THE SLEEP APNOEA/HYPOPNOEA SYNDROME AND SNORING

N J Douglas

Failure to diagnose the sleep apnoea/hypopnoea syndrome leads to impairment of the quality of life and to avoidable deaths

Awareness of the sleep apnoea/hypopnoea syndrome, which affects about 1% of the population, is increasing among both doctors and the public. It is readily treatable, and doctors should keep it in mind as failure to recognise it leads to serious impairment of the quality of life and to avoidable deaths. About 20% of the middle aged population are reported to snore each night, and this not only appreciably inconveniences their partners but also affects their own health and performance during the day.

Symptoms

Percentage of patients with various clinical features of the sleep apnoea/hypopnoea syndrome

• Loud snoring	95%
• Daytime sleepiness	90%
• Unrefreshing sleep	40%
• Restless sleep	40%
• Morning headache	30%
• Nocturnal choking	30%
• Reduced libido	20%
• Morning drunkenness	5%
• Ankle swelling	5%
• Enuresis	2%

Daytime sleepiness is the main symptom of the sleep apnoea/hypopnoea syndrome, and it may be serious enough to ruin patients' lives by making it impossible for them to work, drive, or even complete a conversation. In some cases the sleepiness results in road, occupational, or domestic accidents that may be fatal to them or to others.

Other common symptoms include unrefreshing and restless nocturnal sleep, nocturnal choking, feeling drunk in the morning and reduced libido. Nocturnal choking usually consists of patients waking up aware that they cannot inhale, which is an extremely alarming symptom that passes within seconds. Feeling drunk in the morning is uncommon, and consists of bizarre behaviour after waking up.

Spouses or partners should be interviewed whenever possible; they usually give a history of loud, intermittent snoring and most report frequent apnoeas, which is a useful though not diagnostic feature.

Most patients (85%) are men, and about half weigh at least 30% more than their ideal body weight. Obesity is thought to cause the syndrome by the fat in the neck squashing the upper airway. It is important to remember, however, that the syndrome can also occur in thin people. It occurs at all ages, but is most common in late middle age. In children it may cause failure to achieve at school and is often associated with enlarged tonsils.

Aetiology

Site of airway narrowing in patients with the sleep apnoea/hypopnoea syndrome.

Apnoeas occur if the upper airway at the back of the throat is sucked closed when the patient breathes in during sleep. When the patient is awake the tendency for the airway to be sucked closed is overcome by the action of the opening muscles of the upper airway including the genioglossus and the palatal muscles, but sleep induces hypotonia and the upper airway narrows. In some the narrowing is not critical, but does result in turbulent flow in the narrowed segment which produces the noise of snoring. In others the airway may occlude (which results in apnoeas) or almost occlude (which results in hypopnoeas). These will continue until the subject is woken up, probably by the struggle to breathe against the blocked throat. The awakenings are so brief that the subjects are rarely aware of them, but they may be woken up to a thousand times a night and the disruption of sleep accounts for the symptoms of daytime sleepiness and impaired daytime performance.

Right heart failure, secondary polycythaemia, and carbon dioxide retention occur rarely, and usually in those with underlying lung disease, as a result of the recurrent nocturnal hypoxaemia and hypoventilation. There is no evidence that sleep apnoea is more common among patients with lung disease, but when the conditions coexist the patients have two causes of nocturnal hypoxaemia and so the episodes are likely to be more common.

The sleep apnoea/hypopnoea syndrome is associated with an increase in mortality from cerebrovascular and cardiovascular causes. There is also accumulating evidence that people who snore habitually may be at increased risk of cardiovascular and cerebrovascular problems even if they have no other features of the syndrome. There is also evidence that some people who snore despite breathing normally during sleep have disturbed sleep patterns that result in daytime sleepiness and impaired performance.

Diagnosis

Oxygen saturation measured overnight by an ear oximeter in a patient with the sleep apnoea/hypopnoea syndrome.

Patient wired up for a sleep study.

Firm diagnosis of the sleep apnoea/hypopnoea syndrome cannot be made without overnight monitoring. In some countries, including the United Kingdom, doctors have tended to use the monitoring of overnight oxygen saturation as the initial screening test. Recent evidence indicates, however, that oximetry alone will detect only about two thirds of patients with the syndrome.

It is important that doctors who carry out overnight oximetry studies are adequately trained in the interpretation of the tracings, and realise that many patients who have severe sleep apnoea/hypopnoea syndrome have no disturbance whatsoever in their overnight oximetry tracing. The deterioration in daytime function in these patients correlates with the frequency of arousals rather than the extent of hypoxaemia. They should be aware of the potential pitfalls of false positive results whether in hypoxaemic patients or caused by artefacts on the machine.

