

Quality of Life, Before and After Thoracic Sympathectomy: Report on 378 Operated Patients

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Background. Thoracic sympathectomy is indicated to treat primary hyperhidrosis. The objective is to analyze the results and complications of thoracic sympathectomy and propose a questionnaire to assess the quality of life of patients.

Methods. Between October 1995 and March 2002, 378 patients were evaluated. Sixty-two percent were female, with a mean age of 26.8 years old (range 9 to 70 years old). There were 57.4% patients with palmar-plantar hyperhidrosis; 25% with palmar, plantar, and axillary hyperhidrosis; 15.7% with pure axillary hyperhidrosis; and 6.5% with craniofacial hyperhidrosis. General anesthesia was used in 97.3%, epidural with sedation in 2.7%. The sympathetic chain was resected in 12.5%, thermal ablation with the electrical scalpel was performed in 66.3%, and with the harmonic scalpel in 21.2% of the patients.

Results. Successful sympathectomies were performed in 90.3% of the patients; the follow-up was from 1 to 60

months (mean 12.4 ± 8.3 months). The recurrence rates were 8.2% for palmar hyperhidrosis, 13.7% for pure axillary hyperhidrosis, 27.5% of which were reoperated successfully. Improvement of the plantar hyperhidrosis was also registered in 58%. Horner's syndrome was reported in 1% with regression in half of them after 30 days. No mortality or serious complications were observed, nor the need to convert to thoracotomy. Of the total number of patients, 93.4% answered the quality of life questionnaire, 86.4% of whom noted improvement after the procedure.

Conclusions. Thoracic sympathectomy is a simple, effective, safe method for the treatment of hyperhidrosis, resulting in an improved quality of life for patients. The questionnaire documents this change.

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Hyperhidrosis (HH) is defined as excessive sweating beyond physiologic needs, which results in profuse sweating of the palms, axillae, feet, and face, and is of unknown etiology. It is associated with severe emotional, occupational, and social distress. HH affects approximately 1% of the population, and mostly is prevalent in adolescents or young adults. Approximately 12.5% to 56.5% of the patients are associated with a family history [1].

Local, topical, medical, and psychologic therapies of HH are either not commonly helpful or the effects are usually temporary. Nowadays the resection or ablation of the paravertebral sympathetic chain is the therapy of choice, offering immediate and permanent symptom relief. The utilization of video-assisted thoracic surgery (VATS) to perform thoracic sympathectomy has fostered progress in the treatment of HH, and this type of surgery is being increasingly performed and confirmed by many authors [2, 3]. Once secondary causes of HH have been ruled out, surgical treatment should be contemplated.

In the last 10 years, thousands of surgeries have been

reported, but few authors have utilized objective measurements to assess their results. Nowadays, quality-of-life (QOL) questionnaires have been devised and must be included to objectively evaluate and to confirm that using VATS to perform sympathectomy can improve both patient's symptoms and the overall QOL [4]. However, there are still very few studies, especially prospective ones, with a significant number of patients. Even the ones that already exist [5, 6] have not made use of a specific questionnaire to assess these types of patients. Based on the studies by Amir and coworkers [7] we have devised a specific questionnaire, which has been consecutively applied to all the patients we have operated on, in order to evaluate the patients with HH. The goal of this study is to assess the results of VATS sympathectomy in a large number of patients with HH using a specific QOL questionnaire.

Material and Methods

Between October 1995 and September 2002, 378 patients operated on for HH using VATS were surveyed. This was a prospective, nonrandomized and uncontrolled study. The patients underwent similar treatment, following the same protocol, according to the ethical standards of the

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Table 1. Surgical Technique for Hyperhidrosis

Surgical Technique	Thoracic Ganglia
Palmar-Plantar	T2
Palmar-Axillary-Plantar	T2-T3
Pure axillary	T3-T4
Facial	T2

Committee of Ethics for Analysis of Research Projects on Human Experimentation of the Clinical Hospital of the University of São Paulo Medical School. The mean age was 26.8 ± 10.5 years (range 9 to 70 years old); 62% were females (234 patients) and 38% males (144 patients).

