



# How to select patients properly for surgical treatment of hyperhidrosis?

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## Introduction

The history of sympathetic surgery has begun at the 19th century (1). At that time, the scientific knowledge about the autonomous nervous system and its disorders was minimal. Due to this, the selection of patients and the surgical indications for procedures on the sympathetic chain were quite imprecise, and thus, the results were anecdotal.

In 1920, Kotzareff (2) described the first sympathectomy performed to treat a patient with hyperhidrosis and in 1942, the first thoracoscopic sympathectomy was published by Hughes (3). Since then, more refined and minimally invasive surgical techniques/instruments have been developed. Simultaneously to this technical evolution, the amount of information available about the function—and therefore, also the dysfunctions—of the autonomic nervous system has also increased significantly and, as a result, the selection of patients for sympathectomy and the surgical indications to treat hyperhidrosis have changed dramatically.

Although some controversy still persists, endoscopic thoracic sympathectomy (ETS) is associated with excellent clinical results for the treatment of patients with primary hyperhidrosis. Among all these patients, those who benefit the most from surgery are the ones with hand sweating complaints, making primary palmar hyperhidrosis the most common indication of ETS worldwide.

Nevertheless, the procedure can also achieve very good clinical outcomes in certain cases of axillary hyperhidrosis and facial hyperhidrosis/blushing. Other unusual indications for ETS (non-related to primary hyperhidrosis) are not intended to be discussed in this article.

Whenever an ETS is intended to be the strategy to treat hyperhidrosis, the “key for success” of this procedure and its postoperative results resides majorly on two main aspects: the adequate preoperative selection of patients and the correct intraoperative approach to the target level of the sympathetic chain.

The present paper will focus precisely on this patient selection process for ETS, which is essentially based on a detailed clinical history and a careful physical examination.

## How to select the correct patient for ETS?

First of all, the appropriate selection of patients for surgical treatment of hyperhidrosis by ETS must take into consideration the fact that this disease affects patient’s quality of life, but definitely poses no risk at all to life. Starting from this premise, it is natural to assume that a judicious preoperative assessment is mandatory for all potential candidates to ETS.

When evaluating these patients, the first step of this assessment—and perhaps the most important—is a detailed clinical history focused on the sweating complaints. This step is followed by a careful physical examination. In most patients, additional tests are not needed, but can be performed, if necessary. Tests to measure the amount of sweat production exist, although their usefulness within the context of the preoperative clinical assessment is not significant. The information provided by patients about their symptoms during a simple surgical consultation is usually sufficient to clarify the diagnosis of hyperhidrosis

**Table 1** Useful criteria to select patients (or not) for ETS

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Clear distinction between primary from secondary hyperhidrosis
Definition of the exact location/intensity of sweat complaints and its real impact on patient's quality of life
Identification of concomitant overweight or obesity
Report of chronic/regular use of specific medications that can affect sweat production
Report of past pleuro-pulmonary diseases and/or previous thoracic surgeries that can predict technical difficulties during ETS
Hyperhidrosis in patients with clinically relevant associated diseases
Special situations regarding patient's age: children within the first decade of life and adults over 40 years old

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ETS, endoscopic thoracic sympathectomy.

and to detect potential issues that may interfere with surgical results, disappearance of symptoms and patient's postoperative level of satisfaction/quality of life.

Even though there are no absolute contraindications to ETS, some particular clinical conditions are clearly linked to worse surgical outcomes and must be identified preoperatively, in order to detect cases that should be potentially excluded from surgical treatment.

With this regard, we have selected what we consider the main criteria that must be carefully analyzed by proper clinical judgment to improve the selection of patients for ETS, aiming to obtain the best risk-benefit ratio for the intended surgery. These criteria are shown in *Table 1* and each one of them will be discussed in detail within this text.

### ***Distinguishing primary from secondary hyperhidrosis***

According to the expert consensus published by the Society of Thoracic Surgeons (STS) in 2011 (4), hyperhidrosis is described as a dysfunction characterized by sweat production beyond the physiological needs for body's normal thermoregulation. Hyperhidrosis can occur as a clinical manifestation of several systemic disorders, representing only a part (a symptom) of another disease, which is usually clinically evident or easily identified. In these cases, the so-called secondary hyperhidrosis must not be treated with surgery and all therapeutic efforts should be engaged to the underlying main clinical condition.

In the other hand, the diagnosis of primary hyperhidrosis is usually represented by excessive sweating complaints occurring as the main scenario, with no other systemic causes related to it. In these cases, hyperhidrosis is the "disease itself" and its hallmark is the isolated and localized excessive sweat.

This distinction between primary and secondary

hyperhidrosis is usually made through clinical history and physical examination and it is of crucial importance, because surgical treatment is not an option in secondary hyperhidrosis, whereas it is clearly one of the most valuable therapeutic tools to treat—and cure—primary hyperhidrosis patients.