Another drawback of using oximetry alone is that it does not provide information about other causes of daytime sleepiness such as narcolepsy and periodic limb movement disorder. About half of all patients who undergo overnight oximetry alone for the diagnosis of sleep apnoea/hypopnoea syndrome will have negative or equivocal results, but their symptoms will be severe enough for a more detailed overnight study to be required. It may therefore be more convenient for more detailed investigations to be done in the first place.

The current "gold standard" for the diagnosis of the sleep apnoea/hypopnoea syndrome is polysomnography, in which the patterns of sleep and arousal are recorded by electroencephalography, electromyography, and electro-oculography; breathing patterns by semiquantitative recording of thoracoabdominal movements, oronasal flow and oximetry; together with electrocardiography and anterior tibial electromyography. The sleep apnoea/hypopnoea syndrome can be confidently diagnosed if there are more than 15 apnoeas or hypopnoeas in any one hour of sleep. These studies also permit assessment of the extent of disruption of sleep, irregularity of breathing, and extent of desaturation.

Differential diagnosis of excessive daytime sleepiness

- Sleep apnoea/hypopnoea syndrome
- Narcolepsy
- Nocturnal myoclonus
- Idiopathic hypersomnolence
- Psychological
- Drugs
- Sleep restriction

Polysomnography also enables the confident exclusion of the sleep apnoea/hypopnoea syndrome, the diagnosis of nocturnal myoclonus (which also causes daytime sleepiness) and, by the observation of rapid eye movement (REM) sleep soon after the onset of sleep, raises the possibility of narcolepsy. Narcolepsy may be difficult to diagnose, particularly when the sleepiness is not accompanied by any of the other features of narcolepsy such as cataplexy, sleep paralysis, or hypnagogic hallucinations. It is about one twentieth as common as the sleep apnoea/hypopnoea syndrome.

Enlarged tonsils and oedematous uvula in a patient with the sleep apnoea/hypopnoea syndrome.

Diagram of pressure within the upper airway, during spontaneous inspiration, showing the tendency for the upper airway to narrow (left), and the effect of treatment with CPAP, which keeps the airway widely patent (right).

Patient being treated with CPAP.

Conservative

Obesity, enlarged tonsils, hypothyroidism, and acromegaly are all predisposing factors to both the sleep apnoea/hypopnoea syndrome and simple snoring and should be treated if possible. Patients should be encouraged to avoid alcohol and sedatives in the evening as these relax the dilating muscles of the upper airway. If those with simple snoring snore only when supine, the placing of a cork or a golf ball in a pocket stitched to the back of the pyjama jacket is a traditional and often effective remedy. Another way of dealing with simple snoring is to use a nasal dilating clip, which can be bought from pharmacies. This can become displaced, but in some cases it is useful.

Surgery

It may help to have the opinion of an otorhinolaryngologist in patients in whom the sleep apnoea/hypopnoea syndrome has been definitely diagnosed, to try and find out if there is any defect that is narrowing the nose or pharynx. Serious defects should be corrected, but operation on minor lesions such as septal deviation or nasal polyps is often unhelpful. Severe retrognathia should be corrected by combined advancement of the mandible and maxilla.

Operation in the absence of the need to remove specific defects has the attraction of being a single event, which will obviate the need for nightly treatment thereafter. At present, however, its role is both unclear and contentious. The operation most often done is uvulopalatopharyngoplasty, which is essentially a pharyngeal "rebore." Rates of improvement vary from 15% to 65%, probably depending on surgical technique and on selection of patients whose apnoea is the result of pharyngeal obstruction. About half of all patients with the sleep apnoea/hypopnoea syndrome obstruct at this level, the others occluding their airways behind the tongue. Unfortunately there is as yet no easy way of finding out the level of obstruction during sleep. If one becomes available, the ability to select patients better may make uvulopalatopharyngoplasty a more successful operation.

A serious problem with the operation is that patients in whom it fails may then be unable to benefit from continuous positive airway pressure (CPAP), because the pressure applied through the nose may leak out through the mouth as the seal between the soft palate and tongue has been destroyed and the CPAP will not blow open the upper airway at the site of obstruction. In addition, uvulopalatopharyngoplasty carries a certain operative mortality, and CPAP has been shown to decrease overall mortality.

Operations such as partial glossectomy, hyoidoplasty, partial mandibular advancement, and palatal laser treatment are still experimental.

Drugs

Drugs play no part in the treatment of the syndrome, because the side effects generally cause more trouble than relief of symptoms, and there is no evidence of reduction in either morbidity or mortality.

