

# Long-Term Results of Endoscopic Thoracic Sympathectomy for Upper Limb Hyperhidrosis

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**Background.** Immediate results of endoscopic thoracic sympathectomy (ETS) for hyperhidrosis are good. Adverse effects are well known but are supposed to decrease with time. We report the long-term results of ETS with regard to efficacy, side effects and patient satisfaction.

**Methods.** From 1993 to 1998, 382 patients suffering from hyperhidrosis of the upper limbs were operated on by means of bilateral ETS. One hundred twenty-five could be reached. There were 91 females and 34 males with a mean age of 28 years. The mean follow-up was 3.8 years (range: 24 to 84 months). Patients answered a detailed questionnaire from an independent observer addressing the following issues: stability of the initial result, outcome of side effects, degree of satisfaction.

**Results.** The global recurrence rate was 8.8%: 6.6% for palmar hyperhidrosis and 65% for axillary hyperhidrosis. Compensatory sweating was observed in 86.4% of the patients. It was considered as minor by 61% of them, as embarrassing by 31.5%, and as disabling by 7.5%. Other

reported side effects were: Horner's syndrome in 3 patients (2.4%), healing in 2 of them; chronic rhinitis in 3 (2.4%); gustatory sweating in 9 (7.2%); and hand dryness in 42%. Sixty-five percent of the patients were fully satisfied, 28.7% were globally satisfied, and 6.3% regretted the operation. Ninety-two percent of the patients claimed they would ask for the operation if it were to be redone.

**Conclusions.** This study confirms that results of ETS are good and stable for palmar hyperhidrosis but deteriorate for axillary hyperhidrosis. Compensatory sweating does not improve with time and is the main cause of dissatisfaction. Recommendations drawn from these results are the following: (1) patients suffering from isolated axillary hyperhidrosis should rather be treated by local therapy; (2) patients should be better informed of adverse effects.

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More and more patients with severe palmar hyperhidrosis (HH) are referred to the surgeon for endoscopic thoracic sympathectomy (ETS). The dramatic efficiency of surgery on hand sweating has made ETS popular among patients and physicians. Complications such as Horner's syndrome (HS) or adverse effects such as compensatory sweating (CS) have been reported, but according to most authors are supposed to vanish with time [1-3] and are sometimes considered as a minor drawback. However, very few studies do report a long-term follow-up [4] because following these patients is difficult. They are usually young, thus relocate frequently, and do not see the need for surgical control once they have been treated. When patients are seen 1 or 2 months after surgery, they are usually amazed by the result. Thus, some consequences of the operation remain in the background, for example, postoperative pain or hand dryness. Conversely, side effects like CS are often not perceived. Evaluating the global result of the operation is therefore difficult.

The aim of this study was to check whether patients,

after some years, were satisfied or dissatisfied in terms of efficiency and side effects. The study did not aim at dealing with the initial results and postoperative complications that have been recently reported in this journal [5].

## Patients and Methods

From 1993 to 2001, 530 patients have been operated on for upper limb hyperhidrosis. The 382 patients with a minimal follow-up of 2 years were selected for the study. Only 125 of them could be reached (33%). This high rate of loss for follow-up is due to the young age of most patients and to their dispersion throughout the country. There were 91 females and 34 males, ranging in age from 15 to 56 years (average: 28.2 years). This subgroup was comparable to the general group of 382 patients, in terms of age, gender distribution, and complaint.

Most patients were suffering from both palmar and plantar HH (9.04%), but their main complaint was hand sweating. Precise distribution of sweating is reported in Table 1. All patients considered themselves as severely handicapped: 77% avoided shaking hands, 17% had to wear gloves to achieve some tasks, and 19% said their choice of their professional life had been directly influ-

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Table 1. Distribution of Sweating Before Surgery

Palmar and plantar	30%
Palmar, axillar, and plantar	51.2%
Palmar, plantar, and facial	6%
Palmar, axillar, plantar, and facial	4.8%
Axillar only	8%

enced by their handicap. Ninety-two percent of the patients had tried medical therapy before undergoing surgery. Sixty-two percent of them had iontophoresis that was either unsuccessful or poorly tolerated. A majority of the patients (95%) had decided to be operated on because of failure of medical therapy while some (5%) said they had grown weary despite some efficiency of iontophoresis.

