The management of olfactory disorders

Disorders of olfaction affect quality of life and their significance are underestimated. Investigation and diagnosis can help in the early implementation of rehabilitative measures and also in recognizing those forms of olfactory disorders that are potentially treatable.

Historically the sense of smell was hugely valued by the medical profession, Hippocrates, Galen and Cato having used perfumes to combat infection. However, more recently its importance has been superseded by the senses of vision and hearing. Olfaction not only distinguishes pleasant odours, but evokes memories and emotions. Many occupations rely on their sense of smell, such as chefs, fire fighters and wine tasters. It also has an important role in safety, as an early warning from hazards such as gas leaks, fire and spoiled food. Serious pathology, such as intracranial tumours and dementia, can present as olfactory disorders, and smell is therefore an important symptom to elicit.

There are various types of olfactory disorders, which can be separated into four categories: anosmia, hyposmia, dysosmia and phantosmia (*Table 1*).

Aetiology

Olfactory disorders can be broadly classified into conductive and sensorineural dysfunction. Conductive disorder is the inability of odour molecules to reach the olfactory cleft, most commonly as a result of sinonasal disease. A sensorineural disorder is damage to the olfactory pathway, anywhere from olfactory receptor cells to the olfactory centre in the brain. There are a number of major causes of olfactory dysfunction (*Table 2*).

Chronic rhinosinusitis

Chronic rhinosinusitis is a major cause of olfactory problems, accounting for about 25% of smell loss (Raviv and Kern, 2004). It is often associated with allergic or non-allergic rhinitis and nasal polyposis. Although primarily a conductive disorder a study by Kern (2000) found inflammatory changes in olfactory mucosa in these patients. This suggests a sensorineural element, which may account for patients whose olfactory disorder has not resolved following treatment for chronic rhinosinusitis.

Table 1. Type of olfactory disorders

Type	Description
Anosmia	Inability to smell
Hyposmia	Decreased ability to smell
Dysosmia	Altered perception of smell
Phantosmia	Perception of smell without stimulus

Upper respiratory tract infection

Accounting for around 30% of olfactory loss (Wrobel and Leopold, 2004), upper respiratory tract infections are the most common cause of permanent hyposmia. It occurs more frequently in women, in older age groups, and patients are more likely to suffer hyposmia than anosmia.

Head injury

Olfactory dysfunction affects around 5–10% of patients with head injury (Wrobel and Leopold, 2004). Dysfunction can occur at any point along the olfactory pathway: from trauma to the nasal tract, from shearing of olfactory neurons at the cribiform plate to mass effect in olfactory centres in the brain. The extent of olfactory loss is related to the severity of the original injury, and the pattern of loss is usually immediate (Wrobel and Leopold, 2004). Around 10% of patients show some recovery.

Old age

Olfactory acuity gradually deteriorates with age, and the majority of people may be unaware of it. However, elderly people are at particular risk of the consequences of

Table 2. Major causes of olfactory disorders

Conductive	Chronic rhinosinusitis
	Polyps
	Allergic rhinitis
	Tumour
Sensorineural	Viral upper respiratory tract infection
	Head injury
	Old age
	Toxins or drugs
	Alzheimer's disease
	Multiple sclerosis
	Congenital

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olfactory loss such as nutritional deficit and fire and gas hazards. Murphy et al (2002) found an overall prevalence of around 25%, with incidence increasing with age and males being more susceptible. Polypharmacy and comorbidities in the elderly population can also contribute to olfactory dysfunction.

Drugs

Literally hundreds of medications have been associated with olfactory dysfunction (*Table 3*).

History and examination

In any clinical situation a thorough history and examination is crucial in formulating an appropriate management plan. In terms of olfaction, determining whether the cause is conductive, and therefore more amenable to treatment, or sensorineural is extremely important. Complaints of loss of taste are often associated with primary olfactory problems and should be treated as such.

History

In sinonasal disease (chronic rhinosinusitis and polyposis) olfactory loss tends to be gradual, often over several years. In about half of patients it is characterized by a fluctuating pattern of olfactory loss (e.g. improvement during physical exercise or showering) which is often more sensitive to treatment. Dysosmia and phantosmia have also been described, but seem to be more a characteristic of post-viral olfactory loss. Owing to the gradual onset, olfactory dysfunction is not a primary concern as patients tend to adjust.

Following an upper respiratory tract infection, olfactory loss seems to persist long after associated symptoms subside. The loss is sudden and the preceding illness is usually clearly identifiable. Olfactory distortion may be a feature.

Olfactory dysfunction secondary to head trauma can occur even after minor injuries. Loss is usually immediate and prolonged amnesia is a poor prognostic factor. Frontal blows are more likely to cause problems.

There are a numbers of salient points to be brought out in the history (*Table 4*).

