Sleep Onset Rapid Eye Movement (SOREM) in Sleep Disorder Patients: Association with Sleepiness and Fatigue

Study objective: To investigate the relationship between daytime sleep onset rapid eye movement (SOREM) and daytime sleepiness and fatigue in sleep patients

Participants: 444 patients from a sleep clinic. Data were recovered retrospectively from patient charts.

Main Outcome Measure: Average time of falling asleep in the Mean Sleep Latency Test (MSLT) and the Maintenance of Wakefulness Test (MWT) and two self-reported scales, fatigue scale and sleepiness scale

Methods: Two sample t-test to analyze results from MSLT and MWT; frequency tables and chi-square tests to analyze fatigue scale and sleepiness scale

Results: Patients with daytime SOREMs fall asleep significantly faster in both MSLT and MWT than patients without daytime SOREM. Fatigue scale as reported by patients was no significant different among the groups with and without daytime SOREMs. Sleepiness scale as reported by patients showed a weak or moderate evidence of more sleepiness in patients with SOREMs.

Conclusions: These results suggest that sleep patients with daytime SOREMs exhibit more daytime sleepiness and fatigue than sleep patients not having daytime SOREMs. However, they might have little self-consciousness of their own inability to stay awake and can lead to serious hazardous accidents.

INTRODUCTION

This study involved an in-depth assessment of daytime fatigue and sleepiness in sleep disorder patients with and without daytime sleep onset rapid eye movement (SOREM). The experimental subjects, 444 patients from a sleep clinic, underwent a Mean Sleep Latency Test (MSLT) and a Maintenance of Wakefulness Test (MWT) which two tests were at most 10 days apart. MSLT was a daytime test administered after a night in the sleep lab. During four sessions spaced throughout the day, patients were encouraged to fall asleep. Each session lasted 30 minutes. Time it took to fall asleep over the four sessions were averaged out and being assessed. If a patient did not fall asleep during any session, 30 minutes was recorded for that session. MWT was similar to MSLT except patients were asked to stay awake (without external stimulation) in each session. Patient who had at least one SOREM during his or her MSLT or MWT was considered to have SOREM. Other data of interest include the self-reported measures of fatigue and sleepiness. They are both on a scale from 1 to 7 where higher scores indicated more fatigue or sleepiness accordingly.

The following analysis will seek to determine the existence of association between SOREMs and sleepiness/fatigue in sleep disorder patients. In particular this will involve use of two sample t-tests in order to perform a hypothesis test to determine whether any apparent differences in the MLST and MWT existed among the groups with and without SOREMs. Analysis will also be undertaken to test the association between SOREMs and the self-reported measure of fatigue and sleepiness.

METHODS & RESULTS

Mean Sleep Latency Test (MSLT)

Only patients who fell asleep in at least one session of MSLT were included in this analysis. By the use of a two sample t-test to compare the means of the average time it took to fall asleep over the four sessions of MSLT of patients with and without SOREMs. A test of the equality of variance is used to test the assumption of equal variances. There was no evidence that variance for the two groups are different (p=0.53). Therefore, it is suitable to use the pooled equal variance t-test in the analysis. Average time it took for clients to fall asleep during MSLT was significantly lower among the SOREM group than the non-SOREM group; the t-test comparing the SOREM mean of 7.58 (s.d. 4.56) with the non-SOREM mean of 9.90 (s.d. 4.24) was statistically significant ($p < 0.001$).

Maintenance of Wakefulness Test (MWT)

Similarly, only patients who fell asleep in at least one session of MWT were included in this analysis. A two sample t-test was used to compare the means of the average time it took to fall asleep over the four sessions of MWT of patients with and without SOREMs. There was no evidence that variance for the two groups are different ($p = 0.09$)

according to the test of the equality of variance therefore the pooled equal variance t-test was used in the analysis. Average time it took for clients to fall asleep during the MWT was significantly lower in the SOREM group than the non-SOREM group; the t-test comparing the SOREM mean of 17.20 (s.d. 6.94) with the non-SOREM mean of 21.98 (s.d. 5.02) was statistically significant (p = 0.003).

Fatigue Scale and Sleepiness Scale

Descriptive statistics were used to summarize the patients' self-reported measure of fatigue and sleepiness (Table 1, 2). Analysis of whether there is an association between SOREMs and fatigue and sleepiness were done with chi-square tests. It turned out that there was no evidence against the null hypothesis that there was no association between the fatigue measure and SOREM (p = 0.56). And there was weak evidence that the sleepiness measure was associated with SOREM (p = 0.07). As only 1 patient in each group reported a level 7 of sleepiness, another chi-square test was carried out by merging level 6 and 7 and moderate evidence of an association between sleepiness measure and SOREMs was found after merging (p = 0.04). This indicated patients with daytime SOREMs tended to self-report a higher sleepiness scale than patients without SOREMs. Trends in both tables below coincide with results from the chi-square tests.

Table 1. Frequency table of fatigue scale by SOREMs groups

Frequency (Column %)		SOREM	
		No	Yes
Fatigue Scale	1	19 (8.96)	17 (8.10)
	2	38 (17.92)	37 (17.62)
	3	53 (25.00)	38 (18.10)
	4	36 (16.98)	37 (17.62)
	5	19 (8.96)	28 (13.33)
	6	43 (20.28)	47 (22.38)
	7	4 (1.89)	6 (2.86)
Total		212	210

(Frequency Missing = 22)

Table 2. Frequency table of sleepiness scale (level 6 and 7 merged) by SOREMs groups

Frequency (Column %)		SOREM	
		No	Yes
Sleepiness Scale	1	24 (11.43)	24 (11.59)
	2	57 (27.14)	33 (15.94)
	3	58 (27.62)	64 (30.92)
	4	37 (17.62)	32 (15.46)
	5	20 (9.52)	33 (15.94)
	6 & 7	14 (6.67)	21 (10.14)
Total		210	207

(Frequency Missing = 27)

CONCLUSION AND DISCUSSION

In conclusion, this study underscored the association between daytime sleep onset rapid eye movement (SOREM) and daytime sleepiness or fatigue. In both the Mean Sleep Latency Test (MSLT), where patients were encouraged to fall asleep, and the Maintenance of Wakefulness Test (MWT), where patients were encouraged to stay awake, the average time it took the patients to fall asleep was statistically significantly lower in patients with daytime SOREMs than in patients without daytime SOREMs. However, in terms of the self-reported measure of fatigue and sleepiness, patients with daytime SOREMs perceived themselves as having no statistically significant difference in fatigue and only weak or moderate evidence of more sleepiness than patients without daytime SOREMs. These results suggest that sleep disorder patients with daytime SOREMs, although fell asleep evidently faster in both MSLT and MWT, were not capable of recognizing his or her own struggle and inability to stay awake. This can lead to serious consequences on roads for drivers and other substantially impacts to patients' daily life.

Some limitations in the study was that the time frame of the MSLT and MWT (at most 10 days in-between) may have led to inclusion of temporary sleep problems the patients experienced and influenced some sleep behaviors of them. But this should have been true for both groups with and without SOREMs. Also the relatively small sample size makes the results less capable to generalize to other patients with daytime sleeping disorder. Finally, further research needs to explore the impact of daytime SOREMs on the prognosis and treatment of sleep disorder patients.