All patients were healthy with nothing notable in their history or on physical examination. The sympathetic chain was resected or ablated from the second thoracic ganglion (T2) to T4 according to the area affected by HH (Table 1). Two hundred seventeen patients (57.4%) complained mainly of palmar and plantar sweating; 95 patients (25%) of palmar, axillary, and plantar sweating; 60 patients (15.7%) of pure axillary sweating; and 25 patients (6.5%) of facial sweating or blushing. Most of the patients (325 patients, 86%) had been previously treated conservatively elsewhere without significant improvement.

At the beginning of our experiment, both hemithoraces were operated on at an interval of a few weeks (4 to 5). In the past 6 years we have been operating on both sides performing just one procedure sequentially, starting with the left hemithorax. Three hundred and sixty-eight patients (97.3%) underwent the procedure under general anesthesia, 209 patients (55.3%) with double lung ventilation, and 159 patients (42%) with single lung ventilation. Ten patients (2.7%) were operated on with thoracic epidural anesthesia and sedation.

The patients were placed in a supine position, slightly elevated at the shoulders with both arms abducted to 90 degrees. Two 5-mm incisions were made; the first was a submammary incision made for the 30-degree camera, and the second incision was a midaxillary one for the surgical instruments. No carbon dioxide insufflation was utilized. We started surgically resecting the sympathetic chain in the foremost 45 patients (12.5%); however, afterwards we changed to ablation using electrocoagulation in 251 patients (66.3%). Since September 2001 we have adapted the method using the harmonic scalpel in 80 patients (21.2%).

The lung was reexpanded under direct vision at the same time as the air was aspirated from the pleural space through a small catheter (16Fr). Hence, no thoracic drain was necessary. A chest radiograph was immediately requested postoperatively for complete lung expansion. The patients were surgically reevaluated after 7 days, 30 days, and approximately every 6 months in our follow-up.

All patients had undergone no fewer than two evaluations when we applied our specific study questionnaire with questions addressing their well-being and QOL before and at least 30 days after the surgery. The questionnaire consisted of 20 questions divided into five

domains, with five levels of response based on tables that admitted only one answer. The difference between the final answer and the one registered at the preoperative period was called "the effect of treatment in the QOL" in Figure 1.

Results

Each of the 362 patients (95.7%) had an uneventful postoperative course and was discharged on the following day, 15 patients (4%) were discharged after 48 hours and only 1 patient (0.3%) was discharged after 72 hours of evolution. The postoperative follow-up ranged from 1 to 60 months (mean 12.42 ± 8.3 months). Considering the final surgical results, 301 patients (79.7%) were completely satisfied with the outcome of the operation, having immediate and permanent relief of the referred sweating or symptoms; 40 patients (10.6%) were moderately satisfied, with no sweating but complaining of compensatory hyperhidrosis (CH); and 37 patients (9.7%) were dissatisfied, claiming no or only minimal improvement and intense CH. Among these, only 15 patients (4%) regretted the surgical procedure.

Therapeutic success was registered for 341 patients (90.3%). The recurrence rates were 22 patients (8.2%) for the palmar group, and 7 patients (13.7%) for the pure axillary group. Eight patients (27.5%) were submitted to resympathectomy. The postoperative complications were as follows: 17 patients (4.6%) with mild brachial plexus; 9 patients (2.4%) with pneumothorax, but only 7 patients (1.8%) required chest tube drainage; 5 patients (1.2%) with pulmonary atelectasis; 2 patients (0.6%) with superficial phlebitis; 2 patients (0.6%) with intercostal pain at trocar site; and 1 patient (0.3%) with intercostal venous bleeding. Finally, we had 2 patients (0.5%) with transient and 2 patients (0.5%) with definitive unilateral Horner's syndrome. There was no mortality or conversion to open surgery.

The response rate for the QOL questionnaire was 344 patients (93.4%). The patient's QOL results before the surgery are illustrated in Table 2. It can be observed that all patients were in poor or in very poor condition according to the questionnaire. The patient's QOL results, at least 30 days after the surgery, are demonstrated in Table 3. At least 30 days after the surgery 260 patients (75.7%) were much better, 37 patients (10.7%) were slightly better, 17 patients (5%) were the same, 16 patients (4.6%) were slightly worse, and 14 patients (4%) were much worse than before the surgery. In summary, 86.4% of the patients changed to a better QOL after the procedure.

When the patients were asked to place the domains in order of preference, the most altered items regarding their QOL were: functional/social, personal, and special circumstances. Finally, 326 patients (86.3%) answered positively when asked if they would recommend this operation to anyone else suffering from the same condition.