Table 3. Drugs classes associated with olfactory disorders

Drug class	Example
Local anaesthetics	Cocaine hydrochloride
Antihypertensives	Nifedipine
Antimicrobials	Streptomycin
	Amphotericin B
Hyperthyroid medication	Carbimazole
	Thiouracil
Opiates	Codeine
	Morphine
Antidepressants	Amitryptilline
Radiation therapy	To head
Sympathomimetics	Amphetamines
Vasodilators	Diltiazem
Ameobicides and antihelminthics	Metranidazole
	Nidazole
Immunosuppressants	Methotrexate
	Azothioprine
Antirheumatics	Gold
	Colchicine
	Allopurinol

adapted from Schiffmann and Gatlin (1993)

Examination

Examination should include a full head and neck examination, including a thorough cranial nerve and neurological examination if a central cause is suspected.

A study by Seiden and Duncan (2001) found anterior rhinoscopy failed to diagnose a conductive loss in 51% of patients, whereas nasal endoscopy missed only 9%. Therefore a thorough rigid endoscopic examination should be made of the nasal cavities, in particular the roof of the nose where the olfactory mucosa is concentrated. Assessment should also be made for evidence of disease in the meati of lateral nasal walls. Points to note are mucosal oedema, mucopus, polyps and masses.

Olfactory tests

Most objective olfactory tests involve measuring the detection threshold of a specific odorant. Alternatively, suprathreshold tests involve identifying and discriminating specific odorants. The tests described are of particular use within an outpatient setting and also as a research tool.

University of Pennsylvania Smell Identification Test

The University of Pennsylvania Smell Identification Test (UPSIT) is a self-administered test which uses 40 microencapsulated odorants, which are released by scratching the odour-impregnated booklets (also known as the 'scratch and sniff' test) (Doty et al, 1984). It has extremely high test–retest reliability and not only identifies those with anosmia and hyposmia, but also identifies malingerers. Although the gold standard in North America, its use has not been validated in UK populations, and it is also fairly expensive to administer.

Combined olfactory test

Robson et al (1996) developed a test more suitable for a UK population. It combines a threshold test, utilizing step dilutions of 1-butanol, and then uses substances more familiar to the UK population for odour identification – nine substances each with a choice of four answers

(ammonia was included as a pure trigeminal stimulant but was excluded from the results). Both the threshold and odour identification tests were rated out of nine and the mean score was the combined olfactory score. The validation study shows this test to be a reliable inexpensive method of diagnosing anosmia but unreliable at distinguishing subtleties.

The 12-item cross-cultural smell identification test (CC-SIT)

Based on UPSIT and developed by the same group, the aim was to produce a self-administered reliable method of assessing olfactory function in under 5 minutes that could be used across different cultures (Doty et al, 1996). Validation results suggest its use as only a quick screening tool, and with the UK not being one of the cultures investigated, may mean this is an unreliable test for use in the UK.

Sniffin' Sticks

'Sniffin' Sticks' developed by Kobal et al (1996) uses odorant pens to determine olfactory threshold as well as testing suprathresholds. A study by Wolfensberger et al (2000) validated the use of Sniffin' Sticks in determining olfactory performance, showing good correlation with the UPSIT results. The test is not quick, taking up to 40 minutes to complete and, unlike UPSIT, can only be performed with medical assistance.

Smell diskettes

Briner and Simmen (1999) developed a screening test for odour identification using smell diskettes with eight different odours. Using Sniffin' Sticks as a comparison, it was found to be a fast, reliable method of distinguishing normosmia from hyposmia or anosmia. However, tests with limited number of odours raise concerns about test–retest reliability.

Imaging

Computed tomography (CT) determines the extent of paranasal sinus inflammatory disease, whereas magnetic resonance imaging (MRI) is better at assessing the olfactory bulb or the presence of tumour. MRI can also identify congenital causes of anosmia such as absent olfactory bulbs seen in Kallmann's syndrome. A questionnaire study of UK consultant ear, nose and throat surgeons found that 73% used CT scans compared to 37% using MRI scans as an aid in diagnosing olfactory dysfunction (E McNeil et al, 2005, unpublished data). There are no published guidelines for the use of CT and MRI, however, if history, examination and nasal endoscopy fail to identify an underlying cause, then imaging of the sinuses and anterior skull base is indicated.

Other investigations

Other investigations may include bacteriological and/or cytological analysis, allergy testing, anterior rhinometry (measuring nasal airflow) and acoustic rhinometry (measuring nasal volume). These are generally not used as a simple assessment of olfaction.

Treatment

It is important to counsel all patients presenting with loss of smell regarding safety issues such as smoke and gas detectors. Labelling food with discard dates and being extra vigilant regarding spoiled and rotten food are all ways of adapting. The use of different textured food sometimes makes meals more appealing.

Conductive

Topical steroids

The use of topical steroids in sinonasal disease is well documented. Objective studies of olfaction with different steroid preparations have provided a mixed picture.

