

## Thoracoscopic Sympathectomy for Palmar Hyperhidrosis: Immediate Results and Postoperative Quality of Life

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**OBJECTIVE:** Primary palmar hyperhidrosis is a socially and occupationally debilitating disorder characterized by excessive sweating. The purpose of this study was to evaluate the results, complications, and degree of satisfaction among patients who underwent video-assisted bilateral thoracoscopic sympathectomy of the second and third ganglia (T2-T3) to treat primary palmar hyperhidrosis at the Department of General and Thoracic Surgery of the Hospital Universitario Virgen Macarena in Seville, Spain.

**MATERIAL AND METHOD:** A study of 226 thoracoscopic sympathectomies was undertaken based on case histories and a prospective pre- and postoperative questionnaire survey. The sample was composed of 113 patients (47 males and 66 females), ranging in age from 14 to 50 years, with primary palmar and axillary hyperhidrosis, in some cases severe. Bilateral video-assisted thoracoscopic T2-T3 sympathectomy was performed under general anesthesia in all cases. Follow up included a questionnaire on pre- and postoperative quality of life and degree of satisfaction. Descriptive statistics on the surgical procedure, quality of life, and postoperative changes were compiled and frequency analyzed. A nonparametric Wilcoxon test for paired variables was performed to contrast significant differences between pre- and postoperative quality of life related to hyperhidrosis and its complications.

**RESULTS:** The therapeutic success rate was 100%. Complications were seen in 14.2% of the cases and included hemothorax in two, hemopneumothorax in three, pleural hemorrhage in two, and minimal apical airspace in nine. Of the 106 patients who were monitored over a period of 6 to 12 months through follow-up interviews and questionnaires, 67% developed compensatory sweating, 95% reported improvement in quality of life, and 4% experienced no change in quality of life, mainly because of the emergence of compensatory sweating. Of the patients interviewed, 97.2% said that they would undergo the operation again.

**CONCLUSION:** Video-assisted thoracoscopic sympathectomy for the treatment of primary palmar hyperhidrosis is effective, with low rates of morbidity and no mortality. Despite the appearance of postoperative changes such as compensatory sweating, patient satisfaction with the procedure is high and their quality of life improves.

**Key words:** *Hyperhidrosis. Video-assisted thoracoscopic sympathectomy. VATS. Postoperative quality of life.*

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Tratamiento de la hiperhidrosis palmar por simpatectomía torácica. Resultados inmediatos y calidad de vida postoperatoria

**OBJETIVO:** La hiperhidrosis palmar primaria localizada es un trastorno en la producción del sudor que resulta social y laboralmente incapacitante. El propósito de este estudio es evaluar los resultados, complicaciones y grado de satisfacción de los pacientes con hiperhidrosis palmar primaria tratados con simpatectomía videotoroscópica T2-T3 bilateral en el Servicio de Cirugía General y Torácica del Hospital Universitario Virgen Macarena de Sevilla.

**MATERIAL Y MÉTODO:** Se ha realizado un estudio clínico prospectivo histórico de 226 simpatectomías torácicas. La muestra la componen 113 pacientes (47 varones y 66 mujeres) de 14 a 50 años de edad con hiperhidrosis palmar y axilar primaria, en algunos severa. A todos ellos se les intervino bajo anestesia general practicándoseles simpatectomía videotoroscópica T2-T3 bilateral. Se presenta un seguimiento mediante cuestionario en relación con la calidad de vida y grado de satisfacción pre y postoperatoria. Se han efectuado análisis de frecuencia y descriptivos de los datos obtenidos sobre la técnica quirúrgica, calidad de vida y cambios posteriores a la cirugía y una prueba no paramétrica de Wilcoxon para dos variables relacionadas para contrastar diferencias significativas entre la calidad de vida pre y postoperatoria con relación a la hiperhidrosis y sus complicaciones.

**RESULTADOS:** El porcentaje de éxito terapéutico ha sido del 100%. La tasa de complicaciones del procedimiento fue del 14,2% e incluyó hemotórax en dos pacientes, hemoneumotórax en tres, derrame pleural en dos y mínima cámara aérea apical en 9. De los 106 pacientes a los que se les realizó seguimiento entre 6 y 12 meses mediante entrevista y cuestionario, un 67% de ellos desarrollaron sudación compensatoria. Un 95% de estos pacientes refirió mejoría de su calidad de vida, y un 4% no experimentó ningún cambio en ella, sobre todo al considerar la aparición de la sudación compensatoria. El 97,2% de los pacientes entrevistados respondieron afirmativamente a la cuestión de si se volverían a operar.