#### Technique

The technique has been described previously [6]. The procedure was performed under general anesthesia and selective tracheal intubation. No CO<sub>2</sub> insufflation was used. A 5-mm 0° telescope and two additional 3-mm ports for microinstruments were used. The mediastinal pleura was opened and the sympathetic chain was dissected, severed, and removed from the second thoracic ganglion (T2) to the fourth (T4). Dissection was carried out with high frequency cautery, except at the level of T2 where no coagulation was used in order to prevent current diffusion to the stellate ganglion. Accessory fibers and Kuntz's nerve were located and coagulated. In addition, parietal pleura over the rib was transversally cut from the sympathetic trunk, at T3 and T4 level [7]. The above described technique was used in most patients (111 patients). In 14 patients, a technique of selective sympathectomy was performed. Hence, the main trunk was preserved and only the Rami Communicantes were divided, according to the description of R. Wittmoser [8]. This technique aimed at reducing the rate of CS. Because of the high recurrence rate [6], it was abandoned for a conventional technique, that is, complete division of the sympathetic chain between T2 and T4.

At the end of the procedure, a 16F chest tube was left in place for a few hours. It was removed after checking the chest Roentgenogram and the patients were usually discharged the morning after surgery. All patients received an analgesic prescription and a recommendation form. In the beginning of our experience, the procedure was performed in two stages after an interval of 2 weeks (51 patients). Then both sides were done as a one-stage procedure (74 patients).

Time between the operation and this study ranged between 2 and 7 years (average: 46 months). All patients were contacted by phone. They answered a detailed questionnaire regarding the early and long-term results, side effects, and satisfaction rate. The same independent observer (A.P.), who did not belong to our department, posed all questions. A sweating index was defined in order to evaluate the evolution of hyperhidrosis with time. One hundred was defined as the level of sweating

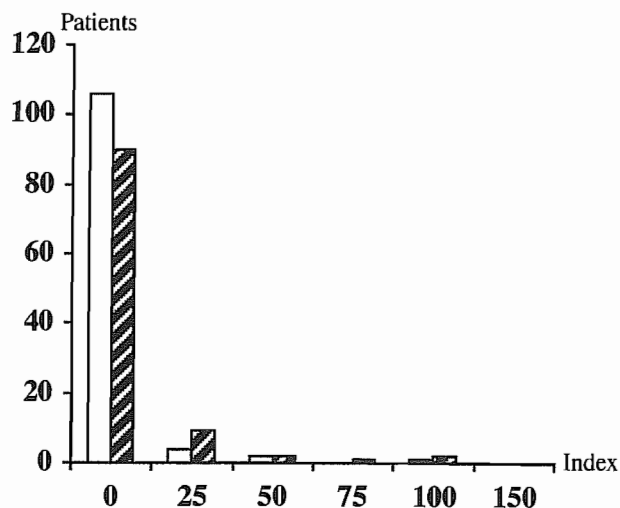


Fig 1. Evolution of palmar hyperhidrosis with time. One hundred is the level of sweating as estimated by the patient before surgery. □ = postoperative score; ▨ = score at 46 months.

as estimated by the patient before surgery. Patients were asked how this index had evolved with time.

#### Results

There was no initial failure of ETS. The result remained good in 114 patients (91.2%), while 11 patients experienced complete or partial relapse. Figure 1 demonstrates that efficacy of ETS for palmar HH remained almost constant with time in all but 5 patients. Four of these 5 patients had been operated on according to the selective technique [6]. With regard to axillary HH, only 35% of the patients said the result was stable. The others had partial (47%) or complete (17%) relapse (Figure 2).

Seventy-five percent of the patients complaining of

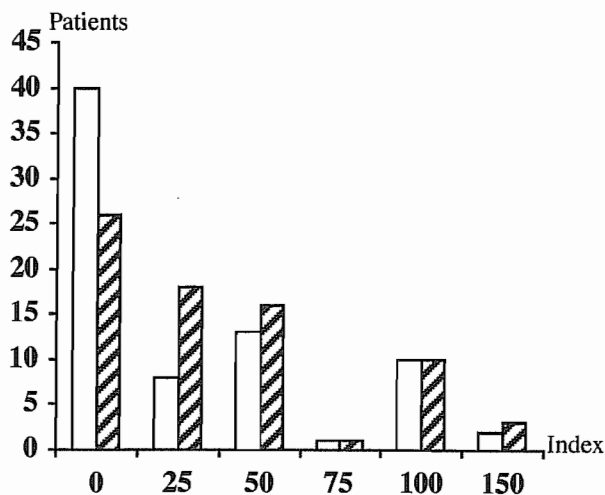


Fig 2. Evolution of axillary hyperhidrosis with time. One hundred is the level of sweating as estimated by the patient before surgery. □ = postoperative score; ▨ = score at 46 months.