In primary hyperhidrosis, sweat overproduction is typically focal, being presented mainly as palmar (hands), axillar (armpits), and/or plantar (feet). Craniofacial hyperhidrosis is also described, isolated or combined with facial blushing.

This condition affects around 2% to 3% of the people. Both genders are affected equally, and it seems to exist some genetic susceptibility (5).

The classic clinical presentation is characterized by the report of localized excessive sweat since early childhood (particularly in hands). Throughout the years, the intensity of the complaints usually increases, bringing to patients a broad spectrum of limitations and inconveniences, which ultimately lead to a substantial impair in their quality of life. In these patients, it is very common to observe a disturbing sweat overproduction even when there is no obvious stimulus to that.

Psychological, emotional and physical stresses tend to exacerbate the symptoms, which do not depend on the environment temperature and are evidently disproportional to it. An additional hallmark of primary hyperhidrosis is that the excessive sweat does not happen when the patient is sleeping.

In the other hand, secondary hyperhidrosis happens as an effect derived from another condition. In these patients, hyperhidrosis is not the disorder itself, but a symptom of another underlying process. The excessive sweat is classically widespread (not localized) and the clinical manifestation frequently starts when patients are

already grown adults, usually overlapping the origin of the primary illness. Sweat overproduction can be observed independently from patient's consciousness, occurring during sleep as well as when the patient is awake. In secondary hyperhidrosis, the role of stress is much less clear. The list of known causes of secondary hyperhidrosis is extensive and include the following: warm/hot environment (exogenous source of heat), obesity and other diseases such as hyperthyroidism, diabetes mellitus, pre/peri-menopause disturbances, neuroendocrine tumors, hematologic malignancies, neurologic disorders, spinal cord injuries, as well as tuberculosis and other infections.

#### ***Definition of the exact location/intensity of the sweat complaints and its real impact in patient's quality of life***

Defining exactly where and how an individual is affected by hyperhidrosis is a quite reliable way to estimate the real impact of excessive sweating in someone's life. In addition to that, the precise characterization of sweat complaints can help the thoracic surgeon to anticipate if a patient is suitable (or not) for surgical treatment and to evaluate the potential for good results after ETS, besides being useful for a better surgical planning.

The best outcomes post-ETS are accomplished in individuals with palmar hyperhidrosis. In these patients, symptoms disappearance and improvement in quality of life is close to 100% and ETS is accepted as the first-line therapy. Patients presenting with palmar-axillar excessive sweat also high levels of postoperative satisfaction, mainly because of the disappearance of the palmar complaint.

Those individuals with pure axillary hyperhidrosis may reach a poorer grade of satisfaction after ETS and must be initially directed to non-surgical therapeutic strategies. Ideally, they can become potential candidates to ETS only if less invasive treatments show to be ineffective.

Individuals presenting with craniofacial hyperhidrosis and/or facial blushing compose a specific group: postoperative results are remarkably good regarding the disappearance of complaints; nonetheless, because of the mandatory interruption of the sympathetic chain at the level of second rib/second thoracic ganglion, these patients are exposed to a greater risk of compensatory hyperhidrosis concerning to its incidence and intensity. It demands these individuals to be cautiously elected for ETS, only after a full and conscious understanding of every possible risks and benefits related to the interruption of sympathetic chain at the mentioned level.

Regarding the intensity of symptoms, it is necessary to clarify how the excessive sweat is described by the patient and how it is observed by the thoracic surgeon during the physical examination. However, even more important than that is to understand how the patient really feels about the complaints.

In practice, in addition to the detected sweat, the way the patient describes his social limitations and compromised quality of life is a strong indicator that the patient may benefit from the surgical treatment. On the contrary, even if a patient indeed sweats excessively, if this condition is not perceived as a major problem by the patient, the role of any surgical intervention should be questioned.

Naturally, from someone presenting with an evident excessive sweating, a story of a significant impact in quality of life is expected and consequently, the surgical treatment will play an important role.

#### ***Concomitant overweight or obesity***

Overweighed and obese patients tend have worse outcomes after ETS, especially due to a higher risk of severe compensatory hyperhidrosis. When submitted to surgery, these patients also tend to report a higher postoperative regret rate. The STS consensus (4) recommends that patients should maintain their body mass index (BMI) under 28 to be accepted for a possible ETS procedure. In our practice (6), we advocate that the ideal patient for ETS must have a BMI <25, as well as we strongly advise these patients to keep their normal weight even after surgery, in order to reduce the risk of postoperative compensatory sweating.

It is always important to highlight that the best strategy against compensatory hyperhidrosis is still focused on its prevention (7), as much as possible, since its treatment is difficult.