**CONCLUSIÓN:** La simpatectomía videotoroscópica es un método efectivo para el tratamiento de la hiperhidrosis palmar primaria con bajas tasas de morbilidad y nulas de mortalidad. A pesar de la aparición de cambios posteriores como la sudación compensatoria, presenta una alta tasa de satisfacción y mejora de la calidad de vida de los pacientes.

**Palabras clave:** *Hiperhidrosis. Simpatectomía torácica videotoroscópica. Calidad de vida postoperatoria.*

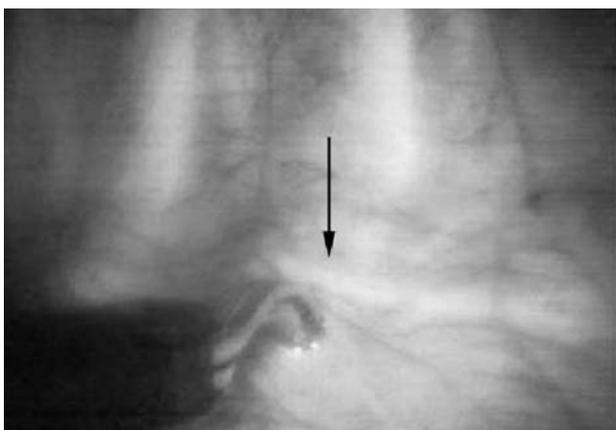


Figure 1. Beginning of the opening in the parietal pleura for dissection of the sympathetic chain (arrow).

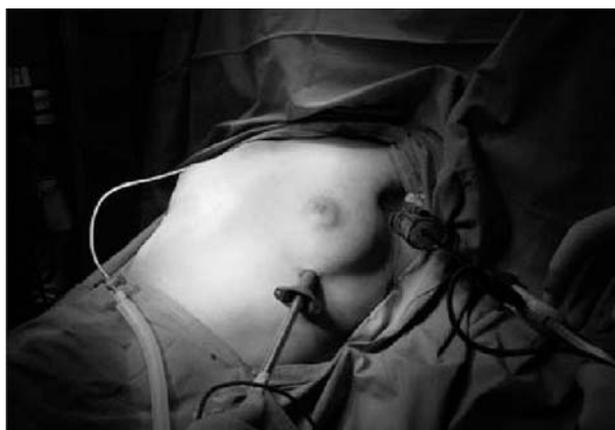


Figure 2. Patient in a semi-sitting position with the left side completed and the trocars in position on the right side.

## Introduction

Primary hyperhidrosis is a disorder characterized by excessive sweating in the palms and, frequently, the axillas and soles. The triggers are almost always emotional, although heat or exercise may also be involved.

Although not life-threatening, hyperhidrosis causes educational and occupational difficulties, as well as psychological and social problems. It has a slightly higher prevalence among women and a higher incidence among Asians and Sephardic Jews.<sup>1</sup> Treatment modalities, reviewed by White,<sup>2</sup> include topical application of aluminium chloride, iontophoresis, topical anticholinergics, and therapies based on conditioning or biofeedback, all of which are effective only in mild cases. Other treatments, including botulinum toxin injection, liposuction, and excision of the sweat glands, have also been attempted, with limited success. Interruption of the sympathetic innervation of the eccrine glands of the upper extremity via the upper thoracic chain, therefore, emerged as the best surgical treatment.

Several surgical approaches to open thoracic sympathectomy have been used: Adson,<sup>3</sup> Smithwick,<sup>4</sup> and Cloward<sup>5</sup> advocated the posterior approach; Telford,<sup>6</sup> the supraclavicular; Goetz,<sup>7</sup> the transthoracic; and Atkins<sup>8</sup> and Ross,<sup>9</sup> the transaxillary. Authors supporting minimally invasive surgical techniques include Wilkinson,<sup>10</sup> who operates by percutaneous radiofrequency ablation, and Kux,<sup>11</sup> who defends thoracic endoscopic sympathectomy—even though no protocol (in terms of location, number of ports, and type of endoscope) has been established for accessing the pleural cavity. Thoracoscopic resection of the upper thoracic sympathetic chain has been defended by numerous authors<sup>12,13</sup> over the last decade as the treatment of choice for hyperhidrosis of the upper extremity.

