Hyperhidrosis: current management

Hyperhidrosis can be a distressing problem for the afflicted patient and is commonly encountered by both primary care and hospital physicians. This article reviews the essentials of diagnosis and current treatment modalities available for various forms of hyperhidrosis.

Hyperhidrosis is a disorder characterized by secretion of sweat in excess of physiological requirements. It is a common management issue for primary care physicians in the UK. It can have disabling consequences on the afflicted both in terms of physical and emotional wellbeing. Hyperhidrosis can become the substrate for other diseases such as bromhidrosis, dermal mycoses, gram negative infections of the feet and plantar or palmar warts. There now exists a powerful armamentarium to tackle this problem in the majority of patients.

Causes of hyperhidrosis can be classified as primary and secondary; it may be focal or generalized. Primary or essential hyperhidrosis causes much emotional upset (nervous sweating) and is located mainly in the axillae, palms and soles. It is thought to affect up to 1% of the population, commonly affecting young adults (Stolman 1987; Byrne et al, 1990). The afflicted have a positive family history in 30–50% of cases (Kaufman et al, 2003).

In secondary hyperhidrosis an underlying cause exists:

- Neurological conditions (syringomyleia, focal lesions of the CNS, Ross syndrome, auriculotemporal syndrome, Sudeck's syndrome, neuropathies)
- Endocrine disorders (hypoglycaemia, hyperthyroidism)
- Drugs (antidepressants, antiemetics)
- The menopause
- Neoplastic disease (Hodgkin's lymphoma, carcinoid syndrome, phaeochromocytoma)
- Chronic infection.

Pathophysiology

Skin contains two types of sweat glands, exocrine and apocrine. The 2–3 million exocrine glands secrete a watery liquid rich in electrolytes. These glands are concentrated on the palms, soles and axillae. Their role is thermoregulation and they are innervated by postsynaptic sympathetic fibres. Apocrine glands are mostly located in the axillae and anogenital regions, and are regulated hormonally. Their lipid-rich secretion is viscous and contains steroids and hormones. They are not involved in hyperhidrosis.

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The most common cause of focal hyperhidrosis is essential or idiopathic focal hyperhidrosis. The precise mechanism has not as yet been delineated; however, dysfunction of the central sympathetic system has been proposed as a potential mechanism.

Diagnosis

In assessment of hyperhidrosis, consideration must be given to the impact of the condition on the patient. Care should be taken to rule out potential secondary causes, but the aetiology is likely to be primary hyperhidrosis.

Although semi-quantitative methods have been described using gravimetric, hygrometric and colourimetric methods (Raulin et al, 1988), these have not gained widespread acceptance. The diagnosis is mostly based on clinical findings.

The hyperhidrosis area may be outlined by the Minor test; a 2% iodine solution is applied to an area of skin, once dry the area is sprinkled with starch powder which turns blue/black in the affected area.

Medical treatment

Topical treatment

Aluminium chloride preparations have been found to be effective in treating axillary hyperhidrosis in over 90% of cases (Raulin and Petzoldt, 1987). Aluminium salts act by temporarily closing the pores of sweat glands in the lower and middle epidermis. Long-term treatment results in atrophy of the acini of the glands (Holzle and Braun-Falco, 1984). Many commercially available aluminium-containing preparations exist; if used they should be applied nightly when the glands are mostly inactive to allow penetration. However, treatment may be limited by severe irritation even in non-atopic skin, although this may be ameliorated by the 'modified topical therapy' suggested by Lowe et al (2003) which uses an emollient with 1% hydrocortisone the next morning.

Tap water iontophoresis

This therapy involves submerging the offending body part in a basin of lukewarm water through which a direct current is passed using plastic covered electrodes. Each session lasts 10–15 minutes and two or three sessions are required per week until response is obtained in about 2 weeks. The mechanism is thought to involve reversible disruption of ion channels in acini of sweat glands (Hill et al, 1981). Response rates of 90% have been quoted, two or three sessions per week are required and improvement is usually seen in five to ten sessions (Raulin et al, 1988).

If initial response is not achieved, the addition of anticholinergic drugs has been found to make effects more apparent and last longer (Morgan, 1980; Hill et al, 1981). The addition of anticholinergics does expose the patient to typical atropine-like symptoms, but the long-term safety (Holze, 1984) and the introduction of home units make iontophoresis an acceptable option.

Botulinum toxin

Botulinum toxin is a neurotoxin derived from the gram positive spore-forming anaerobe *Clostridium botulinum*. It is an irreversible inhibitor of acetylcholine at the neuromuscular junction and at sweat glands. It is a relatively new treatment for hyperhidrosis, first reported in 1996 (Bushara et al, 1996). Botulinum toxin A is available in two commercially available products: Botox (Allergan Ltd, High Wycombe) and Dysport (Ipsen Ltd, Slough). Both toxins are given in mouse units (mU), however, the different biological activity of the mU of both means that they can not be directly compared (1mU Botox is equivalent to 3–5 mU of Dysport; Sampaio et al, 1997).

Before treatment, the Minor test is used to visualize the area of hyperhidrosis. Injection is done subcutaneously either to form a wheal at the injection site, or manipulated under the skin to distribute the substance.