#### ***Chronic/regular use of medications that can affect sweat production***

Every doctor who deals with hyperhidrosis patients must be aware that hyperhidrosis can be pharmacologically induced (8). Antidepressants, opioids, selective serotonin reuptake inhibitors and cholinesterase inhibitors are a few examples of medications that can increase sweat production and thus, lead to a drug-induced hyperhidrosis, a quite frequently neglected clinical situation.

Every patient with sweat complaints who might be a potential candidate to ETS must have his own medical history

reviewed in detail, particularly those with neurologic disorders and/or under psychiatric treatment. All medications in regular/chronic use should be listed, in a way that any possible drug side-effects that could be related to the hyperhidrosis can be identified. Special attention should be paid if the begin of sweating complaints coincides with the start of drug administration.

In cases where excessive sweat is caused by one or more medications, dose reduction, drug substitution or discontinuation are the possible strategies. In these cases, the surgical indication for ETS must be kept on hold and the procedure should be reserved only for those patients the hyperhidrosis is proven to be not drug-related.

#### ***Previous pleuro-pulmonary diseases and/or thoracic surgeries that can predict technical difficulties during the intended ETS procedure***

During the first surgical consultation, patient's past medical history must include questions about previous pleural and/or pulmonary diseases such as pneumonia, tuberculosis, suppurative processes, pneumothorax, hemothorax, pleural empyema or other previous episodes of pleural effusion, as well as possible precedent surgical procedures within the pleural cavity. All these conditions may foresee the presence of intrathoracic pleuropulmonary adhesions that can make the intended ETS more prone to intraoperative pitfalls, postoperative complications and surgical failure.

Of course, none of these situations represent an absolute contraindication to surgery, but they surely bring relevant information, which constitute a very important part of the selection process of patients for ETS and therefore must not be ignored.

#### ***Hyperhidrosis in patients with clinically relevant associated diseases***

With respect to relevant clinical conditions that may coexist with primary hyperhidrosis, their importance on the selection process of patients for ETS is a simple matter of risk-benefit ratio.

Considering the fact that hyperhidrosis is a benign, non-fatal and long-term illness, patients presenting with associated systemic diseases severe enough to represent an elevated surgical risk for ETS should not be considered surgical candidates upfront. If these patients still call for a possible surgical treatment for hyperhidrosis, a detailed

preoperative workup focused on the best compensation achievable of their pathologies is mandatory to define if they can become eligible to surgery. In some cases, it will never be the case and ETS shall not be an option to treat them.

#### ***Special situations regarding patient's age: school-age children and adults over 40 years old***

Theoretically, ETS can be performed at any age, since the patient's body is large enough to get the surgical instruments easily through the ribs (9,10).

Primary hyperhidrosis patients are almost always young and fit. This healthy profile is a consequence of the nature of primary hyperhidrosis condition, in which the excessive sweat is usually noticed very early in childhood and tends to become more disturbing in adolescence, making the majority of patients to seek medical attention mostly between the second and third decades of life.

Even when the excessive sweat is felt within the first decade of life, it is common that patients only perceive it as a real problem when they become teenagers. The concept of "self-perception" is strongly linked to our own bodies and it usually becomes more acute with the end of childhood. That's exactly when the patient realizes that this inconvenient situation can interfere with social interactions and worsen quality of life.

In our opinion, the surgical indication must consider and address this awareness. It explains our preference to perform ETS only in those individuals who have maturity enough to precisely recognize in what magnitude hyperhidrosis is worsening their quality of life, in order to validate surgical indication, considering all the possible benefits and risks related to the intervention (11). In practice, it means that we do not perform ETS in children just to satisfy their parent's request, even when the diagnosis is evident. Once fulfilled this norm, it is interest to mention our impression that a younger age might be a predictor of good outcomes after ETS, with respect to the control of symptoms, postoperative satisfaction and the risk of compensatory hyperhidrosis. These findings are based only in our personal experience, but they seem to be corroborated by the study of Bell and coworkers (12). However, some available data show the opposite and thus an open debate about this topic still remains. Leiderman and coworkers (13) published a series suggesting that older age is associated with better control of sweating complaints, although postoperative quality of life

and occurrence of compensatory hyperhidrosis was similar in all ages analyzed in this study.

Regardless any controversy, it is absolutely acceptable that older patients with primary hyperhidrosis, who haven't had prior specialized evaluation for any reason, can also seek for surgical treatment and become candidates for ETS. Since the diagnostic criteria and clinical eligibility are fulfilled, there is no reason to preclude this population from a potentially curative treatment.

## Summary

Primary hyperhidrosis usually leads patients to a poor quality of life. Although some controversies still exist, in the majority of cases, ETS still remains as the main option for curative treatment.

The thoracic surgeon must be judicious in the clinical preoperative assessment to accurately select which patients will fit for surgical treatment by ETS, considering all the potential risks and benefits related to this procedure.

The adequate preoperative selection of patients and the correct intraoperative approach to the target level of the sympathetic chain are the keys for the best surgical results.

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