Generally speaking, how would you rate your Quality of Life? BEFORE SURGERY?

Excellent	1
Very good	2
Good	3
Poor/Inferior	4
Very poor/Inferior	5

How would you rate your Quality of Life? AT LEAST 30 DAYS AFTER SURGERY?

Much better	1
Slightly better	2
The same	3
Slightly worse	4
Much worse	5

Compared to the period before surgery,

1) FUNCTIONAL / SOCIAL DOMAIN, with relation to the following items, how would you rate your Quality of Life:

	BEFORE SURGERY	AFTER SURGERY
Writing:	1 2 3 4 5	1 2 3 4 5
Manual work:	1 2 3 4 5	1 2 3 4 5
Leisure:	1 2 3 4 5	1 2 3 4 5
Sports:	1 2 3 4 5	1 2 3 4 5
Hand shaking:	1 2 3 4 5	1 2 3 4 5
Socializing (public places):	1 2 3 4 5	1 2 3 4 5
Grasping objects:	1 2 3 4 5	1 2 3 4 5
Social dancing:	1 2 3 4 5	1 2 3 4 5

2) PERSONAL DOMAIN, with your partner / spouse. How would you rate your Quality of Life:

	BEFORE SURGERY	AFTER SURGERY
Holding hands:	1 2 3 4 5	1 2 3 4 5
Intimate touching:	1 2 3 4 5	1 2 3 4 5
Intimate affairs:	1 2 3 4 5	1 2 3 4 5

3) EMOTIONAL-SELF or OTHERS; how would you rate the fact that after sweating/blushing excessively:

	BEFORE SURGERY	AFTER SURGERY
I always justified myself:	1 2 3 4 5	1 2 3 4 5
People rejected me slightly:	1 2 3 4 5	1 2 3 4 5

4) UNDER SPECIAL CIRCUMSTANCES – How would you rate your Quality of Life:

	BEFORE SURGERY	AFTER SURGERY
In a closed or hot environment:	1 2 3 4 5	1 2 3 4 5
When tense or worried:	1 2 3 4 5	1 2 3 4 5
Thinking about the problem	1 2 3 4 5	1 2 3 4 5
Before an examination/ meeting/speaking in public	1 2 3 4 5	1 2 3 4 5
Wearing sandals /walking barefoot	1 2 3 4 5	1 2 3 4 5
Wearing colored clothing	1 2 3 4 5	1 2 3 4 5
Having problems at school / work	1 2 3 4 5	1 2 3 4 5

TOTAL SCORE:

The effect of treatment in Quality of Life: BEFORE SURGERY (20 Excellent – 100 Very poor/ Inferior)
 (As close as) AFTER SURGERY (20 Much better – 100 Much worse)

Fig 1. Quality-of-life questionnaire for evaluation of hyperhidrosis.

Comment

Patients with increased sweat production often suffer from enormous psychosocial stress because they are restricted in both their private and professional lives. Surgical treatment does bring a long-term resolution to the problem, but should only be considered in well-justified cases due to the invasive and permanent character of the procedure. The advantages of transthoracic endoscopic surgery over other conventional open thoracotomy procedures are the accurate vision of the surgical field and the better identification of the intrathoracic anatomy, low morbidity, cosmetic results, and short hospital stay [8]. The previous supraclavicular approach carries significant complication risks (such as Horner's syndrome, phrenic nerve injury, brachial plexus injury,

chylous leak, pneumothorax, and bleeding) without mentioning the unaesthetic cervical scar. The contemporary anesthetic management also contributes significantly to the successful completion of the surgery and decreases

Table 2. Quality of Life Related to Hyperhidrosis Before Surgery

Quality of Life	Number (344)	Percent
Excellent	0	0.0
Very good	0	0.0
Good	0	0.0
Poor	148	43.0
Very poor	196	57.0

Table 3. Quality of Life Related to Hyperhidrosis at Least 30 Days After Surgery

Quality of Life	Number (344)	Percent
Much better	260	75.7
Slightly better	37	10.7
The same	17	5.0
Slightly worse	16	4.6
Much worse	14	4.0

morbidity. In our group, we have also been studying the possibility of carrying out the procedure with epidural anesthesia and sedation, with the patient awake, but we still do not have the final results on this study.