This paper describes our experience with this technique as well as the pre- and postoperative degree of satisfaction and quality of life of our patients.

## Patients and Methods

Between November 1994 and November 2002, 226 video-assisted thoracoscopic sympathectomies of the second and third thoracic (T2-T3) ganglia were performed on 113 patients with severe palmar and upper extremity hyperhidrosis. Of the 113 patients, 58.4% were female and 41.6% male; the mean age at intervention was 27.55 years, with a mode of 26 years (range: 14-50 years).

For the operation, the patients were positioned as follows: 48.7% in lateral decubitus of the corresponding hemithorax, 12.4% in ventral decubitus, and 38.9% in semi-sitting position with the limbs raised. In the first interventions, 3 entry ports were made, although this was later reduced to 2: a 12 mm port for the optical endoscope (0-degree Karl Storz Endoscope) and a 5 mm port for the surgical instruments. The sympathetic chain, which is easily visible (Figure 1), was dissected from T2 to T3 and the communicating rami and the nerve of Kuntz (if there was one) were severed. Chest tubes were removed 12 to 24 hours after the operation and the patient was discharged.

Positioning was modified in the final operations so that patients were in semi-sitting position with their arms abducted, permitting access to both sides without needing to change the patient's posture, thereby saving time (Figure 2). This position permits the sympathetic chain to be viewed easily and comfortably because gravity pulls the apex of the lung away, revealing the spine and the sympathetic chain. In the final interventions, with the patient in semi-sitting position, the estimated duration of surgery was from 24 to 42 minutes for both sides.

The patients in this study were given appointments for a check-up 1 month following surgery, at which time a questionnaire on quality of life and degree of satisfaction was administered. This was repeated at 1 year.

Two distinct groups of postoperative complications arose from surgery. The first group consisted of compensatory hyperhidrosis (compensatory increase in sweating in other areas of the body, principally the chest, abdomen, lumbar area, and buttocks), which was an item on the questionnaire; gustatory disorders (facial sweating after eating or smelling food); phantom sweating (persistence of the same preoperative tactile or proprioceptive sensation in the skin before starting to sweat); cardiovascular reactions (reduction in heart rate or blood pressure), and other sequelae. The

second group consisted of those affected by more serious postoperative complications: Horner's syndrome (ptosis, miosis, enophthalmos, and conjunctival injection), neuritis, facial dryness, chylothorax, and pneumothorax.

Of the 113 patients, 106 answered the questionnaire on postoperative results, side effects, and complications caused by the intervention. Questions on mid- and long-term results, with an emphasis on degree of patient satisfaction, were also included. The questionnaire was the basis for this study.

## Results

Video-assisted thoracoscopic T2-T3 sympathectomies were performed on 113 patients. The hyperhidrosis was eliminated in 100% of the interventions. No recurrence was reported. The mean postoperative stay was 1.81 days (range: 1-7 days), with a mode of 1 day in 54.9% of the 113 patients.

The complication rate was 14.2%; in other words, 16 patients had various complications, all of which were minor, as shown in Table 1.

One patient developed bilateral hemothorax in reaction to ketorolac and required chest tubes on both sides. The remaining complications were treated by inserting a small caliber chest tube until resolution.

Of the 113 patients included in the study, 106 were interviewed and responded to the questionnaire on postsurgical quality of life. These patients were

monitored on an outpatient basis at our unit for a period between 6 to 12 months. It was impossible to locate the remaining 7 patients.

The percentage of patients reporting improvement in their quality of life was 95.3%, while 3.8% reported no change (especially given the emergence of compensatory sweating). This data is reflected in Table 2.

Patients were interviewed about the emergence of postoperative side effects influencing their perception of quality of life and satisfaction; the results are shown in Table 3. Compensatory sweating was the most frequent side effect influencing patient satisfaction (67% reported having noticed its appearance or increase). Compensatory sweating occurred most frequently in the back and abdomen (17% of cases), followed by the back, abdomen, and thighs (13% each).

