Obstructive Sleep Apnoea Syndrome

**Synonyms:** obstructive sleep apnoea/hypopnoea syndrome (OSAHS)

(*NB: sometimes 'apnoea' is spelt 'apnea'*

The widely accepted definition of obstructive sleep apnoea syndrome (OSAS) is a clinical condition in which there is intermittent and repeated upper airway collapse during sleep. This results in irregular breathing at night and excessive sleepiness during the day.

- Complete apnoea is defined as a ten-second pause in breathing activity.
- Partial apnoea, also known as hypopnoea, is characterised by a ten-second period in which ventilation is reduced by at least 50%.
- Research is focusing on the concept of sleep fragmentation (the poor-quality sleep produced by repeated episodes of apnoea or hypopnoea) and objective measurements of upper airways obstruction.

**Epidemiology**

OSAS is a worldwide phenomenon. The prevalence of OSAS in Western countries is around 4% in middle-aged men and around 2% in middle-aged women [1]. The incidence is increasing as the incidence of obesity is increasing.

OSAS is highly prevalent in persons with type 2 diabetes and related metabolic conditions such as insulin resistance and glucose intolerance [2].

Risk factors include [3]:

- Obesity (strongest risk factor).
- Male gender.
- Middle age (55-59 in men, 60-64 in women).
- Smoking.
- Sedative drugs.
- Excess alcohol consumption.
- Family history
- Possibly genetic tendency related to jaw morphology.
- Obese children - they have a higher prevalence and severity of OSAS [4].

**Presentation**

**History**

A history of snoring and witnessed apnoeas with symptoms of sleep fragmentation, such as excessive daytime sleepiness, suggests OSAS [1].

Snoring is the simplest form of sleep-disordered breathing (SDB). The following may be suggestive of OSAS:

- Excessive daytime sleepiness.
- Impaired concentration.
- Snoring.
- Unrefreshing sleep.
- Choking episodes during sleep.
- Witnessed apnoeas.
- Restless sleep.
- Irritability/personality change.
- Nocturia.
- Decreased libido.

Symptoms such as personality change, episodes of apnoea, irritability and restlessness at night may be better elicited by taking a history from a partner.

Daytime sleepiness is sometimes assessed using the Epworth Sleepiness Scale [5]. Investigation is usually recommended when the score is greater than 10. However, at least 10% of the population have a score of 11 or more [1].

An urgent referral is recommended if the Epworth sleepiness score is >18 or the patient has had a road traffic incident or near miss event [1]. Those with signs of respiratory failure or heart failure should also be referred urgently [6].
NB: the presence of uncomplicated snoring or occasional apnoeas without a history of excessive sleepiness does not require investigation. Reassurance can be given that such apnoeas are self-terminating and do not require treatment.

Examination
There are no specific diagnostic findings on examination but the following may be noteworthy:

- Obesity.
- Fat deposition anterolateral to the upper airway may signify obstruction.
- Neck circumference is a strong predictor of OSAS (<37 cm is low-risk, >48 cm is high-risk).
- Certain craniofacial or pharyngeal abnormalities are associated with OSAS - eg, retrognathia, micrognathia, enlarged tonsils, macroglossia, thickening or lengthening of the soft palate or uvula.
- Assess for presence of nasal polyps, rhinitis or any deformity of the nose.

Differential diagnosis

- Fragmented sleep (quality of sleep).
- Sleep deprivation (quantity of sleep).
- Shift work.
- Depression.
- Narcolepsy.
- Hypothyroidism.
- Restless legs syndrome/periodic limb movement disorder.
- Drugs:
  - Sedatives.
  - Stimulants (caffeine, theophyllines, amphetamines).
  - Beta-blockers.
  - Selective serotonin reuptake inhibitors (SSRIs).
  - Idiopathic hypersomnolence.
  - Excess alcohol.

Neurological conditions:

- Dystrophica myotonica.
- Previous encephalitis.
- Previous head injury.
- Parkinsonism.

Diagnosis

OSAS is defined by five or more respiratory events (apnoeas, hypopnoeas or arousals) per hour, in association with symptoms of SDB.

Clinical assessment is not sufficient to make a diagnosis of OSAS. The diagnosis of OSAS is made through different levels of nocturnal monitoring of respiratory, sleep and cardiac parameters, aimed to detect the obstructive events and the following changes in blood oxygen saturation.

Postural OSAS is diagnosed when the obstructive events take place exclusively or mainly in the supine posture and it occurs approximately in 30% of the patients with OSAS. The supine position, mainly due to the effect of gravity on tongue and soft palate position, is usually associated with an increased number of apnoeas and hypopnoeas.

