

## Hyperhidrosis

Hyperhidrosis, or excessive sweating, is a condition that usually begins in either childhood or adolescence. Although any site on the body can be affected, the sites most commonly affected are the palms and soles (palmoplantar hyperhidrosis) and/or axillae (axillary hyperhidrosis). Axillary problems tend to start in late adolescence, while palmoplantar excessive sweating often begins earlier, average age 12-13 years. 1-2% of the global population have some form of hyperhidrosis, whereas severe cases can reach up to 0.1% of the population. In most cases, if untreated, hyperhidrosis will persist throughout life causing great emotional distress and psychological handicap and stigmata interfering with the patient's personal and professional life. It may also interfere with the academic education of the sufferers, especially in its palmoplantar form, as patients find it very difficult to write on a piece of paper without soaking it in sweat. I have come across two such cases who had to give up higher education due to uncontrollable hyperhidrosis. Undoubtedly, severe cases of hyperhidrosis may adversely affect the patient's quality of life.

This condition may be idiopathic or secondary to other diseases, metabolic disorders, febrile illnesses, or medication use. Hyperhidrosis can be divided into generalized and localized (see Table 1) and can affect both sexes and all races and ages. Generalized hyperhidrosis may be the consequence of autonomic dysregulation, or it may develop secondary to a metabolic disorder, febrile illness, or malignancy. In its localized form, hyperhidrosis may result from a disruption followed by abnormal regeneration of sympathetic nerves or a localized abnormality in the number or distribution of the eccrine glands, or it may be associated with other (usually vascular) abnormalities.<sup>1</sup>

<i>Generalized</i>	<i>Localized</i>
<ul style="list-style-type: none"> <li>~Fever</li> <li>~Metabolic abnormalities (e.g. hyperthyroidism, hypoglycemia, menopause)</li> <li>~Drugs {e.g. tricyclic antidepressants, Pilocarpine Hydrochloride (= Systemic treatment for xerostomia), Levothyroxine, etc }</li> <li>~Neoplastic disease (e.g. Hodgkins)</li> <li>~Neurological (e.g. autonomic dysregulation)</li> <li>~Alcoholism</li> <li>~Anxiety</li> <li>~Phobias (e.g. Panic attacks, agoraphobia)</li> <li>~Cardiac Pathology (e.g. arrhythmias)</li> <li>~Tuberculosis</li> </ul>	<ul style="list-style-type: none"> <li>~Emotionally induced (Palmoplantar sweating is controlled by the cerebral cortex and responds to emotional stimuli rather than to increase in temperature; palmoplantar, unlike axillary, sweating does not occur during sleep or sedation!)</li> <li>~Frey syndrome</li> <li>~Endocrinopathy</li> <li>~Glomus tumour (also known as glomangioma, or nonchromaffin paraganglioma), a rare <a href="#">benign neoplasm</a>, a specialized arteriovenous <a href="#">anastomosis</a> usually found in the skin of the extremities.</li> <li>~Viral infections (e.g. Herpes Zoster)</li> <li>~Eccrine hamartomas</li> </ul>

**Table 1.** Causes of Hyperhidrosis

### Treatment

Hyperhidrosis is difficult to treat effectively. There are numerous options ranging from pharmacotherapy to surgical sympathectomy (see Table 2). Botulinum Toxin type A is a very effective treatment particularly for the axillary hyperhidrosis as will be discussed later.

