

# Obstructive sleep apnoea and driving

The number of road signs on our motorways encouraging drivers to stop driving when they feel tired, highlights that up to a fifth of road traffic accidents may be caused by sleepiness. Drivers may be sleepy for many reasons, such as insufficient sleep following a late night or a night shift, but underlying medical conditions leading to daytime somnolence, such as obstructive sleep apnoea syndrome, are often under-recognized.

## What is obstructive sleep apnoea syndrome?

Obstructive sleep apnoea is characterized by repeated episodes of snoring, upper airway obstruction, apnoea, desaturation and subsequent arousal to terminate the apnoea. This may occur hundreds of times a night, and can lead to marked sleep disturbance. Not all patients with obstructive sleep apnoea have daytime sleepiness, and obstructive sleep apnoea syndrome (or obstructive sleep apnoea and hypopnoea syndrome) is the association of sleep apnoea on sleep studies with symptoms of daytime somnolence. It is this group of patients for whom there are rules regarding driving (see below).

The prevalence of obstructive sleep apnoea syndrome in men in the UK is estimated to be approximately 1% (Stradling and Crosby, 1991), and obstructive sleep apnoea syndrome is around half as prevalent in women. This figure is likely to have increased since these estimates because of the obesity epidemic. A neck circumference of greater than 43 cm has a strong association with obstructive sleep apnoea. Obstructive sleep apnoea syndrome is often under-diagnosed, as patients and their doctors may attribute their symptoms of sleepiness and tiredness to their lifestyle or to other medical conditions.

## Management of obstructive sleep apnoea syndrome

Those people with a history of unrefreshing sleep, snoring, choking, witnessed apnoeas and daytime sleepiness should be investigated with sleep studies, usually via a sleep clinic. The Epworth Sleepiness Score is commonly used to quantify day-

time somnolence in sleepy individuals. A sleep history, taking note of sleep and wake times, nocturnal disturbances, caffeine, alcohol and nicotine intake, may help identify other causes of sleepiness.

It is recommended that patients with moderate to severe obstructive sleep apnoea syndrome (apnoea-hypopnoea index of >15/hour or an oxygen desaturation index of >10/hour, with Epworth Sleepiness Score of  $\geq 10$ ) should be started on continuous positive airway pressure (National Institute for Health and Clinical Excellence, 2008). Randomized controlled trials have shown that continuous positive airway pressure significantly improves daytime somnolence both subjectively and objectively. Continuous positive airway pressure also has beneficial effects on hypertension, cardiac function and arterial stiffness in obstructive sleep apnoea syndrome.

## Obstructive sleep apnoea syndrome and road traffic accidents

Most of us take driving for granted, ignoring the fact that it is a task involving a complex skill set: cognitive reactions, decision-making abilities and motor functions. These are obviously influenced by our ability to concentrate, which can be impaired when we are sleepy.

It has been difficult to establish the exact effect of untreated obstructive sleep apnoea syndrome on actual driving and road traffic accidents. Patients may not remember whether a crash was the result of sleepiness or not. They may also be reluctant to admit to any sleepiness at the wheel because of concerns that they might lose their license. Retrospective studies have their limitations with regards to recall bias with patients and controls, but have served to highlight important links between obstructive sleep apnoea syndrome and driving. The correlation between untreated obstructive sleep apnoea syndrome and road traffic accidents was first noted in the late 1980s. Subsequent studies have identified a strong link between the two, with a two to three times greater risk of a crash in patients with untreated obstructive sleep apnoea syndrome (Ellen et al, 2006).

A number of studies have used driving simulators as a reproducible, cheaper and safer way to look into the effect of obstructive sleep apnoea syndrome on different aspects of driving, accepting that this is not truly representative of the complexities of driving in real life. A controlled study compared the simulated steering of patients with untreated obstructive sleep apnoea to people with 1 night's sleep deprivation and to people following alcohol ingestion (Hack et al, 2001). It found that alcohol intoxication impaired steering throughout the 90-minute test, sleep deprivation caused progressively worsening steering error, although initially the test was fine, and the steering errors of people with untreated obstructive sleep apnoea lay between those of people with sleep deprivation and those with alcohol intoxication, but a wide spread of the data suggested that some people maintained their simulated steering skills throughout the test. This suggested sleep fragmentation and sleepiness is the cause of driving problems in obstructive sleep apnoea.

Other studies have demonstrated that patients with obstructive sleep apnoea syndrome performed worse than controls on lane position variability, speed variability, steering rate variability and crash frequency (Risser et al, 2000). Continuous positive airway pressure significantly improves steering performance and reaction time to stimuli in those with obstructive sleep apnoea compared to placebo continuous positive airway pressure (Hack et al, 2000).

Perhaps some of the most useful 'real life' driving data comes from Canada, where researchers were able to access objective crash data from provincial insurance records for 783 patients with suspected obstructive sleep apnoea syndrome and compare it to the records of age- and sex-matched controls (Mulgrew et al, 2008). Over a 3-year period, patients with mild, moderate and severe obstructive sleep apnoea syndrome had an increased rate of road traffic accidents compared to controls, and there were disproportionately increased rates of these road traffic accidents being associated with personal injury compared to the control group (*Figure 1*).

