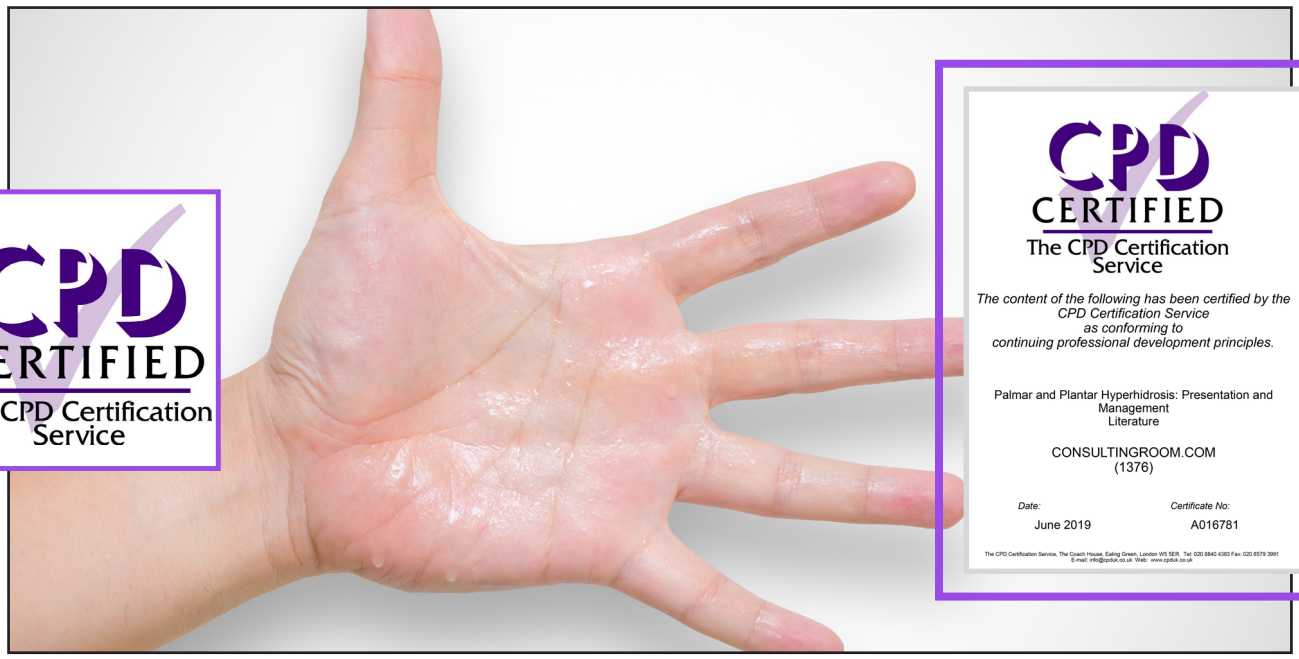

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PALMAR AND PLANTAR HYPERHIDROSIS: PRESENTATION AND MANAGEMENT

Primary palmar and plantar hyperhidrosis is debilitating and can prevent patients undertaking simple everyday tasks significantly affecting quality of life. Patient-administered treatments of antiperspirants and/or iontophoresis are safe and can be very effective for many patients says Dr Richard Oliver, Head of Technical and Clinical at STD Pharmaceutical Products Ltd

Sweating affecting the hands and feet is, along with the axilla and craniofacial area, the most common distribution of primary (focal) hyperhidrosis.[1,2] Unlike some body areas, palmar and plantar hyperhidrosis can often be less evident to other people but a major issue for the patient.

If you consider the daily activities undertaken with your hands and feet, how different and difficult these activities would be if they were constantly wet. Daily functions using the hands are difficult including operating touch screens, keyboards, handling paper and any manual operations. Intimate contact, including holding or shaking hands with others, is often avoided; this can have profound consequences with forming relationships and securing work.

Persistently wet feet cause issues walking across tiled floors, wearing sandals and flip-flop type shoes, shoes that literally rot due to being constantly wet and fungal or bacterial infections often develop.

Unsurprisingly, these issues have significant effects on patients' overall quality of life including their social life, sense of well-being, emotional, mental and even physical health.[1]

General advice

Cognitive behavioural therapy (CBT) is often cited as a treatment modality, especially online. Whilst there is often an anxiety-related element to hyperhidrosis, and given the emotional burden of the condition, in the absence of formal CBT being available or even necessary, creating a generally positive attitude in these patients is important.

Generally, naturally occurring fibres and materials allow greater air exchange with the skin than man-made materials. Leather shoes are better than synthetic materials, open toed shoes, if they can be worn, are preferable. It is advisable, when possible, to have alternate shoe days so one pair of shoes has a chance to dry out completely in between. Copper or silver impregnated socks and bamboo or charcoal insoles are also recommended.