Continuous positive airway pressure

Most patients who fail to respond to the above measures should be treated by CPAP given through a nasal mask, which is tolerated by most patients. The pressure needed must be measured by a sleep study as too low a pressure may not only worsen the hypoxaemia but will result in failure to benefit, which may turn the patient against this potentially useful treatment. CPAP reverses symptoms rapidly and the change is dramatic, with many patients only then realising the extent of their previous disability. Side effects are few, the most common being nasal stuffiness.

Overnight oxygen saturation traces in a patient with the sleep apnoea/hypopnoea syndrome. Left: Baseline tracing when the patient was receiving no treatment. Right: Tracing taken the next night during treatment with CPAP, showing abolition of episodes of desaturation by normalisation of the breathing pattern.

This often results from an air leak that develops through the mouth when the patient's muscle tone drops during sleep and can often be helped by the addition of a chin strap. If this fails intranasal steroids or atropinic drugs are often helpful. It is occasionally necessary to add a humidifier to the system.

The main drawback to CPAP is that patients need to use the machine every night of their lives, although this is a small price to pay for the benefit obtained. In practice most patients use the machine for about four hours a night, some use it for part of the night, and some occasionally omit it altogether.

Fewer than 1% of patients with sleep apnoea have apnoeas that do not respond to CPAP and result from cessation of respiratory effort—true central sleep apnoeas. Most of these have coexisting neurological diseases and are best treated either by intermittent positive pressure ventilation through a nasal mask or by diaphragmatic pacing.

Conclusion

Always ask:

- Do you fall asleep each day when not in bed?
- Do you snore loudly and intermittently?

The main problem in the medical management of the sleep apnoea/hypopnoea syndrome is underawareness of the condition. Clinicians must bear the possibility of the diagnosis in mind and ask the appropriate questions routinely.

N J Douglas is a reader, respiratory medicine unit (RIE), University of Edinburgh and director, Scottish National Sleep Laboratory.

The ABC of Sleep Disorders has been edited by Colin M Shapiro, professor of psychiatry, University of Toronto, Canada.

Lesson of the Week

Intraocular foreign body missed by radiography

Andrena M McElvanney, Alistair R Fielder

Foreign bodies in the eye, including metallic splinters, do not always show on radiographs

Foreign bodies entering the eye may give rise to a wide range of complications including hyphaema, cataract, vitreous haemorrhage, and retinal tears and detachment.¹⁻³ Inflammation and infection may also affect the whole ocular cavity, leading to endophthalmitis.⁴

Certain metallic foreign bodies within the eye may produce retinotoxic ions. Ferrous ions destroy retinal photoreceptors and pigment epithelial cells, and copper induces siderosis and chalcosis. Thus, intraocular foreign bodies should be removed promptly to prevent these reactions and minimise intraocular inflammation and infection, which commonly causes a destructive fibrovascular response that may ultimately result in blindness.⁴⁻⁶

Case report

A 42 year old man presented to our accident and emergency department complaining of a gritty sensation in his left eye. Two days earlier he had been fitting a metal tool on to a lathe when he felt a sudden sharp sensation in his left eye. He had not been wearing safety goggles. His left eye became irritable and was irrigated with normal saline by the occupational health nurse.

The following day, as his eye was still troublesome, he attended a general accident and emergency depart-

ment, where the eye was examined under a hand held light and then stained with fluorescein. No abnormality was seen and orbital radiographs showed normal results. Chloramphenicol ointment was applied to the eye overnight, and the patient was advised to seek an ophthalmic opinion the following morning, although he was not formally referred.

On presentation to the ophthalmic department visual acuity (without correction) was 6/5 in the right eye and 6/6+2 in the left. Examination of the left eye under a slit lamp showed injected conjunctiva, a small self sealed perforation of the cornea, and a metallic foreign body on the surface of the iris (fig 1). Repeat orbital radiographs were taken, and, again, showed no radio-opaque foreign body. An intraocular foreign body was, however, detected on ultrasound scanning of the globe (fig 2) and was surgically removed with good result.

Discussion

In many accident and emergency departments it is standard practice to perform orbital radiography in patients with ocular trauma resulting from high velocity particles. The need for such radiological investigation, however, has been debated. The detection of a radio-opaque foreign body depends on its relative density

Birmingham and Midland Eye Hospital, Birmingham B3 2NS
Andrena M McElvanney,
senior house officer
Alistair R Fielder, professor
of ophthalmology

Correspondence to:
Miss McElvanney.

BMJ 1993;306:1060-1