

# Chinese expert consensus on the surgical treatment of primary palmar hyperhidrosis (2021 version)

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## Abstract

Primary palmar hyperhidrosis (PPH) is a pathologic condition of excessive sweating on hands that has adverse impacts on patients' social activity, professional life, and psychological state. Endoscopic thoracic sympathectomy (ETS) is by far the treatment choice for PPH with the most stable and durable curative effects, but special attention should be given to the side effects of the surgery, especially compensatory hyperhidrosis (CH). This consensus is the second version of the Chinese Expert Consensus on the Surgical Treatment of PPH by the China Expert Committee on Palmar Hyperhidrosis (CECPH), which was published 10 years ago. This consensus emphasizes the need for special attention and careful assessment of the patients' feelings, as well as their emotional and mental state, and emphasizes that distress due to palmar sweating and the desire for treatment are prerequisites for diagnosis. It also provides a more nuanced delineation of CH and reviews all new attempts to prevent and treat this side effect. New evidence of the epidemiology, pathogenesis of PPH, and indications for surgery were also assessed or recommended.

**Keywords:** Primary palmar hyperhidrosis; Surgical treatment; Sympathectomy; Sympathectomy; Compensatory hyperhidrosis; Consensus

## Introduction

Primary palmar hyperhidrosis (PPH) is a pathologic condition of excessive sweating of the hands that does not occur secondary to other specific diseases or medications. It commonly emerges among teenagers and youths and may have adverse impacts on patients' social activity, professional life, and psychological state. Thoracic sympathetic surgery as a treatment option for PPH has been established for over a century. With the development of thoracoscopic surgery, endoscopic thoracic sympathectomy (ETS) has been shown worldwide to be a safe and effective therapeutic method over the decades.

However, compensatory hyperhidrosis (CH), which appears as a side effect after ETS, still remains a Gordian knot that needs to be untied. Some patients considered that they suffered from this "newly created disorder" and regretted accepting the surgery even though palmar sweating was successfully cured. How to prevent or relieve CH is an important scientific issue for ETS.

Standardization of the surgery for PPH also needs to be emphasized. Doctors should provide a full explanation and information on the surgical risks and side effects before the surgery.

The Chinese Expert Committee on Palmar Hyperhidrosis (CECPH) is an official academic organization affiliated with the Chinese Medical Doctor Association (CMDA). The first version of the Chinese Expert Consensus on the Surgical Treatment of PPH was published in the Chinese Journal of Thoracic and Cardiovascular Surgery 10 years ago in the Chinese language.<sup>[1]</sup> In the past decade, researchers from all over the world devoted and achieved a lot in the treatment of PPH. We are convinced that it is necessary to revise the expert consensus to supply a comprehensive and professional reference for thoracic surgeons. It is valuable that we publish this version in English to offer the Chinese experience to the world. This expert consensus aims to review the current evidence and provide recommendations on several crucial and debatable issues proposed by expert

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**Table 1: Categories of evidence and consensus.**

Level	Evidence and consensus
1	Based upon high-level evidence, there is uniform consensus that the intervention or statement is appropriate
2A	Based upon low-level evidence, there is uniform consensus that the intervention or statement is appropriate
2B	Based upon low-level evidence, there is consensus that the intervention or statement is appropriate
3	Based upon any level of evidence, there is major disagreement that the intervention or statement is appropriate

committee as follows: (1) prerequisite for the diagnosis of PPH; (2) significance of psychological assessment for PPH patients; (3) recommendations of treatment methods, surgical procedures and surgical incisions for PPH; (4) how to select the procedure between R3 and R4 sympathectomy; (5) prevention and treatment of CH.

A consensus development panel were organized with top experts from CECPH to decide the methodologies, processes, levels of evidence, and related recommendations. A problem-oriented literature search was carried out by the panel members for articles published in PubMed since 2011 when the first version of consensus was published.<sup>[1]</sup> The level of evidence was defined using the criteria discussed by the panel in Table 1, and the recommendation statement was composed based on the real-world evidence and expert consensus.<sup>[2]</sup> After the first draft had been completed, all the panel members were involved in revising and finalizing this document.