A study using T1-weighted three-dimensional structural magnetic resonance imaging showed patients with obstructive sleep apnoea syndrome had focal loss of grey matter in the right middle temporal gyrus and the cerebellum compared to controls (Morrell et al, 2010). It was hypothesized that these changes could contribute to motor dysfunction and working memory deficits – both important in a complex activity such as driving.

### Obstructive sleep apnoea syndrome and the Driver and Vehicle Licensing Agency

Individuals with possible undiagnosed obstructive sleep apnoea syndrome should be advised to avoid driving if they have excessive daytime sleepiness. It is ultimately the driver's legal responsibility to uphold this. If obstructive sleep apnoea syndrome is confirmed on a sleep study, the individual should inform the Driver and Vehicle Licensing Agency (DVLA) and then completes a form asking whether the sleep condition is under control, how long this has been the case, what the treatment is and whether the patient is free from excessive drowsiness. In most cases, the DVLA will be satisfied if the patient's symptoms are controlled, usually with continuous positive airway pressure, and will allow driving to resume.

For group 2 (public service vehicle and heavy goods vehicle) drivers, the criteria are

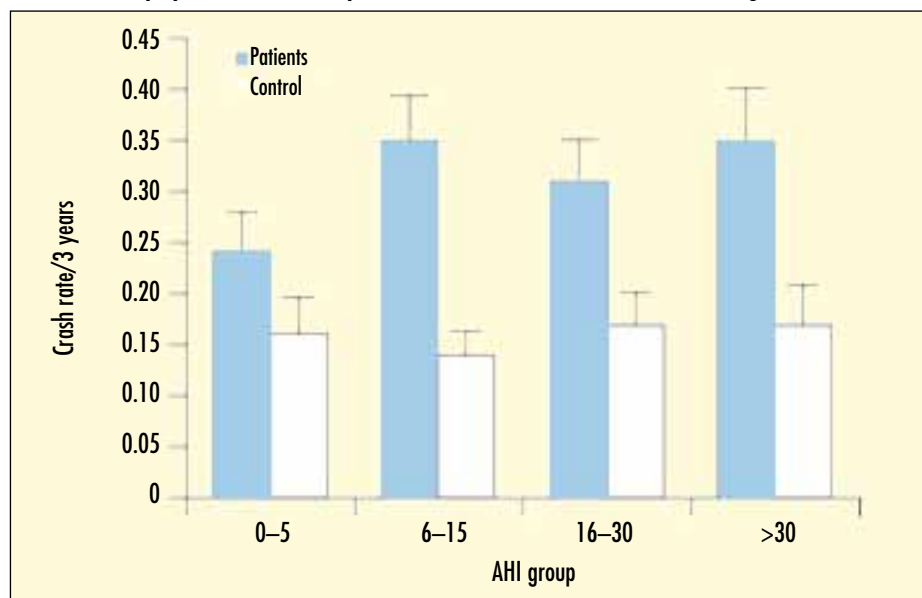
naturally more strict. Besides good symptomatic control, they will also need to demonstrate compliance with continuous positive airway pressure treatment (as confirmed by the sleep clinic) and undergo annual licensing reviews. Again, the DVLA will be satisfied if the patient's symptoms are controlled, usually with continuous positive airway pressure, and will allow driving to resume.

Some patients are reticent to present with obstructive sleep apnoea syndrome or to admit to falling asleep at the wheel because of concerns about losing their driving license. Campaigns have been effective at increasing public awareness about obstructive sleep apnoea syndrome in recent years. During initial consultations, the authors emphasize that the diagnosis of obstructive sleep apnoea syndrome does not preclude driving, which is allowed once the condition is adequately treated.

### Conclusions

It is important to recognize that the syndrome of obstructive sleep apnoea with daytime sleepiness is common and becoming commoner as population obesity levels increase. It is easily diagnosed with a sleep study and an assessment of daytime sleepiness and effectively treated with continuous positive airway pressure. This recognition, diagnosis and treatment ultimately makes the roads safer for patients and us all. **BJHM**

**Figure 1. Mean crash rates over 3 years for patients according to severity of obstructive sleep apnoea/hypopnoea and their respective controls. A higher apnoea-hypopnoea index (AHI) indicates worse obstructive sleep apnoea. Error bars represent standard error of the mean. From Mulgrew et al (2008).**



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### KEY POINTS

- Obstructive sleep apnoea syndrome is a common reason for people to have excessive daytime sleepiness and to potentially be sleepier at the wheel.
- There is a higher rate of steering error, car crashes and personal injury in people with untreated obstructive sleep apnoea compared to controls.
- Continuous positive airway pressure treatment is very effective at improving daytime sleepiness and driving performance in obstructive sleep apnoea syndrome.
- Patients should be made aware they can drive as normal once they have received effective continuous positive airway pressure treatment for obstructive sleep apnoea, so that they do not feel reluctant about presenting with their sleepiness.