

SHORT REPORT

Temporally related changes of sleep complaints in traumatic brain injured patients

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Abstract

Sleep complaints were obtained from 22 hospitalised patients with traumatic brain injury of recent onset (median 3.5 months after injury) and were compared with those of 77 discharged patients who had sustained brain injury about two to three years (median 29.5 months) previously. A high incidence of sleep complaints was noted in both groups (72.7% and 51.9% respectively). Disorders in initiating and maintaining sleep (DIMS) were the most common complaints among hospitalised patients (81.2%), whereas disorders of excessive somnolence (DOES) were common in discharged patients (72.5%). This difference in the nature of the complaints was apparently due to differences between the two groups in the time elapsed since injury, duration of coma, and immediate environmental conditions. In discharged patients with sleep complaints, neurobehavioural impairments and a poorer occupational outcome were more common than in those discharged patients without sleep complaints. It is suggested that early evaluation and treatment of sleep disturbances must be considered an integral part of the rehabilitation process.

Polysomnographic studies carried out in patients after traumatic brain injury have indicated several sleep-wake pattern disturbances. The most common were a decrease in the amount both of rapid eye movement (REM) and slow wave sleep and an increase in the number of awakenings from sleep, resulting in lesser sleep efficiency.¹⁻³ George *et al*¹ suggested that the duration of coma and the time elapsed since the occurrence of trauma have a crucial role in determining sleep abnormalities. Ron *et al*² in a long term follow up study, described a temporal relation between the restoration of normal REM sleep and improvement of higher mental functions in patients with traumatic brain injury. In addition to polysomnographic data, sleep complaints are apparently common in these patients, even a long time after trauma.^{3,4}

We compared the sleep complaints of patients with recent traumatic brain injury with those of patients who sustained brain trauma two to three years before and evaluated the

relation between sleep complaints and high mental function.

Patients and methods

Two groups of patients were evaluated. The first group consisted of 22 patients (16 males and six females) with recent injury (median 3.5 months), hospitalised in the rehabilitation department. The median age was 29 years, and the median (range) duration of coma was 6.5 (1-60) days. The second group consisted of 77 discharged patients (57 males and 20 females) seen at follow up examination 24 to 36 months (median 29.5 months) after injury. The median age was 26 years, and the median (range) duration of coma was 12 (1-160) days. Each patient was helped to complete a questionnaire of 38 items. The questions were designed to determine if the patient had disorders in initiating or maintaining sleep (DIMS), disorders of excessive somnolence (DOES), changes in sleep-wake patterns or parasomnias, and to discover possible causative factors. Questions also concerned time spent in bed, duration of night sleep, time taken to fall asleep, number of awakenings during night sleep, snoring, periodic leg movements and restless legs, number of daytime naps, self evaluation of daytime sleepiness, and the influence of pain, environmental noise, and light on sleep quality. The patients' premorbid state was determined for each item.

All patients were examined by a multidisciplinary team including a senior rehabilitation physician, a psychiatrist, a psychologist, and physical, occupational, and speech therapists. Motor deficits, communicative skills, and cognitive and behavioural performance were studied as part of the ongoing regular clinical assessment. Cognitive assessment included memory test (verbal and visual); Rey-Osterrieth complex figure test; Weigel test; block design test; verbal logic test; transitive, inductive-deductive and analogic thinking test; Raven-matrix test, and trail-making test.⁵ Behaviour affective disturbances were evaluated by psychiatric examination. The use of minor, and sometimes even major, tranquilisers as well as the use of antidepressant drugs were taken into account. Rehabilitation outcome was evaluated only in discharged patients according to actual occupational status. Patients doing either skilled or unskilled work in the open market were considered well

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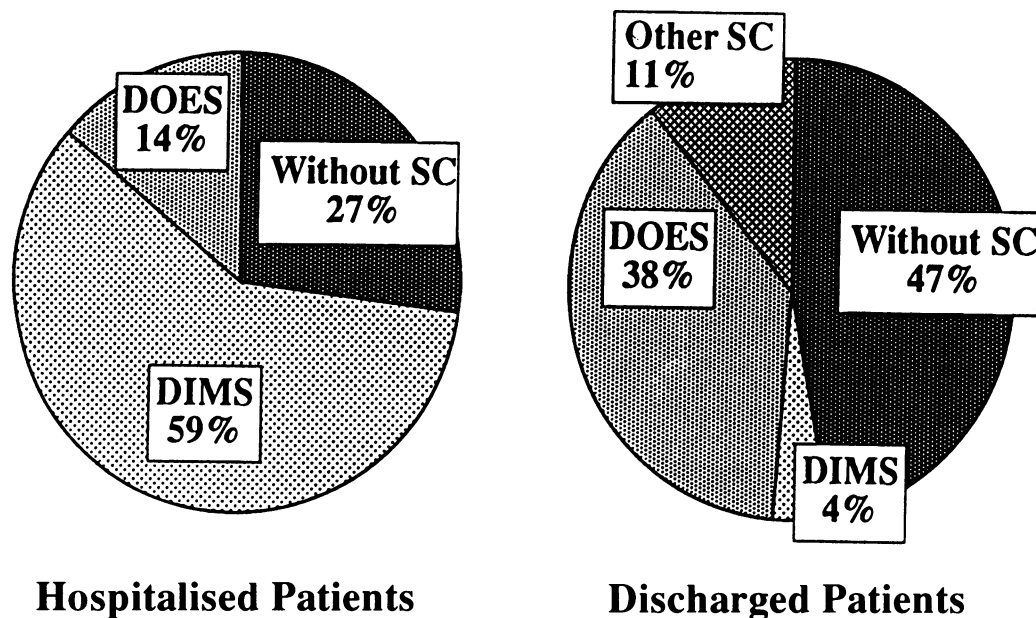