### Epidemiology

The prevalence rate of primary focal hyperhidrosis was reported to be 1–5%.<sup>[3–5]</sup> Regarding PPH, the rate was reported to be 2–5%,<sup>[6,7]</sup> and it affects both sexes equally, but seeking treatment is more frequent among female patients.<sup>[7]</sup> Characteristically, the symptoms of palmar sweating start from childhood and often gradually exacerbate with puberty. PPH presents a regional feature that it is much more common in places near the Equator, such as South China and Brazil. Over 25% of patients have a positive family history.<sup>[6]</sup>

### Pathogenesis

The pathogenesis of PPH remains unknown. It was reported that both the numbers and the functions of sweat glands in patients with PPH are normal.<sup>[8]</sup> It is hypothesized that PPH is a complex dysfunction in the sympathetic system that results in an abnormal response to emotional stress. Additionally, several studies have primarily explored the genetic pathogenesis of PPH. Ro *et al*<sup>[9]</sup> analyzed 49 families with 58 probands of PPH and discovered strong evidence for vertical transmission of this disorder in pedigrees, thus concluding that PPH has a familial aggregation with a possible multigenic mecha-

nism. Kaufmann *et al*<sup>[10]</sup> indicated that PPH is a genetic disorder with an autosomal dominant mode of inheritance after an analysis of 21 patients. Higashimoto *et al*<sup>[11]</sup> first reported a linkage analysis of 11 families and found that the PPH locus maps to 14q11.2–q13. Chen *et al*<sup>[12]</sup> reported a novel locus for PPH mapped on chromosome 2q31.1. These preliminary findings support the need for further investigation of the genetic pathogenesis for PPH.

### Clinical Manifestations

PPH is an idiopathic disease that mainly manifests excessive hand sweating without any regular pattern of onset. It may be triggered or exacerbated by tension, embarrassment, excitement, high temperature, or nothing at all. The severity and duration of sweating symptoms vary each time but do not emerge during the sleeping state. It is also commonly combined with plantar and/or axillary hyperhidrosis. The abnormal condition of hand sweating has negative impacts on patients' daily activities, social interactions, and mental state. Both physical and psychological discomfort deteriorate the quality of life (QOL).

### Diagnosis

**Consensus 1: The subjective feeling of patients is as critical as the objective sweat volume in the diagnosis of PPH. Being distressed by palmar sweating and the desire for treatment are prerequisites for the diagnosis of PPH (level of evidence: 2B; strength of recommendation: strong).**

First, it is essential to exclude secondary causes of hyperhidrosis before confirming PPH diagnosis. Patient history is usually sufficient for diagnosis, and a laboratory test is not needed unless there is a high suspicion of secondary hyperhidrosis.<sup>[13]</sup> In general, it is suggested that the following information should be collected: the pattern of sweating, age of onset, initiating causes, duration, frequency, amount, distribution, night sweating, family history, and any symptoms which refer to a secondary cause.<sup>[13]</sup> Sweating is a normal phenomenon of the human body with the physiological function of thermal regulation; thus, it cannot be diagnosed as a disease unless it causes distress in daily life or to the patient's mental state.

### Assessment of Sweating Severity

#### Subjective assessment

There are several subjective scales applied in clinical practice. The Hyperhidrosis Disease Severity Scale (HDSS) is the most commonly used subjective questionnaire, and the Canadian Hyperhidrosis Advisory Committee recommended using this scale to direct treatment.<sup>[14]</sup> Patients were asked to rank the influence of sweating on daily activities on a scale of four grades. A score of 1 or 2 indicates a mild or moderate type, and a score of 3 or 4 indicates a severe type. Accordingly, we proposed severity assessment criteria for PPH in Table 2. At present, there is no unified scale, and many researchers tend to use self-designed assessment scales based on the HDSS.<sup>[15,16]</sup> The Hyperhidrosis Impact Questionnaire (HHIQ),<sup>[17]</sup> the Dermatology Life Quality Index (DLQI),<sup>[18]</sup> and the Medical Outcomes

**Table 2: Grading system of sweating severity of PPH.**

Grade	Presentation
Mild	Moist hands
Moderate	Wet hands with visible sweating drops
Severe	Very wet hands with dripping sweating

PPH: Primary palmar hyperhidrosis.

Trust Short Form 12 Health Survey (SF-12)<sup>[19]</sup> are other questionnaires used in assessment of hyperhidrosis.