<i>Medical</i>	<i>Surgical</i>
<p>~<i>Pharmacotherapy</i>  <i>Aluminium chloride</i> based antiperspirants are usually tried as a first option.</p> <p><i>Anticholinergic agents</i> – They inhibit the binding of acetylcholine to the cholinergic receptor. Clinical effects usually occur within days. Better to be avoided as they may cause systemic side effects.</p> <p><i>Neuromuscular blocking agents (i.e. BOTOX)</i></p> <p>~ <i>Iontophoresis</i> (tap water vs anticholinergic iontophoresis) – Tap water iontophoresis involves applying a low intensity electrical current to the hands and/or feet or axillae by means of an iontophoresis machine and water baths containing ordinary tap water. Exactly how tap water iontophoresis works remains unclear; however the treatment has been shown to be effective in a great number of people without any significant side effects making it a safe first line treatment option. <sup>2</sup> A variety of machines are now available for use in NHS hospitals or at home.</p>	<p>~<i>Sympahthectomy</i> – reserved as the final treatment option. Upper thoracic sympathectomy has been performed for many years as therapy for hyperhidrosis and several other diseases. There are various surgical approaches available. Prior to the advent of endoscopic transthoracic sympathectomy (ETS), these approaches involved either painful back or neck incisions with possible risk of brachial plexus, or phrenic nerve injury, or Horner's syndrome. With the introduction of ETS the success rate for palmar and facial hyperhidrosis is in excess of 98%, with limited side effects or serious complications. The most common side effect is compensatory truncal sweating, in about 50% of patients. Other side effects include gustatory sweating, pneumothorax, intercostal neuralgia, Horner syndrome, recurrence of hyperhidrosis. Bilateral sympathectomies are performed under general anesthesia. A 5-mm endoscope is used to identify the second through fourth ganglia. The branches to the main sympathetic chain at each level are identified and divided, then the main chain is removed. After completing one side, the opposite side is done. Division of these branches is critical to preventing recurrent symptoms years later. The vast majority of patients have complete relief of palmar hyperhidrosis, and, for most, additional relief of plantar hyperhidrosis. The most effective treatment for axillary hyperhidrosis is BOTOX.</p> <p>Finally <i>surgical excision of the affected sweat glands</i> or <i>subcutaneous liposuction</i> -removes eccrine glands along with adipose tissue- can also be used mainly for axillary hyperhidrosis. Least popular methods.</p>

Table 2. Medical vs Surgical treatment for hyperhidrosis

**How does the toxin work in hyperhidrosis?**

Before I talk about how botulinum toxin can be used in the treatment of hyperhidrosis I would like to give an overview of the anatomy of the smooth muscle and sweat glands so that the reader can better understand the toxin's mechanism of action.

*Sweat glands* are part of skin's adnexa (also known as skin appendages) along with hair, arrector pili muscle, sebaceous glands and nails. They can be divided into eccrine (or merocrine) and apocrine glands (see Table 3). Sweat glands are exocrine glands, found in the skin of all mammal species. In humans an extensive system of eccrine and apocrine sweat glands constitutes the primary means of thermoregulation whereas in most animals - that usually have much fewer sweat glands than humans – additional thermoregulatory channels, such as panting, are required in order to achieve effective temperature regulation. Both apocrine and merocrine sweat glands contain specialized epithelial cells, called myoepithelial cells whose contractions squeeze the gland and discharge the accumulated secretions. The secretory activities of the gland cells and the contractions of myoepithelial cells are controlled by both the autonomic nervous system and by the circulating hormones.<sup>3</sup> Physical activity, emotional stress and internal or external high temperature will stimulate sweat glands. Sequence: Autonomic nervous system activation → contraction of myoepithelial cells → discharge of sweat glands. Finally sweat contains mainly water as well as minerals (i.e. sodium, potassium, calcium, magnesium), trace elements, urea and lactate.

<i>Eccrine sweat glands</i>	<i>Apocrine sweat glands</i>
~Coiled secretory structure in subcutaneous tissue with a single duct passing to the surface. ~ ~Decreased or absent in skin grafts, leading to dryness.	~Found in the axilla and inguinal regions ~Secrete into hair follicles ~Become active at puberty

*Table 3.* Differences between the two types of sweat glands

***References***

1. Schwartz R.A, Altman R. <http://www.hyperhidrosiscare.com/>
2. Elkhyat A & Agache P. Treatment of hyperhidrosis by iontophoresis of weakly mineralised water. 1993. Cutaneous Biophysics Laboratory, Department of Functional Dermatology, 25030 Besancon, France.
3. [http://en.wikipedia.org/wiki/Sweat\\_gland](http://en.wikipedia.org/wiki/Sweat_gland)