In addition, 44.3% of patients interviewed had an immediate family member with severe hyperhidrosis.

## Discussion

The indications for using thoracoscopic thoracic sympathectomy to treat primary hyperhidrosis<sup>14</sup> have been established ever since the first thoracoscopic interventions were performed. In recent years, numerous articles advocating diverse surgical techniques for accessing the thoracic sympathetic chain have been published. Those articles discuss indications such as ablation, resection (and its extent), interruption by clips, and more. In our opinion, resection of the sympathetic chain is indicated whenever there is a possibility of recurrence of hyperhidrosis (0% recurrence in our study). Hashmonai et al<sup>15</sup> compared surgical techniques for the treatment of hyperhidrosis—electrocoagulation or resection—based on a review of the studies published between 1974 and 1999. Those authors found that resection was significantly better in terms of immediate results and absence of recurrence after intervention. Nevertheless, ptosis occurred more frequently with resection of the sympathetic chain. Although resection seems to provide better results, the authors noted that the majority of surgeons tend to use electrocoagulation, perhaps because of its simplicity and shorter surgical time.

As an alternative to extirpation of the thoracic sympathetic segment and with the goal of decreasing the percentage of patients developing compensatory sweating, Lin<sup>16</sup> used endoscopic clipping of the

TABLE 1  
Postoperative Complications

Type of Postoperative Complication	No. of Patients (%)
Pleural hemorrhage	2 (1.8)
Hemopneumothorax	3 (2.7)
Bilateral hemothorax	1 (0.9)
Unilateral hemothorax	1 (0.9)
Minimal apical residual airspace	9 (8.0%)

TABLE 2  
Postoperative Quality of Life

Degree of Change	No. of Patients (%)
Much better	86 (81.1)
Somewhat better	15 (14.2)
Nearly the same	4 (3.8)
Somewhat worse	1 (0.9)

TABLE 3  
Emergence of Postoperative Changes

Latter Changes	No. of Patients (%)			
	None	Slight	Moderate	Profuse
Gustatory sweating	94 (88.7)	7 (6.6)	4 (3.8)	1 (0.9)
Facial dryness	99 (93.4)	4 (3.8)	1 (0.9)	2 (1.9)
Chest or arm pain	75 (70.8)	21 (19.8)	7 (6.6)	3 (2.8)
Phantom sweating	74 (69.8)	29 (27.4)	3 (2.8)	0 (0)
Compensatory sweating	35 (33)	26 (24.5)	24 (22.6)	21 (19.8)

sympathetic thoracic trunk at T3-T4 to block transmission. After a patient developed intolerable compensatory sweating, the video-assisted thoracoscopic removal of the clips resulted in a clear improvement 25 days later, according to the author. Lin concluded that, as an alternative technique, clip blocking offers the advantage of reversibility of side effects such as compensatory sweating. We have not tested this technique in our unit, partly because we currently achieve excellent patient satisfaction with no recurrence; Lin, on the other hand, had 42 patients who required a second sympathectomy because of unsuccessful interventions or recurrent palmar hyperhidrosis.<sup>17</sup>

Compensatory sweating is, without a doubt, one of the most troublesome postoperative complications for patients. Perhaps this is why numerous surgeons have begun to search for the ideal technique to significantly reduce the percentage of cases developing compensatory sweating. Riet et al,<sup>18</sup> in a paper published in 2001, showed that compensatory sweating was nonexistent after limiting the thoracoscopic sympathectomy to the third ganglion. Hsu et al<sup>19</sup> carried out a retrospective study of cohorts from 3 groups from a sample of 171 patients; sympathectomies were performed in the first group at T3-T4, at T4 in the second group, and at T4-T5 in the third group. Results showed that T4-T5 sympathectomy provides higher patient satisfaction with fewer sequelae (including compensatory sweating, which declined from 70% in group 1 to 29% in groups 2 or 3). Cheng et al<sup>20</sup> supported T2 and T3 ramicotomy without damaging the trunk or the ganglia. Despite longer surgical times and greater risk, they advocated this technique as an alternative in order to prevent compensatory sweating. Our study revealed the emergence of compensatory sweating in 95% of the patients, a rather elevated percentage when compared to other studies; however, as will be detailed later, this figure is comparable if we disregard the percentage of patients who reported only slight compensatory sweating (10%).