**Objective assessment**

Theoretically, the sweat volume can be measured objectively by instruments and equipment. Thorlacius *et al*<sup>[20]</sup> applied the gravimetric test in the quantitative assessment of PPH, and a sweat production rate of 100 mg/5 min was defined as a possible cutoff value for distinguishing primary focal hyperhidrosis from normal physiological sweat production. However, the relatively strict requirements of environmental temperature and humidity and complicated operations have restrained its clinical application.<sup>[21]</sup> The minor starch-iodine test and the ninhydrin test are half-quantitative tools to evaluate sweating conditions but have limited value in practice. Dynamic sudometry (instrument for measurement of sweat volume), such as Delfin VapoMeter<sup>[22]</sup> and flow-control perspiration meter,<sup>[23]</sup> seems promising, but further investigations and explorations are still needed to testify their practicability. In summary, the complexity of these apparatuses makes them only available for research purposes, and they are not feasible for general clinical applications. In addition, whether the statistical data measured by these apparatuses agree with the subjective feelings of patients remains to be studied.

**Psychological Assessment**

**Consensus 2: The psychological state of patients with PPH should be emphasized, and strict assessment is recommended (level of evidence: 2A; strength of recommendation: strong).**

PPH usually starts from childhood. The leading problem of the disease is the emotional and mental distress caused by palmar sweating. Recent studies showed that PPH was significantly associated with anxiety and depression compared to the general population, with proportions up to 49.6% and 60.0%, respectively.<sup>[24-28]</sup> It was reported that over half of patients achieved an improvement in the psychological state after ETS.<sup>[29]</sup> In fact, it is important to differentiate anxious or depressive moods from anxiety or depression disorder since the former may be cured and relieved after the treatment of PPH, while the latter will not. The purpose of psychological assessment is to initially screen out those with genuine mental disorders or personality disorders and refer them to psychiatrists for further diagnosis and treatment. We should also know that depression and anxiety disorders may be cured through standard psychiatric treatment, but personality

disorders cannot be cured. These patients are easily dissatisfied with operative outcomes. The decision to operate on them should thus be made with caution.

**Nonsurgical Treatment**

**Consensus 3: Nonsurgical treatment is not recommended for severe PPH due to the significant side effects and poor compliance of patients (level of evidence: 1; strength of recommendation: strong).**

Nonsurgical treatments include topical antiperspirants, oral anticholinergics, iontophoresis, and injectable medications.

Aluminum chloride hexahydrate (ACH) is the most frequent and effective topical medication, but it only has a 60% satisfaction rate.<sup>[30]</sup> Topical anticholinergic medication is another commonly used treatment. Astringent medications were topically used as well. The same disadvantage of all these topical treatments is inadequate long-term efficacy.<sup>[31]</sup>

Oral anticholinergics are commonly used for PPH, but one-third of patients discontinue treatment on account of adverse effects.<sup>[32]</sup> Glycopyrrolate and oxybutynin are selective anticholinergics with fewer side effects, and their response rates are approximately 70%, which make them promising treatment options for PPH.<sup>[32-34]</sup> Further study is expected.

Iontophoresis is another effective treatment for PPH, but the exact mechanism remains unclear. The effective rate is approximately 80%, but maintenance treatment is compulsory every 1-4 weeks.<sup>[35]</sup>

Botulinum toxin (BTX) is a common and effective injectable medication for PPH, but the pain caused by injection limits its usage. BTX is usually highly effective within the first 7-10 days after treatment but lasts only 3-9 months or longer, and repeated injection is required to maintain the effects.<sup>[36]</sup>

To date, there are no drugs or methods with stable and durable effects. Novel and better treatments are expected.

**Interventional Therapies**

**Consensus 4: Interventional blockade of the sympathetic chain is not recommended due to its unstable curative effects (level of evidence: 2B; strength of recommendation: strong).**

Interventional therapies have been sporadically reported to treat PPH in recent decades. The sympathetic chain is blocked by ethanol<sup>[37]</sup> or radiofrequency ablation<sup>[38]</sup> punctured through the chest wall with computed tomography (CT) guidance. Symptoms could be improved immediately and maintained for a short term, but recurrence can occur in 20-40% of patients by follow-up. Low identification accuracy of the sympathetic nerves and insufficient blockade of the sympathetic chain are possible reasons for the unstable effects.

## Surgical Treatment

**Consensus 5:** ETS is by far the best treatment choice for PPH with the most stable and durable curative effects (level of evidence: 1; strength of recommendation: strong).

### Mechanism

The secretion of sweat glands is controlled by sympathetic nerves. The preganglionic neurons of the sympathetic nerve are located in the medial lateral nucleus of the spinal cord. The preganglionic fibers exit the intervertebral foramen within the anterior root of the spinal nerve, then deviate from the spinal nerve, and enter the sympathetic chain of the corresponding segment through the white rami communicantes. In the upper thoracic sympathetic chain, ganglia are mostly located at the level of the corresponding intercostal spaces, which means that the T3 ganglion is located in the third intercostal space.