In addition, there is a shared relief of plantar HH after upper thoracic sympathectomy in approximately 58% of our patients. The mechanism for this benefit was not clear, but the reduction of stress or the explanations suggested by Cloward [9] appear to be reasonable. We do not agree with Duarte and Kux [10] that the disconnection of the sympathetic chain must be extended to T7 to increase the chance of interrupting the fibers that enter the upper portion of the sympathetic chain to the feet. In fact, we believe that extended resection could increase the incidence of CH.

About 23% of the patients with palmar HH complained of a transient episode of palmar sweating. This appeared after the operation, when their hands had been dry for some days, which is more common between the third to the fifth postoperative period. Somehow the denervated sweat glands were reactivated and the result of the operation was always immediately questioned. However, this phenomenon lasted from 4 to 24 hours and the hands became dry again. Asking and Svartholm [11] described similar observations in 31% of their patients.

Although some recent reports have called for caution with respect to adverse effects, VATS sympathectomy is usually seen as a simple and safe procedure with a short postoperative hospital stay. It has even been proposed as an outpatient procedure. However, sympathectomy or sympathectomies are irreversible procedures and the indications must be meticulously considered before the final decision to operate is reached; both the surgeon and the patient should make this decision. The prevention of postoperative complications becomes "imperative" when a surgical procedure such as this is easy to learn and perform. Reversible methods like clipping the sympathetic chain should also be considered, because reconstruction with an open nerve has been reported [12], but the final results are uncertain. Lin and coworkers [13] and Reisfeld and colleagues [14] also noted that the symptoms of CH may be improved after a reversible operation with the removal of the endo-clip. In our casuistic we have not had any experience with the clipping method.

The results and complication rates have not necessarily been similar in reports worldwide. This can be explained in part due to the lack of clear-cut definitions for the indications, success, complications, side effects, and

short- and long-term follow-up data of the procedures. It is well known that sympathectomy is often complicated by CH; the reported incidence rates vary greatly from 30% to 84% [15]. In our series it has been noted in 62.5% of the patients (26.5% moderate and 36% intense). The complication rate also varies with the season and the temperature of the patient's working environment. Most cases were often tolerable and did not reach the point of social embarrassment or occupational disability. The exact mechanism has not been well explained, but it appears there is a correlation between the extent of sympathectomy and the incidence of CH. The occurrence of this complication is unpredictable [2] and we have also noticed a slightly higher incidence of this complication in patients over ideal body weight.

Although VATS sympathectomy is a simple and quick procedure, unusual complications such as chylothorax may occur [16]. However, lethal or potentially serious complications have also been reported [8, 17, 18], such as subclavian artery injury, damage to brachial plexus, large hemothorax, cerebral edema, neurologic sequelae, sinus bradycardia, and cardiac arrest. Postoperative Horner's syndrome (HS) is rare, but is found in almost all reports, and is caused by direct or indirect damage to T1 by current diffusion or excessive traction on the chain during dissection or ablation. In our series we had 2 patients (0.5%) with transient and 2 patients (0.5%) with definitive unilateral HS. Neumayer and associates [19] also agree that the VATS approach reduces the rate of HS because of both better visualization and the surgeon's experience. These factors are in favor of a learning curve [3], mainly dictated by a better identification of the second rib and by gentler handling of the sympathetic chain.

Resympathectomy has been advocated and successfully performed [20], mainly for immediate failure. The main reasons for failure include: an anatomic variation in the sympathetic chain, failure of surgical technique, intense pleural adhesion, vessels overriding the sympathetic chain or aberrant venous arch drainage, overload of adipose tissue, and a possible reinnervation. In our casuistic resympathectomy has occurred in 8 patients. Adhesions after the first operation have been sparse and prevent the procedure in any patient. Of the patients with recurrence, 27.5% were retreated successfully. In all patients we observed that the main cause of primary failure was inadequate surgery.

Hyperhidrosis is a chronic disorder accompanied by subjective suffering of the individual in a world in which abundant sweating is considered unaesthetic, causes distress in social situations, and becomes dangerous and incapacitating, for example, in the army or the police department. Several authors [4, 13, 19] have stated that the condition has been disturbing both in the professional and the social life of patients since childhood, and may be aggravated by puberty because of emotional factors that seem to persist throughout life. The HH condition certainly deeply affects the QOL of individuals suffering from it.