Figure Distribution of sleep complaints (SC) in early and late groups of traumatic brain injured patients. DIMS disorders in initiating and maintaining sleep, DOES disorders of excessive somnolence.

recovered, and those working in sheltered workshops or not working at all were considered poorly rehabilitated.⁶

Results

Sixteen of the 22 hospitalised patients (72.7%) reported sleep related disturbances. Most common were DIMS reported by 13 of 16 patients (82%). Of these, five had difficulty in initiating sleep, seven in maintaining sleep, and one in both. Eight patients (36%) considered the hospital environment (noise or light or both) an important causative factor. Only four of the 13 patients attributed any importance to pain or tension (two patients each, 15%). Three inpatients (14%) complained of DOES (figure). Of the 77 discharged patients, 40 (52%) reported sleep disturbances, the most common being DOES (29 of 40, 73%). Only three patients (8%) reported DIMS. Eight patients (20%) had other complaints, mainly disturbances of the sleep-wake rhythm (figure).

In both groups, age and duration of coma were not significantly associated with sleep

complaints. A relatively higher incidence of sleep complaints was noted among females in both groups. In hospitalised patients, the overall incidence of cognitive and behavioural-affective disturbances was similar in those with sleep complaints and in those without. Dependency in activities of daily living and aphasia were found only in patients reporting sleep problems (table). Occupational outcome could not be determined in this group as they were still hospitalised. Discharged patients reporting sleep complaints had a significantly poorer occupational outcome ($p < 0.01$, Fisher test) and more behavioural disturbances ($p < 0.05$, Fisher test) than those without sleep complaints. The most common behavioural-affective disturbances were anxiety and depression; a high incidence of apathy and aggression was also noted, mainly in patients with frontal lobe lesions. Communicative and cognitive disorders tended to be more common in patients with sleep complaints (table).

Discussion

Our findings indicate that sleep complaints are common in patients with recent traumatic brain injury as well as in those who sustained brain injury about two to three years previously. The incidence of such complaints in both groups was far higher than that in the healthy working population.⁷ The nature of the sleep complaints differed in the two groups. Patients with injury of recent onset had more DIMS while patients with older injuries suffered mostly from DOES. Three factors may account for these differences. Firstly, time since injury: pathophysiological changes in the CNS occurring during the recovery process may alter the nature of the sleep problem. Problems that persist for a long time may also provoke chronic insomnia, which may lead to excessive somnolence, as has been suggested

Table Residual functional disabilities and sleep complaints (SC) in traumatic brain injured patients. Figures are numbers (percentages)

	Motor	Language	Cognition	Behaviour	Dependent in activities of daily living	Unable to work
<i>Hospitalised patients</i>						
Without SC (6)	2 (33)	—	6 (100)	2 (33)	—	
With SC (16)	4 (25)	3 (19)	16 (100)	6 (37)	2 (12)	
Total (22)	6 (27)	3 (14)	22 (100)	8 (36)	2 (9)	
<i>Discharged patients</i>						
Without SC (37)	3 (8)	6 (16)	29 (78)	16 (43)*		14 (38)†
With SC (40)	4 (10)	15 (37)	36 (90)	26 (65)*		27 (68)†
Total (77)	7 (9)	21 (27)	65 (84)	42 (55)		41 (53)

*Fisher test $p < 0.05$.

†Fisher test $p < 0.01$.

with regard to individuals whose sleep disturbances were due to periodic leg movements during sleep.⁸ Secondly, severity of CNS damage: the duration of coma is considered a good measure for assessing the severity of CNS damage.⁵ Discharged patients had spent a relatively longer time in coma than hospitalised patients (median duration 6.5 days and 12 days, respectively). This factor may have contributed to the different manifestations of the sleep problems. Both the amount of time elapsed since injury and the duration of coma were suggested by George *et al*¹ as important factors influencing the sleep-wake patterns of these patients. Thirdly, environmental influence: patients with recent trauma were evaluated while in hospital and subject to unusual noises, tense atmosphere, and loss of privacy, whereas discharged patients were evaluated while already living at home where these factors were generally absent.

Discharged patients with sleep complaints had significantly more behavioural-affective disorders and achieved a lower occupational status than those without sleep complaints. Again various factors may explain this. Firstly, sleep complaints are most probably an expression of physiological sleep alterations related to CNS lesions. Thus patients with a severe lesion may be at a higher risk of both long term sleep problems and high mental function disturbances than those with fairly mild CNS impairment. Secondly, sleep disturbances by themselves may affect the mental capacity of traumatic brain injured patients. Clinical sleep studies have shown extensively that an alteration in the organisation of the sleep-wake pattern due to various pathological causes may have a detrimental effect on mental performance.⁹⁻¹⁰ The importance of high mental functions to the rehabilitation outcome is well known.¹¹⁻¹² Thirdly, anxiety and depression, found in most brain injured patients with behavioural-affective disturbances, are by themselves considered a major cause of insom-

nia and excessive somnolence.¹³⁻¹⁴

In summary, our findings show that sleep complaints are common in traumatic brain injured patients. DIMS occur more often in patients with recent injury and DOES in those with injuries sustained two to three years previously. Patients with sleep complaints present more neurobehavioural disturbances and a poorer occupational outcome than those free of such problems. Early diagnosis and treatment of sleep disturbances may largely help in the integrative rehabilitation process and positively influence occupational outcome.

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