Table 2. Compensatory Sweating Rate and Satisfaction Rate After ETS for Palmar Hyperhidrosis

Author	N	Mean Follow-Up	CS (%)	Fully or Partly Satisfied (%)	Unsatisfied (%)
Herbst and colleagues [4]	270	14.6 years	67.4	93.3	6.7
Duarte and Kux [2]	140	1-4 years	5	96.5	3.5
Rex and colleagues [13]	1152	38 months	59.8	97.5	2.5
Lardinois and Ris [3]	37	34 months	72	95	5
Lai and colleagues [15]	72	18 months	98.6	78	22
Chiou and Chen [16]	91	22 months	97	87	13
Present series	125	46 months	86.4	92	8

CS = compensatory sweating; ETS = endoscopic thoracic sympathectomy.

associated plantar hyperhidrosis said they had noted no change in respect to this problem, 10% had some increase of plantar sweating, and 15% were improved by ETS. Some were even cured by surgery.

Patients were asked about postoperative pain. At the time they were questioned, most patients said they remembered having experienced significant postoperative pain, but none complained of persisting pain after 1 year.

Three patients had a unilateral Horner's syndrome (2.4%). It healed spontaneously in 2 patients within 6 months. For the third patient, ptosis persisted for more than 6 months and he underwent a blepharoplasty.

Most patients experienced hand dryness in the weeks following surgery. Forty-two percent said it persisted after 6 months. The majority of them (86%) considered this a minor concern and 14% disturbing. None of them saw this side effect as disabling.

Two patients (1.6%) noticed a change in their taste and complained of metallic taste in their mouth. Nine patients (7.2%) had a gustatory sweating, which was considered disturbing by 4 of these patients. Three patients (2.4%) complained of chronic rhinitis.

Compensatory sweating was mentioned by 108 patients (8 6.4%). It was described as mild by 66 patients (61%), disturbing by 34 patients (31%), and disabling by 8 patients (7.5%). These later complained of the need to change clothing during the day and were seeking medical therapy. In two of them,  $\beta$ -blockers were tried without success. Compensatory sweating was usually predominately on the trunk.

Patients were asked to indicate their degree of satisfaction, taking into account the results on hyperhidrosis and the onset of potential adverse effects. Sixty-five percent were unreservedly satisfied, 28.7% were globally satisfied (ie, the benefit of surgery was superior to adverse effects), and 6.3% said they regretted having been operated on. Most of the patients who declared they were satisfied said they regretted having waited so long before electing to undergo surgery and some said they had experienced a sort of rebirth. For those dissatisfied, the main reason was severe CS (5 of these 8 patients).

The last question of the questionnaire was "If necessary, would you be reoperated on?" A large majority answered "Yes" (92%) and a minority "No" (8%). The reasons given were as follows: disabling CS in 6 patients;

failure in 1 patient; major postoperative pain in 1 patient; and no reason was given by 2 patients.

### Comment

Endoscopic thoracic sympathectomy (ETS) is known to be a very efficient method for treating palmar HH. Its success rate is greater than 95% in most series. It is lower for axillary HH [4]. Our relatively low success rate (91%) was attributed to the trial of selective HH [6]. Four of 5 patients who recurred from palmar HH belonged to this group. The technique has described by R. Wittmoser [8]. It consisted in the division of the Rami Communicantes with preservation of the main trunk. It aimed at reducing the rate of CS. Actually the difference with a conventional technique was not significant and some relapses were observed [6]. This technique was therefore abandoned. It seems that recurrences usually arise within the first 18 months [9]. Only 1 patient operated on for palmar HH with a conventional technique had a recurrence. Thus our results confirm those of previous studies [1, 4, 9-13]: sympathectomy is an efficient and reliable operation for palmar HH and its results remain constant with time. With regard to axillary HH, our results are similar to those of previous series [4, 14], that is, they do not remain that stable in the long-term. Efficacy of the technique cannot be the only criteria of judgment. Adverse effects must also be considered.