Table 4. Salient points in history

History		Salient points
History of presenting complaint	Olfactory dysfunction	Hyposmia
		Anosmia
		Distortion (phantosmia or dysosmia)
	Speed of onset	Rapid – trauma, viruses
		Gradual – sinonasal disease, neoplasm
	Nasal symptoms	Bleeding – neoplasm
		Discharge – sinonasal disease, trauma (CSF)
		Obstruction – sinonasal disease, neoplasm
	Neurological symptoms	Visual disturbance, headache, behavioural changes – Alzheimer's disease, multiple sclerosis, neoplasm
Past medical history		Upper respiratory tract infection
		Trauma
		Neoplasm
		Surgery
		Radiotherapy
		Other medical conditions, e.g. hay fever or asthma
Social history		Occupation
		Chemical exposure
		Head trauma
		Smoking and alcohol history
		Substance abuse
		Nutrition
Drug history		Past and current medication
		Allergies
Family history		Allergies
		Nasal disorders
		Congenital abnormalities

adapted from Jones and Rog (1998)

Naggar et al (1995) used UPSIT to test betametasone nasal spray and found no significant improvement in olfaction. In contrast Golding-Wood et al (1996) a year later using the same objective olfactory test found betametasone drops (equivalent to prednisolone 3.36 mg) to be an effective treatment. Although no adverse systemic effects have been shown at these doses, the excessive use of steroid drops may result in adrenal suppression (Flynn et al, 1992). Mott et al (1997) found flunisolide nasal spray improved olfactory dysfunction subjectively and objectively, however, Heilmann et al (2004) in a retrospective unblinded study of a similar number of patients showed local steroid application to be of no benefit.

Response to topical steroids may be affected by certain prognostic factors – previous steroid response, fluctuating olfactory dysfunction (Mott et al, 1997). In the light of limited long-term side effects in comparison to systemic steroids, topical steroids are the primary medical treatment.

Systemic steroids

Short courses of oral steroids have been widely used in sinonasal disease, however long-term treatment has potential side effects. Heilmann et al (2004) in a retrospective study looked at the direct effect of oral and topical steroids on olfactory dysfunction. They found no improvement in olfaction among the group given topical treatment, but a significant improvement in those patients given a 3-week tapering course of oral steroids.

Oral steroids may also provide a useful diagnostic tool. Seiden and Duncan (2001) found a temporary reversal of conductive olfactory loss in 83% of patients treated with oral steroids, compared to 25% in patients treated with topical preparations.

Anti-leukotrienes

Anti-leukotrienes have been suggested as a novel therapy for sinonasal disease because of its therapeutic capability in asthma. Parnes and Chuma (2000) found a subjective long-term improvement in olfaction in those treated with anti-leukotrienes, however, further objective studies need to follow.

KEY POINTS

- Major causes of olfactory disorders are sinonasal disease, viral upper respiratory tract infection, head trauma and old age.
- A detailed history and examination including nasal endoscopy is crucial in determining the cause.
- The combined olfactory test is a reliable inexpensive method of screening, validated for the UK.
- Advice on conservative measures and safety issues is essential.
- Medical treatment is most effective in conductive olfactory dysfunction and involves the use of topical steroid preparations, and possibly short courses of oral steroids.
- The mechanism of sensorineural olfactory loss is unclear and at present there is no proven effective treatment.

Surgery

At present olfactory dysfunction is not a primary indication for surgery. Most patients undergo surgery for relief of nasal obstruction. However, there have been many reports of olfactory improvement post-nasal surgery. Rowe-Jones and Mackay (1997) showed statistically significant improvement of olfaction subjectively and objectively following endoscopic sinus surgery. Damm et al (2003), in a prospective study of 30 patients undergoing septoplasty, found an overall improvement in olfactory threshold tests and a surprisingly greater improvement in suprathreshold tests. Although these studies have shown positive results, others have also highlighted the risk of worsening olfactory function during surgery (Kimmelmann, 1994).

Surgery as a treatment of olfactory dysfunction should be used with caution, but can improve airflow to olfactory regions, and may be used if medical treatments have failed. Interpreting these studies is made difficult by varied clinical presentations, lack of objective testing and additional medical therapies used in conjunction with surgery.

Sensorineural

No effective therapy is available for sensorineural olfactory loss; however various treatments have been postulated.

In post-viral olfactory loss, reassurance is often a useful tool, with approximately a third showing improvement after 6 months. Alpha lipoic acid treatment has been suggested but adequate trials have not been undertaken.

Olfactory dysfunction following head injury has also shown some spontaneous recovery, but to a much lesser degree. Zinc sulphate, although found to be of no benefit following post-viral olfactory loss, has shown subjective improvement to post-traumatic loss (Aiba et al, 1998).

Olfactory distortion (dysosmia and/or phantosmia) often affects patients more severely than pure olfactory loss, and the treatment can be quite different. Several medical treatments have been suggested, including the use of: nasal saline drops; oxymetazoline drops; sedatives; antidepressants; anti-epileptic drugs; gabapentin; and local anaesthetics such as cocaine. Surgical interventions have also been suggested as a last resort but usually result in anosmia.

Conclusions

Despite the effects on quality of life, olfactory disorders are still undervalued in the medical profession. Effective treatments are available for conductive olfactory disorders, but further study on the pathophysiology and treatment of sensorineural olfactory dysfunction needs to be undertaken. BJHM

Conflict of interest: none.

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