In 1998 Sayeed and coworkers [4] considered that "the impact of transthoracic endoscopic sympathectomy on

the patient's QOL has not been reported in the literature," and published a study to assess these changes in the QOL of patients with HH using the short form-36 (SF-36) health assessment questionnaire. Despite the high incidence of CH (81%), predominantly affecting the trunk, both the symptoms and the overall QOL were improved. According to the same article and Garrat and colleagues [21], the SF-36 health assessment questionnaire has been widely used. It is easy to use, valid, reliable and sensitive, and a useful tool after a surgical procedure. However, we would like to mention that its sensitivity to changes in the health status might be limited due to preoperative good health and to its general nature. Additional specific questionnaires regarding the condition to be treated are required.

One of the first published reports on QOL following two-stage endoscopic transthoracic sympathectomy, written by Swan and Paes [5], reported that symptomatic improvement was achieved in all patients and there was a significant stepwise upgrading in the QOL after each stage. This prospective cohort study was assessed using the Dermatology Life Quality Index Questionnaire in 10 consecutive patients, although it was not specific, it could effectively evaluate most of all skin conditions. Fredman and associates [22] investigated palmar and axillary HH to determine whether adverse effects, such as 90% CH, could modify patient satisfaction with a standard surgical questionnaire administered to 626 patients who had undergone sympathectomy at least 6 months earlier. From the results of the survey the authors concluded that 25% of the patients were satisfied, 64% of the patients were very satisfied, and 11% of the patients regretted the surgical procedure. Lau and coworkers [6] also tried to evaluate the efficacy of bilateral sympathectomy in alleviating symptoms and improving the QOL for patients in Hawaii using the SF-36 questionnaire with a retrospective cohort study. The authors concluded that, "although sympathectomy resulted in some bodily pain and CH, these elements were outweighed by the improvement in palmar symptoms, social, mental, and physical functioning roles, and overall QOL."

Nowadays the QOL becomes an important outcome measure in medicine, and this psychosocial aspect has important implications for optimal management of patients. These evaluations can be more easily performed in acute diseases. On the other hand, chronic or recurrent diseases of complex etiologies and functional, emotional, social, psychologic, and professional repercussions are faced with innumerable challenges, which have not been overcome yet. Based on an article published by Amir and colleagues [7], which "describes the initial stages of the development of a short disease-specific health related questionnaire to assess the impact of HH on the QL of patients," we have devised [23] the questionnaire accessible in Figure 1. We consider a specific questionnaire is necessary to be used and studied for each specific disease and therapeutic condition. This information is relevant because we want to know how the patients feel and how well they are able to conduct their daily activities before and after the surgical procedure.

The initial part of the questionnaire was applied before the surgery or on the first postoperative day, the subsequent one was applied at least 30 days after the procedure. The report mentioned above from Amir and colleagues [7] provides us with a real framework for the construction of a disease-specific QOL questionnaire for HH to measure the impact of the surgical intervention. On the other hand, one limitation of the method was that only the population awaiting surgery was surveyed, which implies more severely affected patients and the results might be valid only for a high grade of symptoms. In our results we noticed that the response rate to the QOL questionnaire was positively answered by 93.4% of the HH group, where 86.4% of the patients changed to a better QOL after the surgical procedure. Finally, this specific questionnaire proved highly effective, was easily understood and applied, and it was able to evaluate satisfactorily the change in the QOL comparing the periods before and after the surgical procedure.

Besides the effectiveness of the method, the factor that most influenced the QOL of the patients analyzed was the presence of CH. Despite its exact mechanism, the intensity of the symptoms negatively affected the QOL of the patients analyzed. All patients must be exhaustively informed of this possibility and the search for the best method of treatment with the lowest rate of side effects, recurrence of symptoms, and absence of complications are still part of our main objectives. We live in a society that preaches speed, technology, body image, success, and individual achievements. All of this promotes stress with significant losses and unpredictable consequences to our QOL. Among the domains, which were considered the most influenced by the operation, we observed that the most important one was the functional-social domain, that is, the practical aspects of everyday life. This indicates to us that the inadequacy provoked by HH negatively affects daily activities. In second and third places the personal and under special circumstances domains were classified, which objectively reveals that after having been operated on the patients also feel much more self-confident in their personal relationships and with the surrounding environment.

By means of the VATS sympathectomy we have tried to lower the HH symptomatology and consequently the "problems" caused by the disease. Having faced these difficulties we hope that this specific questionnaire will allow us to learn more and to accurately assess the aspects of the QOL of these patients.

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