Specifically, it is believed that the sympathetic nerves that innervate the sweat glands of palms originate from the T2–T5 spinal cord. However, it is unclear which segment is the main component. After entering the sympathetic chain, the preganglionic fibers ascend to the stellate ganglion and cervical ganglia to exchange neurons and send out postganglionic fibers to reach the hands. ETS is a method to decrease the sympathetic nervous impulse to the sweat glands of palms by cutting off the upper thoracic sympathetic chain.

### Indications and contraindications

Indications: (1) Patients diagnosed with PPH and otherwise healthy, aged 15–50 years, with a strong desire for treatment. (2) Moderate or severe types of PPH negatively impact daily activities, work functions, and social interactions.

Relative contraindications are as follows: (1) Obesity or body mass index (BMI) >28 kg/m<sup>2</sup>. (2) Age <15 years or >50 years. (3) Patients with underlying diseases but well controlled or cured.

Absolute contraindications are as follows: (1) secondary or systemic hyperhidrosis; (2) severe arrhythmia or bradycardia with heart rate <55 beats per minute (bpm), which cannot return to normal after exercise; (3) severe adhesions in the thoracic cavity were suspected; (4) refractory mental disorders and personality disorders; (5) complicated with other uncontrolled severe diseases; (6) those who cannot understand or are unwilling to accept CH.

### Preparation

Routine examinations included routine blood tests, biochemical tests, coagulation function tests, chest X-rays, and electrocardiograms (ECGs).

Sufficient, thorough, and face-to-face communication with patients before surgery is necessary and crucial. The purpose is to obtain a systematic evaluation of the severity of symptoms and both the physical and mental

conditions of the patients and to inform patients of the exact surgical procedure, the surgical effects, risks, side effects, and the possibility of self-relief of PPH with age. Patients should be asked to participate in the decision-making of the surgery.

### Nomenclature

We recommend the rib-oriented nomenclature advocated by the International Society of Sympathetic Surgery (ISSS) and The Society of Thoracic Surgeons (STS) committees' consensus, which include the location where the sympathetic chain was interrupted and the method of how it was interrupted.<sup>[39]</sup> For example, if we cauterize the sympathetic chain on the 4th rib, which normally means the sympathetic nerve is interrupted above the T4 ganglion, this procedure could be recorded as R4 sympathicotomy (R referring to rib and the number referring to which rib). Sympathectomy means excising a segment of the sympathetic chain. Sympathicotomy means cutting off the sympathetic chain without excising any piece of the nerve. Ramicotomy means cutting off the rami communicante of the sympathetic chain. Clipping means placing a clamp on the sympathetic chain. This standardized nomenclature facilitates better communication between surgeons all over the world.

### Procedure

**Consensus 6:** Compared with sympathectomy and clipping, sympathicotomy is the simplest and most convenient method to intervene in the sympathetic chain with equivalent surgical effects. It is the optimal procedure in ETS for PPH (level of evidence: 1; strength of recommendation: strong).

We recommend bilateral uniportal thoracoscopy under general anesthesia with endotracheal single lumen intubation or laryngeal mask. The patient is placed in a semi-Fowler's position. A cosmetic incision of 1 cm in length made in the third intercostal space in the middle axillary line of both sides is suitable for the operation. The sympathetic chain should be carefully identified and amputated at the third or fourth rib via electrocautery. It is worth noting that the transection range should be laterally extended by approximately 2 cm along the surface of the corresponding rib to amputate any potential bypass nerve fibers (Kuntz fibers). Both the upper and lower lacerated ends of the sympathetic chain should be properly cauterized to prevent nerve regeneration. Finally, a temporary chest tube is placed to fully expand the lung. The incision is sutured with unnecessary chest drainage.

**Consensus 7:** The approach of bilateral armpit incisions is the optimal choice for ETS. The transareolar approach is feasible for male patients (level of evidence: 2A; strength of recommendation: strong).

Except for the incisions mentioned above,<sup>[40,41]</sup> several reports proposed the transumbilical<sup>[42]</sup> and subxiphoid<sup>[43]</sup> approaches with the initial purpose of cosmetic benefits and reduction of postoperative pain.<sup>[44]</sup> These novel approaches are not recommended due to increased

surgical risks and operational difficulty, which compromises surgical safety.