Polysomnography (PSG)

This has been the traditional gold standard investigation. Various physiological recordings are taken whilst the patient is asleep overnight. Techniques vary widely but international standards dictate that a PSG involves at least an electroencephalogram (EEG), two electro-oculograms (EOGs) to measure horizontal and vertical eye movements and an electromyogram (usually placed on the chin) to monitor muscle movement.

At the end of the investigation, the number of apnoea/hypopnoea episodes whilst asleep is quoted as the Apnoea/Hypopnoea Index (AHI). The AHI is used to measure the severity of OSAS and is calculated by the sum of apnoeas and hypopnoeas divided by the number of hours of sleep.

- Mild: AHI = 5-14 per hour.
- Moderate: AHI = 15-30 per hour.
- Severe: AHI >30 per hour.

Restricted availability of PSG and the cost mean that oximetry and limited respiratory monitoring are more widely used for a diagnosis to be made.

Other investigations

- Domiciliary diagnostic systems, such as respiratory multichannel recording, can measure snoring, nasal airflow, position, oximetry and pulse rate and can detect apnoeas and hypopnoeas.
• Thoracic and abdominal binders register reductions in chest movement (hypopnoeas) that fall short of an apnoea and can differentiate between obstructive and central events.
• A nasolaryngoscopy is usually performed for visualisation of the airway and may also help identify the level of obstruction.
• Blood pressure should be undertaken.
• TFTs may be appropriate in patients in whom hypothyroidism is suspected.
• Arterial blood gases may be required in patients presenting with symptoms of cor pulmonale, to rule out daytime hypoxia or hypercapnoea.

Associated diseases

- Hypertension.
- Cardiovascular disease - coronary heart disease, stroke, congestive heart failure. OSAS is associated with a significant cardiovascular morbidity and mortality[10].
- Obesity.
- Metabolic syndrome.
- Diabetes.
- Asthma - there is some evidence that patients who snore and have severe asthma have an increased risk of developing OSAS[11].

Management

- The goal of the treatment is to restore optimal breathing during the night and also to relieve associated symptoms.
- Management needs to be based on a multidisciplinary and holistic approach which includes lifestyle modifications.
- Benefits may be seen in reduction in daytime sleepiness, simulated driving performance, quality of life, blood pressure and mood. Apart from continuous positive airway pressure (CPAP), there is no diminution of vascular risk in patients without daytime sleepiness, or in asymptomatic patients. It is important to communicate to patients exactly what can be achieved, as well as what the treatments involve.
- Successful long-term management of OSAS requires careful patient education, enlistment of the family's support and the adoption of self-management and patient goal-setting principles[12].

There are four main management options:

Behavioural interventions

Lifestyle changes should be discussed:

- Weight loss improves symptoms and morbidity in all patients with obesity and bariatric surgery is an option in severe obesity[10].
- Smoking cessation should be advocated from a general health perspective; however, again there is no guarantee that this will alleviate OSAS symptoms.
- Alcohol should be avoided in the evening, as should sedative and hypnotic medication, as these all decrease airway dilator function.

CPAP

- CPAP is still recognised as the gold standard treatment. Nasal CPAP (nCPAP) is highly effective in controlling symptoms, improving quality of life and reducing the clinical sequelae of sleep apnoea[10].
- CPAP acts as a pneumatic splint, maintaining upper airway patency. A flow generator delivers pressure through air tubing to a nasal or facial mask worn overnight. Most patients require lifelong therapy.
- CPAP needs to be worn for a minimum of four hours each night. However, CPAP can lead to claustrophobia, rhinitis, nasal irritation and also disturbance to partners, so that patient compliance can become a problem[1].
- The efficacy of CPAP strictly depends on its constant use and that a recurrence of symptoms usually occurs after a few days from treatment interruption[10].
- Bi-level PAP provides two different levels of pressure (higher during inhalation and lower during expiration) and is an alternative in patients intolerant to CPAP and also in patients with associated hypoventilation or chronic obstructive pulmonary disease[13].

Pharmacological treatments

- The role of pharmacological agents is limited. Modafinil may afford some benefit in patients with daytime sleepiness who are compliant with CPAP treatment but longer-term studies are needed.
- The European Respiratory Society has stated that drugs, nasal dilators and apnoea-triggered muscle stimulation cannot be recommended as effective treatments of OSAS at the moment[14].
- Medication such as leukotriene antagonists and topical nasal steroids can be beneficial for children with mild forms of OSAS and also in children with associated allergic diseases[15].
- A Cochrane review has concluded that there is insufficient evidence to recommend the use of drug therapy in the treatment of OSAS[16].

