



Letters to the Editor

Cognitive disturbances and nocturnal hypoxemia in tetraplegic patients

We were delighted to read Sajkov *et al*¹ which expresses in an elegant, complete, and well presented study exactly the same concerns we had several years ago, based on clinical observations in our patient population.² In our experience sleep hypoxemia is frequently missed by clinicians unless sought for specifically, and it is not too hard to look for a connection between cognitive function deficits and hypoxia when considering the well known effects of hypoxia on end organs, particularly the brain and heart. Between December 1990 and December 1994 we have evaluated 17 tetraplegic patients whom we thought to be at risk from nocturnal hypoxemia.

None of the patients had clinical symptoms that would have prompted a sleep study based on the usual criteria for a sleep study such as snoring or overt, unexplained cor pulmonale, a family history of sleep apnea, morbid obesity, etc. Their age ranged from 23–71 years, about half of them were younger than 50 years of age. The duration of injury ranged from 2 months to 39 years, less than 10 years in half of the patients. Five of the seven older and five of the 10 younger patients had some cognitive impairment such as poor attention, blunted affect and mild to severe short-memory defects. Nocturnal oxygen saturation profiles were abnormal in 13/17 tracings with episodic or sustained oscillatory falls of oxygen saturation and thus were considered abnormal. Based on the results of oximetry and subsequent in depth evaluation 6 of the 14 patients with abnormal tracings were treated with nasal CPAP, supplemental oxygen or a combination of both at home with appropriate clinical follow-up. Of special concern to us is the fact that 9 of 14 patients with abnormal tracings are now dead. The interval between the diagnosis of nocturnal hypoxemia and death ranges from 3 to 62 months with an average of 30 months. Two of the younger patients died unexpectedly at night at home; one had used nasal CPAP successfully for over 3 years, the other declined a tracheostomy, could not tolerate nasal CPAP, was then treated with a uvulopalatoplasty which failed. Two other patients did clinically well with CPAP and oxygen but eventually died of progressive heart failure. Only one patient on long-term CPAP and oxygen is alive after more than 5 years, but had at least one episode of respiratory insufficiency requiring intubation and mechanical ventilation during a lengthy hospitalization. Only one death was entirely unrelated. Two patients are lost to follow-up, and the remaining five patients, three of which had normal tracings are alive and well at home.

It is our opinion that nocturnal hypoxemia is a serious, potentially lethal problem whose clinical importance is still largely ignored and underestimated. It appears that in a subgroup of tetraplegic patients the restrictive ventilatory defect imposed by the spinal cord injury and the ventilatory defect of sleep-related upper airway obstruction combine and pose a double jeopardy. It is a challenge how to recognize and best manage these spinal cord injury patients to prevent

morbidity and premature death due to episodic hypoxia and respiratory insufficiency throughout their life time after injury. Therapeutic measures aimed solely to relieve upper airway obstruction during sleep seem to be insufficient, at least in our experience, in this high risk sub group of spinal cord injury patients. The exact size of this high risk subgroup is as yet largely unknown, although your paper, unlike our own contribution, is a very useful step in the direction to estimate prevalence and incidence. Nasal CPAP therapy which can so well control the clinical symptoms in classic obstructive apnea is difficult to implement and sustain in tetraplegic patients for reasons that are rather complex when analyzed on a case by case basis. It may ultimately fail in spinal cord injury patients in delaying major morbidity and preventing premature death unless supplemented by other means to support the respiratory system.

Barbara Gothe, MD
Anita Maximin, PsyD.

References

- 1 Sajkov D *et al*. Sleep apnea related hypoxia is associated with cognitive disturbances in patients with tetraplegia. *Spinal Cord* 1998; **36**: 231–239.
- 2 Gothe B, Maximin A. Clinical relevance of falls in nocturnal oxygen saturation in patients with SCI. *J Spinal Cord Medicine* 1995; **18**: 276 (abstract).

In Reply to Dr Barbara Gothe

We read with interest the letter from Drs Gothe and Maximin in which they present their experience with tetraplegic patients suffering from nocturnal hypoxaemia. We were particularly interested to find out that the 5-year mortality rate in their patients with nocturnal hypoxaemia was as high as that reported (i.e. 64%). An association between sleep disordered breathing and increased cardiovascular mortality has been described in the able bodied population.^{1–3} Drs Gothe and Maximin's data, however, suggest a mortality figure in quadriplegic population well above that of the able bodied population.⁴ Possible explanations for such a high mortality figure may be either the small sample size, the age of their study population, comorbidities or the lead bias. Drs Gothe and Maximin's study population was relatively old (50% of patients >50 years of age) and the time since injury relatively long (50% of patients >10 years post injury). This contrasts with our study population, for example, in which 8% were >50 years of age and only 30% were studied more than 10 years post injury.⁵ These differences may have some bearing on the findings of Gothe and Maximin. We strongly agree that the problem of mortality in quadriplegic patients with sleep



disordered breathing is important and warrants further study using an appropriate sample size and controls.

Dr D Sajkov, MD, PhD
Dr RD McEvoy, MBBS, MD, FRACP

References

- 1 He J *et al.* Mortality and apnea index in obstructive sleep apnea. *Chest* 1988; **94**: 9–14.
- 2 Partinen M, Guilleminault C. Daytime sleepiness and vascular morbidity at seven-year follow-up in obstructive sleep apnea patients. *Chest* 1990; **97**: 27–32.
- 3 Lavie P *et al.* Mortality in sleep apnea patients: a multivariate analysis of risk factors. *Sleep* 1995; **18**: 149–157.
- 4 Gothe B, Maximin A. Clinical relevance of falls in nocturnal oxygen saturation in patients with spinal cord injury. *J Spinal Cord Medicine* 1995; **18**: 276 (abstract).
- 5 Sajkov D *et al.* Sleep apnea related hypoxia is associated with cognitive disturbances in patients with tetraplegia.. *Spinal Cord* 1998; **36**: 231–239.