure 2. Frequency of questionnaires
Abbreviations: DNMSQuest: Dystonia Non-Motor Symptoms Questionnaire, ESS: Epworth Sleepiness Scale, PSQI: Pittsburgh Sleep Quality Index

Results

Table 1. Self-reported sleep diary data

Sleep diary parameters	AOIFCD (n = 50)	Controls (n = 46)	p-value
Sleep onset latency (minutes) (IQR)	22.1 (19.8)	14.1 (14.6)	0.06
Total sleep time (minutes) (IQR)	443.9 (68.5)	441.5 (74.6)	0.79
Time in bed (minutes) (IQR)	530.4 (70.1)	530 (49.1)	0.98
Wake after sleep onset (minutes) (IQR)	15.1 (29.3)	19.8 (20.5)	0.66
Number of nocturnal awakenings (IQR)	2 (1.5)	1.9 (0.9)	0.96
Sleep efficiency (%) (IQR)	86.5 (13.9)	84.9 (8.2)	0.79

Table 2. Wearable-derived sleep data

Wearable-device sleep parameters	AOIFCD (n = 48)	Controls (n = 43)	p-value
Sleep onset latency (minutes) (IQR)	0.96 (1.9)	1 (1.6)	0.7
Total sleep time (minutes) (IQR)	435 (104.4)	388.2 (66.9)	**0.0038**
Wake after sleep onset (SD)	134.8 (116)	147.4 (51.9)	0.21
Sleep efficiency (%) (SD)	75.3 (21.4)	72.6 (9.1)	0.08
Total REM (minutes) (SD)	61.9 (57.1)	59.2 (41.2)	0.71
Total NREM (minutes) (SD)	359.5 (107.4)	325.2 (86.4)	**0.0089**

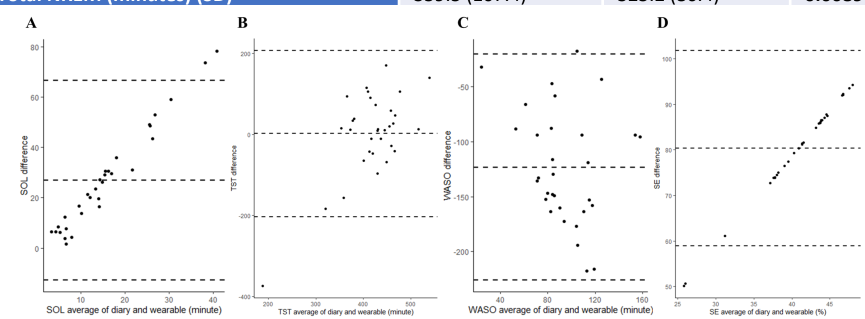

Figure 3. Bland-Altman plots demonstrating agreement of measures in the dystonia cohort A) Sleep onset latency B) total sleep time C) wake after sleep onset D) sleep efficiency

Conclusion

- We found evidence of self-reported sleep disturbances measured by standardised sleep questionnaires
- Altered sleep quality and sleep architecture were present in those with AOIFCD, in particular evidence of increased total sleep time and NREM sleep
- Future work would benefit from comparison of actigraphic and polysomnography variables

References: [1] Walch O, Huang Y, Forger D, Goldstein C. Sleep stage prediction with raw acceleration and photoplethysmography heart rate data derived from a consumer wearable device. *Sleep*. 2019;42(12). doi:10.1093/sleep/zsz180