Treatment

Treatment largely focuses on reducing the volume of sweat excreted onto the skin surface to improve the patient's quality of life. There is no definitive cure and treatments work better for some individuals than for others. Ultimately, many patients will get relief from a combination of modalities.

There is generally a treatment hierarchy which begins with strong antiperspirants then moves to iontophoresis if antiperspirants alone are insufficient. Iontophoresis is successful for the majority, if the patients are prepared to commit the time needed and can tolerate the sensation. The next tier of treatment usually instigated for the treatment of hands and feet can be botulinum toxin (an unlicensed indication) or anticholinergic drugs. Endoscopic thoracic sympathectomy surgery is reserved as a last resort.

Treatment algorithms published by the International Hyperhidrosis Society (IHHS) are available to download which can assist those less familiar with the condition to suggest further treatment options based upon the success or otherwise of treatments tried to date.[3, 4]

Antiperspirants

Strong antiperspirants containing aluminium salts in concentrations up to 30% are the first line in the management of palmar and plantar hyperhidrosis. The metal salts react with the mucopolysaccharides from the sweat leading to a precipitate that blocks the lumen of the eccrine sweat gland ducts forming a physical barrier to sweat reaching the skin surface.[5]

Despite their widespread use and recommendation, the clinical trial evidence supporting their use is rather limited. The best results are achieved when the antiperspirant is applied to clean dry skin at night-time when the sweat production is lowest, but there is enough to react with the product to exert its effect without being washed away. If this is done daily initially, after one to two weeks the cumulative effect of the application means that the antiperspirant only then needs applying every few days to maintain sweat reduction.

Skin irritation is common with the use of strong antiperspirants especially of more sensitive areas but application of the strongest antiperspirants to the palmar and plantar surfaces tends to be tolerated by most patients *(Figure 1)*.

Figure 1: Strong antiperspirants applied to the palmar and plantar surfaces are the first-line of treatment.

Iontophoresis

Tap water iontophoresis has been used for over 50 years to treat palmar and plantar hyperhidrosis with devices now readily available for patients to undertake treatment at home as well as in clinics *(Figure 2)*.

Figure 2: Tap-water iontophoresis is the next level treatment for palmar and plantar hyperhidrosis.

The technique relies on the ions in the tap water to be driven towards the skin by the flow of a low electric current (typically no more than 20 milliamps (mA)). The precise mechanism of iontophoresis for reducing sweating is not known although several hypotheses exist *(Box 1)*.

The observation from Shelley's original work[6] of a mechanical blockage is favoured by many and is similar to the mode of action of antiperspirants.

Notwithstanding the mechanism of action, iontophoresis is effective for treating palmar and plantar hyperhidrosis in the majority of patients. There is published evidence of the efficacy although most studies are observational and the comparative randomised trials are small *(Table 1)*.[7-18]

A variety of study methodologies and both objective (gravimetric) and subjective (patient reported) outcome

Box 1: Hypotheses for the mechanism of iontophoresis in treating hyperhidrosis

1. The electrical current and minerals from the tap water cause hyperkeratinisation of the skin and sweat ducts leading to a mechanical blockage in a similar fashion to the action of aluminium containing antiperspirants.[6,15]
2. An increase in the hydrogen ions (decreasing the pH and producing an acid environment) by hydrolysis of the water within the sweat duct in the anodal (positive) bath damages the duct and may also affect the acinar function of the gland itself.[21]
3. Due to the high level of electrolytes, the current can flow readily and this leads to local electrochemical denaturation of proteins that disrupts the eccrine gland function especially the sodium-potassium pump.[17]
4. The functional secretory mechanism of the cell is disturbed by interrupting the stimulus-secretion coupling; the system linking the receptor to the actual site of ion and molecule translocation across the membrane (the secretion).[22]
5. Depletion of sodium, potassium and chloride ions in the acinar cells results in malfunction of the sodium pump suggested following the observation of increased concentrations of these ions in the tray water[13]

measures have been used making meta-analysis of the results difficult. These studies cite success rates above 80% and probably reflect ideal treatment conditions, current levels and duration of treatment. It has been shown that patients treated successfully by iontophoresis in hospital who then use machines at home had lower success which is largely attributed to lower current levels being used in the self-administered treatment.[16]

There are many variables that can affect the success of iontophoresis including the water hardness, duration of treatment and level of current used. Because iontophoresis relies on the ions in the tap water, it tends to work best in areas where the water is hardest which is in the East, South East, South and Midlands of England and Wales; the extreme West and North West of England and Wales, and most of Scotland have soft tap water. This limitation can be overcome by the addition of ions in the form of metal salts such as common salt or bicarbonate of soda or using bottled water from a hard water area of the UK or elsewhere; French mineral water is generally much higher in ions than that from the UK and readily available.