Compensatory sweating is a troublesome side effect of ETS whose incidence is difficult to assess, because the reported rates vary from 3% [2] to 98% [15]. The usual reported average rate is around 60% (Table 2). High rates of CS are found in studies from countries with hot and humid climates [16]. Andrews and Rennie [17], who have recorded the occurrence of CS after ETS in a predictive manner in 42 patients, reported that 36 patients (86%) suffered from CS. Ten of these patients considered CS as severe. Most patients consider CS as a minor drawback, which is much more bearable than their former condition. But others find CS troublesome. In some rare cases, CS may be so disturbing that patients ask for reconstruction of the sympathetic nerve [18]. Thus, the rate and the importance of CS are underestimated. With regard to CS rate, numerous factors may explain the discrepancy between the various studies. As mentioned by Lai and coworkers [15], the climate plays a major role. In their

series, patients lived in a hot environment (Taiwan) and most (98%) complain of CS [15]. In another series from Taiwan, the rate of CS was comparable (97%) [16]. This has also been noticed by surgeons from Middle East countries [19]. One may assume that patients from Europe or North America do not complain about CS at the same level according to the time of year (winter or summer) that they are seen in consultation. In addition, it is often written that CS progressively disappears with time [1, 9, 10, 20]. Our experience demonstrates that CS was still present after more than 2 years and patients did not report improvement with time. Our experience also illustrates that some patients who just mentioned mild CS when seen in consultation 2 months after surgery may complain of severe CS some months later. This may be partly due to the fact that patients are initially so satisfied to be relieved from their HH that CS is minimized. With time, patients get familiar with their new condition and progressively forget how much they were handicapped. Therefore, adverse effects appear in the foreground. The average follow-up is 46 months, so the outcome cannot be anticipated in the very long-term, but it has to be admitted that the common assertion that CS vanishes with time is most likely wrong. Herbst and colleagues [4], who had a follow-up of 14 years, reported CS in 67% of their patients.

Alternate operations have been proposed to reduce the occurrence of CS. Al Dohayan [19], a surgeon from Saudi Arabia who deals with patients living in a very hot climate, has proposed performing a unilateral sympathectomy on the dominant hand side. Doing so, he observed a reduction of CS. None of his patients suffered from severe CS. Some authors hypothesized CS was correlated to the extent of the sympathectomy. A limited sympathectomy, performed by van't Riet and coworkers [21], transected the sympathetic chain cranially and caudally to the third ganglion (T3). In a series of 14 patients they did not observe any CS with a mean follow-up of 3.5 years. Others proposed limiting sympathectomy to the resection of the second ganglion (T2). Chiou and Chen [16] have performed a T2 resection in 91 patients. The immediate success rate was 99%, but 16% of the patients had a recurrence after a mean follow-up of 22 months and 97% after suffered from CS. Lai and colleagues [15] did not note significant difference between T2 and T2-T3 sympathectomy with regard to CS.

Lin and colleagues [22] described a technique of mere clipping of both ends of the T2 ganglion. The total rate of CS was not mentioned, but 5 patients were reoperated on for disabling CS. The procedure consisted of the removal of the clips. Four recovered from their CS. Although these techniques look interesting, one may wonder whether the efficacy of the operation will remain stable with time. Lai and coworkers [15] suggested that limited resection may lead to recurrence in the long-term. Chiou and Chen [16] reported a recurrence rate of 16% after limited T2 resection, some of which occurred only 2 weeks after surgery. At the time we were performing limited sympathectomy with preservation of the sympathetic trunk and division of the rami, we had to face early

relapses [6]. This most likely means that reinnervation is possible, as suggested by some authors [23, 24].

The rate of unsatisfied patients was similar to the rate reported in other studies (Table 2). As mentioned in most series, the main reason for dissatisfaction is CS. Herbst and colleagues [4] observed that CS was a complaint that increased in importance after years. In their series, the satisfaction rate was 95.5% in the early postoperative period and decreased to 67% in the long-term [4].

Although patients have always been aware of CS, some of them complained they had not been clearly warned. It is therefore of utmost importance to give both oral and written information without minimizing the problem. Some patients with associated psychologic problems should be referred to the psychiatrist for consultation. In doing so, some patients will not be selected for surgery and others will renounce it on their own. Those who do have the surgery will better tolerate eventual CS because they will have been better prepared. Application of ETS for isolated axillary HH seems questionable [14]. In these patients a less invasive method should be first considered, such as axillary liposuction [25] or botulinum toxin injections [26]. Naumann and coworkers [27] have demonstrated that 94% of the patients responded to botulinum toxin injections at week 4. The mean duration of benefit was about 7 months. Those patients relapsing could be treated by repeated injections [27]. In this indication, sympathectomy should be the last solution.

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For April, the article chosen for discussion under the

Adult Cardiac Surgery Dilemma Section of the Discussion Forum is:

### Awake Coronary Artery Bypass Grafting: Utopia or Reality?

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