Surgery

- Various techniques have been tried; however, assessment is difficult due to inconsistency of trial methodology. The evidence base is at best equivocal.
- Surgical procedures are usually considered for patients for whom CPAP or oral appliances have failed, or if such treatments are contra-indicated by claustrophobia or dental disease[1].
• The procedures evaluated include:
  - Uvulopalatopharyngoplasty (UPPP) - patients may be unable to use CPAP subsequently.
  - Laser-assisted uvulopalatopharyngoplasty (LAUP).
  - Radiofrequency ablation of the tongue base.
  - Suspension of the hyoid bone.
  - Maxillofacial surgery, which can be considered in exceptional circumstances to achieve advancement of the mandible.
  - Tonsillectomy - appropriate for tonsillar enlargement.
  - Tracheostomy - may be necessary in very severe OSAS where other treatments fail.
  - New, minimally invasive surgical techniques - currently being developed to achieve better patient outcomes and reduce surgical morbidity[12].

• For uncomplicated cases in children, surgical intervention with removal of the tonsils and adenoids can lead to significant improvements[19].

Other treatments
• Positional therapy can be beneficial for those with postural OSAS. This should prevent them from sleeping in the supine posture. Many positional therapy strategies are available. These include the simple 'tennis ball technique', consisting of a tennis ball strapped to the back to discourage supine position, supine alarm devices and a number of positional pillows[8].
• Oral appliances have gained increasing recognition as a useful alternative to CPAP for the treatment of patients with mild-to-moderate OSAS and for those patients with severe disease intolerant to CPAP[17]. The most commonly used oral appliances are mandibular advanced splints. These devices attach to both the upper and lower dental arches in order to advance and retain the mandible in a forward position.
• Treatment with these splints is safe. Transient side-effects are common and can include excessive salivation, dry mouth and gingival irritation. Side-effects that are more persistent include arthralgia, teeth pain and occlusal changes[18].

Complications
• Excessive daytime sleepiness may cause accidents in the home, at work and whilst driving.
• OSAS is important from a public health perspective because of the increased risk of cardiovascular morbidity and road traffic incidents[1].
• Irritability, depression and other psychological consequences may ensue.
• Cardiovascular complications include hypertension, coronary artery disease, congestive cardiac failure.
• OSAS has also been identified as an independent risk factor for stroke[19, 20].
• There is an increased risk of hypertension in patients with OSAS[21]. There is also an increased risk of heart failure in patients with OSAS[22].
• Patients with OSAS have an increased risk of type 2 diabetes mellitus[23].

Obstructive sleep apnoea and driving[24]
• All patients with OSAS causing excessive daytime or awake time sleepiness need to cease driving until satisfactory control of symptoms has been attained.
• Those with Group 2 entitlement should also cease driving until satisfactory control of symptoms has been attained, with ongoing compliance with treatment, confirmed by a consultant or specialist opinion.
• However, patients do not need to stop driving or inform the DVLA if they are being investigated for, or have a diagnosis of, sleep apnoea but do not experience symptoms of daytime sleepiness that are of a severity likely to impair driving.
• Patients should inform the DVLA (but not cease driving) if they are successfully using CPAP or mandibular positioning therapy. However, as long as the patient is compliant with treatment and their symptoms are controlled such that they no longer impair driving, their licence should not be affected[25].

Prognosis
• Untreated OSAS can lead to significant neurocognitive and also cardiovascular morbidity. The cognitive impairment can lead to reduced concentration, accidents and also memory problems.
• For patients who respond to CPAP, the short-term prognosis is excellent. There is a positive benefit in terms of reduction in daytime sleepiness and in snoring and an improvement in cognitive function and general health status after 4-8 weeks of treatment with CPAP[26].
• Treatment can significantly decrease cardiovascular complications, especially in those patients with severe OSAS.
• CPAP therapy can significantly reduce blood pressure in patients with comorbid hypertension and OSAS[27].
• The current evidence is in agreement that OSAS treatment decreases all-cause mortality in patients with hypertension[28].

Further reading & references
1. Greenstone M, Hack M; Obstructive sleep apnoea. BMJ. 2014 Jun 17;348:g3745. doi: 10.1136/bmj.g3745.
5. Epworth Sleepiness Scale; British Snoring and Sleep Apnoea Association
6. Obstructive sleep apnoea syndrome; NICE CKS, April 2015 (UK access only)
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