The anticholinergic (antimuscarinic) drug glycopyrronium bromide (glycopyrrolate) is licensed for using with tap water iontophoresis which can improve the efficacy of treatment.[19, 20] However, the drug product is expensive, only has a 30-day shelf life once in solution and obtaining prescriptions on the NHS can be challenging for some patients.

Despite the heterogeneity of the published research, common to the majority is a general consensus on the protocol for treatment. A current of about 20 mA for 20 minutes for the hands and up to 30 minutes for the feet is recommended. The treatments should initially be three times in the first week, twice in the second week and once in weeks three and four.

Thereafter, maintenance treatments

Table 1. Summary of clinical trials using direct current iontophoresis for treating hyperhidrosis

Author	Study type	Number of Patients	Outcomes	% success*
Midtgaard [17] Denmark	O	25 patients with palmar, plantar or axillary hyperhidrosis	21/25 treatment effective	84%
Stolman [18] USA	RCT	18 patients (10 female) with palmar hyperhidrosis	15/18 reduction in sweating assessed by starch-iodine test	83%
Holzle and Alberti [9] Germany	O	71 patients (35 female) with palmar or plantar hyperhidrosis	Mean reduction by gravimetry of 52 to 10 mg/min for hands and 43 to 15 mg/min for feet	
Desnos, et al.[12] France	O	93 patients (61 female) with palmar or plantar or palmar-plantar hyperhidrosis	86/93 reduction in sweating using an ordinal scale with subjective assessment	92%
Dahl and Glent-Madsen [7] Denmark	RCT	11 patients with palmar hyperhidrosis	81% sweat reduction using gravimetric assessment after median of 10 treatments	81%
Elkhyat and Agache [13] France	O	35 patients with palmar hyperhidrosis	34/35 improvement on visual inspection	97%
Walia, et al. [10] India	O	27 patients with palmar or plantar or palmar-plantar hyperhidrosis	24/27 marked improvement in symptoms	88%
Karakoc, et al. [15] Turkey	O	112 patients (62 female) with palmar or plantar or palmar-plantar hyperhidrosis	91/112 reduction in sweat intensity measured by pad glove method	81%
Siah and Hampton [11] UK	O	23 patients (16 female) with palmar and plantar hyperhidrosis	Mean severity scores decreased from 7.6 to 1.9 for hands and from 8.47 to 3.0 for feet using an ordinal scale (1-10)	
McAleer and Collins [16]	O	25 patients (Hospital)/13 patients (Home) with palmoplantar and/or axillary hyperhidrosis	72% of patients reported significant improvement of symptoms and quality of life with hospital treatment 31% of patients reported significant improvement of symptoms and 38% in quality of life with home treatment	
Selim, et al. [8] Egypt	O	20 children (10 female)	49% reduction in sweat output after treatment compared to pre-treatment	
Dagash, et al. [14] UK	O	43 children (30 female) with palmoplantar and/or axillary hyperhidrosis	36/43 reported improvement by reduction of HDSS score	84%

O=observational, RCT=Randomised controlled trial
*if cited or the outcome measures permit

are required before the sweating returns to its original level. These are typically once a week but can be as long as months apart for some patients.

Adverse events arising from iontophoresis are generally transient and mild and can largely be prevented by adhering to prescribed protocol and technique. Avoiding direct contact of the skin with the electrode (which leads to a concentration of current) will avoid burns. Breaks in the skin such as cuts or scratches should be covered with petroleum jelly to prevent the current flowing into them.

There are very few absolute contraindications to iontophoresis. As most elective procedures are contraindicated during pregnancy so is iontophoresis, which can be frustrating for some women because sweating can be worsened during pregnancy. Substantial metal implants placed during corrective or reparative orthopaedic surgery that are in the path of the current are contraindicated, alongside cardiac pacemakers. Poorly controlled epilepsy is a contraindication but for patients whose condition is well controlled iontophoresis is safe.

Conclusions

Palmar and plantar hyperhidrosis can severely impair patients' ability to undertake everyday tasks and activities which significantly affect quality of life. Palmar and plantar hyperhidrosis can often be successfully managed using self-administered home use treatments of antiperspirants and/or iontophoresis. Other healthcare professional prescribed treatment modalities are available and will be covered elsewhere in this issue.

Further information on treating the hands and feet as well as other areas can be found at **hyperhidrosisuk.org**.

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