BRIEF REPORTS

Timing of Sleep and Wakefulness in Alzheimer's Disease Patients Residing at Home

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Introduction

Dysfunction of the circadian timing system has long been suspected in Alzheimer's disease (AD) because such patients frequently, though not inevitably, have sleep disturbance (Bliwise 1989). Despite such sleep disruption, some studies of various physiological phenomena typically showing diurnal variation (e.g., body temperature, cortisol, prolactin, melatonin) have had difficulty showing differences between AD patients and controls (Prinz et al 1984; Touitou 1982; Christie et al 1983), perhaps owing to selection bias in patients studied (Witting et al 1990). More recently, Campbell et al (1988) reported the existence of an earlier acrophase in the body temperature cycle in male AD patients relative to age-matched, nondemented controls. This finding contrasts with the data of Satlin et al (1991) who reported a delayed acrophase in the rest/activity cycle in AD patients. Here we present data on the timing of sleep/wakefulness in AD patients in their home as recorded by caregivers in a 1-week sleep log. To the best of our knowledge, no data currently exist on the timing of sleep and wakefulness in a group of well-characterized AD patients in their natural environments.

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Methods

Subjects

Subjects were 54 AD patients (36 men, 19 women) and 30 nondemented elderly controls (10 men, 20 women). Patients were significantly younger than controls (63.7 versus 73.8, $t = 5.85$, $p < 0.001$). At the time of this data collection, all AD patients met National Institute of Neurological and Communicative Disorders and Stroke (NINCDS) criteria for probable ($n = 43$) or possible ($n = 11$) AD. Four of the former have now come to autopsy and are confirmed. Global Deterioration Scale scores (Reisberg et al 1982) were available on 28 of the patients. The mean rating on this scale was 5.3 (SD = 1.4) indicating a moderate to severe level of cognitive decline in the sample. Mean Mini Mental State Exam (Folstein et al 1975) at time of sleep log was 15.0 (SD = 8.6) ($n = 51$). Controls were members of an aged cohort of community volunteers recruited for studies of sleep and aging (Bliwise et al 1987). All had MMSE scores of 28 or higher. None of the patients or controls used a psychoactive medication during the week of the sleep log or in the preceding month.

Procedures

Caregivers of AD patients, all of whom resided at home, were asked to complete a 1-week sleep log charting the daily bed times, wake-up times, and amount of sleep of each patient for each night. Daily naps were also recorded. Caregiv-

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ers were not asked to record their own sleep in order to increase compliance and relative accuracy of the reports about the patients. Control subjects completed the sleep log on their own. On the basis of the 7 days of data, we computed a 1-week mean for each of the nocturnal sleep variables as well as for the number and duration of the daily naps. We then compared data from the AD patients and controls with *t*-tests performed separately by gender. Differences between patients' and controls' within-subjects variance in bedtimes and wake-up times were compared with an *F*-test.

Results

Results are shown in Table 1 and confirm earlier bedtimes in both male and female AD patients relative to the controls. Wake-up times did not differentiate the groups but longer nocturnal sleep times of 1.5–2.0 hrs were estimated by caregivers of the AD patients. Controls reported longer nap durations than were present in the AD patients, though in the women with AD, a trend toward a greater number of brief bouts of daytime sleep was observed.

Within-subjects variance in bedtimes did not distinguish male and female patients from controls. There was also no difference in within-subjects variance in wake-up times in women. Male AD patients, however, showed significantly greater variability in wake-up times relative to male controls ($F = 3.12$, df = 33,10, $p < 0.05$).

Discussion

Although the present findings could be construed as providing some support for Campbell et al's finding of an earlier acrophase in the body temperature cycle in AD patients (Campbell et al 1988; Gillin et al 1989), it may well be that caregivers select or steer the demented patient to bed at an earlier hour simply for expedience. Sleep disturbance in demented patients is known to be a major factor in their institutionalization

Table 1. Comparison of Sleep Log Data in Patients and Controls

	Male AD patients (n = 36)		Male controls (n = 10)			
Variable	Mean	(SD)	Mean	(SD)	t	p
Bedtime	10:07 PM	(65 min)	11:18 PM	(46 min)	3.08	$p < 0.001$
Wake-up time	7:00 AM	(71 min)	6:46 AM	(46 min)	0.93	NS
Total nocturnal sleep time	8.8 hr	(1.2 hr)	7.0 hr	(0.8 hr)	4.47	$p < 0.001$
Mean daily nap time	0.60 min	(0.85 min)	18.3 min	(25.7 min)	2.18	$p < 0.05$
Mean daily nap no.	0.62	(0.70)	0.60	(0.56)	0.08	NS
	Female AD patients (n = 19)		Female controls (n = 20)			
Variable	Mean	(SD)	Mean	(SD)	t	p
Bedtime	10:05 PM	(55 min)	11:30 PM	(54 min)	4.27	$p < 0.001$
Wake-up time	6:42 AM	(53 min)	6:54 AM	(66 min)	.59	NS
Total nocturnal sleep time	8.5 hr	(1.1 hr)	7.1 hr	(1.4 hr)	2.98	$p < 0.01$
Mean daily nap time	0.68 min	(0.70 min)	20.0 min	(26.3 min)	3.28	$p < 0.01$
Mean daily nap no.	0.77	(0.87)	0.39	(0.40)	1.67	NS

(Pollak et al 1990), and an earlier bedtime could simply represent an attempt by caregivers to provide themselves with an overnight respite.

In addition to projected changes in phase relationships in AD, some alterations in the so-called amplitude of these rhythms also have been speculated to exist (Bliwise 1989). Increased tendencies for daytime sleep have been noted in AD patients, even to some extent, paralleling the extent of their cognitive impairment (Prinz et al 1982a, 1982b). In this respect, our data on napping appear somewhat unusual in that both our male and female controls take longer naps than do our AD patients. One possible explanation of this phenomenon is that our elderly controls, who are in generally good health and lead relatively active and busy lives, may take daytime naps to compensate for voluntarily shorter nocturnal sleep durations. Clearly a thorough understanding of 24-hr sleep/wake patterns of elderly persons in a naturalistic context should take the full range of social influences into account (Monk et al 1990).

The current results overlap considerably with existing literature on sleep patterns in AD patients and elderly controls. For example, the greater day-to-day variability in wake-up times in male AD patients is consistent with the substantial intersubject and intrasubject variability in rest-activity patterns demonstrated by Witting et al (1990). Similarly, the apparently late bed times of the elderly controls are consistent with several other studies suggesting that nondemented elderly individuals residing at home elect typical bedtimes at 11:00 PM or later (Buysse et al 1991; Tune 1969; Webb 1981; Hayter 1983).

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