**Consensus 8: R3 and R4 sympathicotomy are both the standard procedures for PPH (level of evidence: 1; strength of recommendation: strong.)**

All the existing case-controlled studies of R3 and R4 sympathicotomy indicated that both procedures had sound curative effects. R3 sympathicotomy has the effect of drier hands and a higher incidence and severity of CH. R4 sympathicotomy has the effect of a mild moist hand and a lower incidence and severity of CH. Patients should be informed about these differences and encouraged to participate in the decision of the intended procedure.

R4 sympathicotomy is considered a better choice than R3 due to its lower incidence of CH and higher satisfaction rate.<sup>[40,45-47]</sup> However, it is noteworthy that approximately half of the patients had the effect of mild moist hands after R4 sympathicotomy, and approximately, 3% had poor therapeutic results, which indeed compromised the curative effects.<sup>[48]</sup> Patients should be fully informed about this and be allowed to participate in the decision of which procedure to perform. These are crucial to ensure patients' satisfaction of the surgical outcomes.

**Therapeutic effect**

ETS is effective in over 95% of cases but decreases slightly with time because relapse may occur. Recurrence rates vary considerably from 0% to 34.8%,<sup>[49]</sup> which may be due to different techniques used (sympathectomy/sympathicotomy/clipping/ramicotomy), different levels of the sympathetic chain interrupted (R3/R4/R2-4), different assessment methods of curative effects used (qualitative questionnaire with subjective bias), and different lengths of follow-up reported. In addition, anatomic variation of the sympathetic chain and possible reinnervation of the dissected nerves may also lead to recurrence. Resympathicotomy is a solution for recurrence, but highly selected patients are advised.

**Complications**

ETS is a typical procedure of bilateral thoracoscopic surgery, so it has all the potential complications of this type of surgery, including accidental bleeding, intraoperative lung injury, pneumothorax, hemothorax, infection, and pain. There will also be the possibility of medical negligence, such as a brachial plexus injury caused by improper posture.<sup>[50]</sup> Since almost all patients who are going to receive this surgery are young people in good health with a high demand for QOL, surgeons must be very careful to avoid all these complications as much as possible.

**Side effects**

Horner's syndrome and bradycardia were the primary side effects of ETS. Improper localization of the second rib is the major reason for the occurrence of Horner's syndrome, but it becomes rare since the interference site

of the nerve was lowered to the third or fourth rib. There have been reports of cardiac arrest or requiring a pacemaker during the procedure.<sup>[51]</sup> Since the left sympathetic nerve is the dominant innervation of the heart, the right-side procedure is suggested to be performed first.

CH is the most common side effect after ETS. It will be introduced exclusively later in the text. Gustatory sweating is another side effect with a reported incidence rate ranging from 1% to 75%.<sup>[52]</sup> It is a phenomenon where excessive craniofacial sweating onset is triggered by special odor or eating spicy/acidic food. The pathophysiological basis for this phenomenon is not yet understood.

**Compensatory Hyperhidrosis (CH)**

**Consensus 9: The acceptance of postoperative CH depends on the sweat volume, the patient's knowledge of CH, and the patient's personality characteristics. An intensive preoperative conversation with patients is helpful to decrease patients' dissatisfaction after surgery (level of evidence: 2A; strength of recommendation: strong).**

**Consensus 10: R2 sympathicotomy or sympathectomy is the main cause of moderate/severe CH. This procedure should not be used in the treatment of PPH (level of evidence: 1; strength of recommendation: strong).**

CH is a phenomenon in which excessive sweating onset occurs in parts of the body other than the hands and is usually triggered by high temperature, irritating foods, mental stress, or nothing at all. This side effect is believed to be the result of a disturbance in the sympathetic system after surgery, but the exact pathogenesis remains unknown. Some patients with extremely severe CH consider it a disaster and regretted accepting the surgery. Some patients even developed suicidal tendencies.

The incidence rate of CH varies considerably because of the same possible reasons as that of the recurrence mentioned in the paragraph of therapeutic effect. According to the literature, the incidence rates of CH of R3 and R4 were up to 100% and 80%, respectively.<sup>[53]</sup> The rates of moderate and severe types were up to 26.8% and 12.4%, respectively.<sup>[53]</sup> We proposed new classification criteria for the severity of CH [Table 3].<sup>[54]</sup> It is noteworthy that preventing or curing CH is the priority in the surgical treatment of PPH.