For the treatment of axillary sweating, in addition to a large multicentre randomized placebo-controlled trial, there exist a number of open and controlled studies to support its efficacy. The large placebo-controlled trial (Naumann and Lowe, 2001) of 320 patients with persistant bilateral axillary hyperhidrosis evaluating 50 U of intradermal Botox, which was significantly superior to placebo at all measured time points and the mean reduction of sweat production at 4 weeks was 83.5% compared to 20.8% for placebo. The authors reported no significant adverse outcomes. Similar findings were reported from a controlled study using 100 and 200 MU Dysport (Heckmann et al, 2001).

Convincing data also exist for the use of Dysport in palmar hyperhidrosis in the form of open studies and one small double-blind placebo-controlled trial (Schnider et al, 1997). Significant reductions in sweating were observed with an effective duration of mainly between 4 and 6 months. Treatment doses used were larger in the palm because the area being treated is larger (120–220 mU Botox or 120 mU Dysport). Although results appear encouraging the treatment is painful, requiring a median nerve block, and causes a degree of hand muscle weakness which has lead to a lack of enthusiasm.

Botox has also been used in the treatment of Frey's syndrome (gustatory sweating). An open study of 45 patients demonstrated effective reduction in facial sweating following 21 mU of Botox with no recurrence of sweating during the 6-month follow-up period (Naumann et al, 1997). Furthermore a long-lasting effect of between 11 and 36 months after single treatment has been observed in three other open studies (Bjerkhoel and Trobbe, 1997; Laskawi et al, 1998; Laccourreye et al, 1999). Naumann (2001) suggested that this peculiarly long-acting effect may be related to the specific aetiology of the condition.

Botox has also been successfully used in the treatment of compensatory sweating in Ross syndrome (Bergmann et al, 1998).

Surgical treatment

Excision of axillary tissue

Where medical therapy has proved ineffectual, surgical excision of axillary sweat glands has proved successful (Taylor, 1982; Stenquist, 1985; Bisbal et al, 1987). The area to be excised can be identified using the Minor test as described above. A procedure involving a single transverse incision parallel to the skin crease as well as one involving additional incisions peripheral to the central one with undermining and resection of sweat glands around each incision has been described (Hurley and Shelley, 1963, 1966). Alternatively procedures involving the fashioning of bipedal flaps with two incisions and excision of subcutaneous tissue, and bat-shaped axillary excisions have been described all with good results (Breach, 1979; Stenquist, 1985). Z-plasty incorporation into closure has been advocated to avoid scar contracture (Ellis and Scurr, 1979).

Suction-assisted lipolysis

This procedure is amenable to day surgery and can be done under either local or general anaesthesia. The surface of the dermis is suctioned out through a 1 cm incision in the anterior axillary fold. A few reports exist of the successful application of this technique (Shenaq et al, 1987; Tofield, 1988).

Open thoracic sympathectomy

This procedure is now only of historical interest having been superceded by the minimally invasive endoscopic approach. Sweat glands in the hands are denervated by removal of the sympathetic nerve trunks T3 to T4, for the feet L3 is removed and for the axillae T3 to T6. Excellent results were described with both a cervical (Ellis, 1979) and a transaxillary approach (Bass et al, 1983; Bogokowsky et al, 1983; Adar, 1994).

Endoscopic thoracic sympathectomy

Endoscopic thoracic sympathectomy was first reported in 1942 by Hughes from Sheffield; Kux published a series of 1400 operations in 1954, but the procedure did not become widespread until the introduction of video-assisted surgery in the 1980s. This minimally-invasive procedure is performed usually as a synchronous bilateral procedure under general anaesthesia with endotracheal intubation. Endoscopic thoracic sympathectomy (ETS) is safe in experienced hands with minimal short-term morbidity (Ojimba and Cameron, 2004) and is a very effective treatment with satisfactory initial control of

symptoms in 95% of cases of hand sweating. However, the results of treatment may be compromised by the development of side-effects; in a long-term follow up from Vienna satisfaction fell to 66% after 25 years (Herbst et al, 1994). The main problem is the development of compensatory sweating on the trunk which is a near-universal consequence. This is usually fairly mild, but more worrying is the unpredictable occurrence of devastating 'reflex' sweating which can affect 1% of cases having upper dorsal sympathectomy. All patients should be specifically warned of this rare but unpleasant result (Adar, 1998). For this reason ETS is generally not recommended for isolated axillary hyperhidrosis and for palmar hyperhidrosis ETS should be a last resort when conservative measures have failed.

Conclusions

Hyperhidrosis causing significant distress to the patient should be treated. The mode of treatment should be tailored to the needs of the patient and the area affected. Botulinum toxin A has emerged as the treatment of choice for axillary hyperhidrosis and ETS for palmar hyperhidrosis. **BJHM**

Conflict of interest: Mr A Cameron has a large endoscopic thoracic sympathectomy practice and teaches the Royal College of Surgeons of England endoscopic thoracic sympathectomy course.

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KEY POINTS

- In the vast majority of cases hyperhydrosis is primary in aetiology.
- Axillary hyperhidrosis is best treated with subcutaneous botulinum toxin.
- Palmar hyperhidrosis may be effectively treated with endoscopic thoracic sympathectomy.

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