**Table 3: Grading system of CH.**

Grade	Presentation
Mild	Moist skin with no bothersome features
Moderate	Wet skin with bothersome features, but tolerable
Severe	Obvious oversweating with many bothersome features, barely tolerable with no regret for surgery
Extremely severe	Extreme oversweating, intolerable with regret for surgery

CH: Compensatory hyperhidrosis.

Over the years, the following approaches have been tried and explored for the prevention or treatment of CH.

### Unilateral sequential ETS

Several studies<sup>[55,56]</sup> reported that unilateral sequential ETS could reduce the occurrence and severity of CH with a hypothetical explanation of upregulation of sweating in the contralateral hand and downregulation of thermoregulatory sweating of the trunk and lower limbs during the interval between two-stage surgeries. When the contralateral hand is denervated, both hands will stay dry, and the downregulation will remain in the trunk and lower limbs. This is an interesting finding but the real mechanism requires more investigation. Further study is thus advocated.

### Ramicotomy

Early studies indicated that ramicotomy compromised the curative effect with higher recurrence.<sup>[57]</sup> Recently, Akil *et al*<sup>[58]</sup> reported a cohort of 51 patients who underwent T2–T5 ramicotomy and achieved good curative results, and no CH occurred after a 12-month follow-up. The authors concluded that T2–T5 ramicotomy was effective in reducing CH. We recommend further studies on larger cohorts and comparisons with controlled groups to verify their findings.

### Expanded sympathicotomy

Han *et al*<sup>[59]</sup> reported that expanded sympathicotomy (R3 or R4 sympathicotomy extended to R8 or even to R12) could reduce CH effectively. The authors assumed that CH occurs through the remaining sympathetic chains from the hypothalamic reflex arc. The expanded intervention could block sympathetic innervation to the trunk. Since it was a retrospective subgroup analysis with 67 patients, we recommend further investigation with larger cohorts to test their conclusions.

### Removal of clip

The history of clipping surgery to treat PPH goes back over 20 years, and there has been dispute on the effect of the surgery and the reverse effect of clip removal. Hynes *et al*<sup>[60]</sup> proposed that CH could be alleviated when the clip was removed among patients who underwent clipping of the sympathetic chain to treat PPH. Therefore, they advocated the clipping method prior to sympathicotomy. This is controversial since another study showed that it was irreversible due to neural degeneration.<sup>[61]</sup>

### Nerve reconstruction

Autogenous nerve grafts or nerve reconstruction may be a possible solution to treat CH. Several case reports demonstrated the use of the intercostal nerve,<sup>[62]</sup> the sural nerve,<sup>[63]</sup> or a small segment of the superficial vein of the forearm<sup>[64]</sup> to reconnect the two ends of the sympathetic chain and obtained good results. We recommend and encourage these promising attempts.

### Ganglionectomy guided with laser speckle flowgraphy

Yamamoto *et al*<sup>[65]</sup> reported that ganglionectomy guided with laser speckle flowgraphy is a potential way to cure CH. Patients with severe CH were reoperated on, and laser speckle flowgraphy was utilized to observe the blood perfusion of the skin. The related skin area of CH was determined by electrical stimulation of the sympathetic ganglion during the operation, and ganglionectomy of positive ganglia was performed. The results showed that excision of the appropriate ganglia is an effective treatment for CH.

### Oral medication

Teivelis *et al*<sup>[66]</sup> reported using oxybutynin to treat bothersome CH in 21 patients and achieved a moderate to major improvement of CH in 15 patients with acceptable drug toxicity. Accordingly, oral medications may be a viable choice for dealing with CH, and more detailed research is expected.

In general, PPH is a very unique disease whose etiology is still being explored. Its diagnosis should be objectively based on the amount of sweat and subjectively based on the patient's perception of sweat. This consensus emphasizes the need for special attention and careful assessment of the patients' feelings, as well as their emotional and mental state, and this should be a crucial reference for the decision of treatment. The sympathetic nerve is an important structure with complex functions in the human body. ETS is thus far the most effective method for the treatment of PPH. However, special attention should be given to the side effects of the surgery, especially CH. This consensus provides a more nuanced delineation of CH. All consensus with PPH who are ready to receive this surgery must be ensured that they have been clearly informed and have a true understanding of CH. We encourage all new attempts to prevent and treat CH. We look forward to more accurate and individualized surgical methods in the future to further improve the effect of surgical treatment for PPH.

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### Conflicts of interest

None.

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