Certainly, one of the biggest initial drawbacks of this technique was the need to reposition the patient from one side to the other after a hemithorax operation in lateral decubitus. At our hospital, we began performing thoracic sympathectomies in lateral decubitus, later changing to ventral decubitus; currently, we use a semi-sitting position with the upper limbs abducted. This avoids the need to reposition the patient, saving important surgical time for the patient (who spends less time under anesthesia), the surgeon, and the hospital. Naruse et al<sup>21</sup> described this surgical procedure in 120 endoscopic thoracic sympathectomies performed with 2 mm incisions and the patient in semi-sitting position, concluding by recommending this procedure as the method of choice for the surgical treatment of palmar hyperhidrosis because it reduces the time in surgery (in his series, operations lasted from 11 to 81 minutes). The estimated time of our most recent operations with the patient in semi-sitting position varied from 24 to 42

minutes, practically the same as the series in Lin,<sup>17</sup> whose mean time was 30 minutes.<sup>20-32</sup>

Studies of patient series in which primary hyperhidrosis has been treated surgically reveal a high degree of patient satisfaction. In personal interviews, patients recognize that hyperhidrosis is a serious social problem that affects them when they interact with other people, work, drive, or try to maintain their self-confidence and character. In our study, 95.3% of the patients reported improved quality of life after surgery, and 3.8% considered the situation unchanged (mostly because of the emergence of compensatory sweating). Lin<sup>16</sup>, in a study of a series of 26 patients, reported the emergence of compensatory sweating in 88.5% of patients (although 92.3% were satisfied with the surgery), while Kim et al,<sup>12</sup> in a series of 45 patients, reported an overall satisfaction with quality of life at 92% (on a scale of 0 to 100%, ranging from poor to excellent). The best results are reported by Lardinois and Ris,<sup>23</sup> with improvement in quality of life in 94.6% of the patients, and Cohen et al,<sup>28</sup> with a satisfaction rate of 98.2%. Fukushima et al<sup>27</sup> observed that in the immediate postoperative period, 92% of patients were satisfied with the results, although the satisfaction level fell to 72% at a later period. These papers suggest that the rate of satisfaction declined after the immediate postoperative period (at which time the patient perceives that he or she has been cured of palmar hyperhidrosis) to a later period in which the patient copes with changes (in our study, represented primarily by compensatory sweating).

The emergence of complications varies from one series to the next. The percentage of complications in our study was 17.7%, including the persistence of minimal apical airspace, requiring only respiratory physical therapy for resolution. Complications included 2 cases of right side pleural hemorrhage resolved with a chest tube; 3 cases of left hemopneumothorax, also resolved with a chest tube; bilateral hemothorax (a reaction to ketorolac), requiring withdrawal of medication and insertion of a chest tube in both hemithoraces to stabilize coagulation; 1 case of left unilateral hemothorax requiring a second video-assisted thoracoscopic intervention to achieve hemostasis; 9 cases of minimal apical airspace, and 3 cases of unilateral ptosis that disappeared spontaneously within 1 to 15 days. Han et al<sup>29</sup> reported that, of 103 cases, 2 experienced pneumothorax requiring a chest tube, 5 developed unilateral Horner's syndrome, and 3 experienced neuralgias. Gossot et al,<sup>31</sup> in their study of 467 patients, recorded 1 torn subclavian artery, 2 chylothoraces, 25 hemorrhages (5.3%), 12 pneumothoraces (1.3%) after removal of the chest tube, and 4 patients (0.4%) with unilateral partial Horner's syndrome. We believe that, once the technique has been mastered and refined, both the complication rate and morbidity should be quite low. Likewise, because lung separation is unnecessary in semi-sitting position, we believe that the occurrence of postoperative

pneumothorax should become rare and that the use of the harmonic scalpel should reduce the incidence of eschar hemorrhage in the intercostal vessels, which occurs more easily with the standard electric scalpel.

In conclusion, it is our opinion that the low morbidity and zero mortality rate of this surgical technique recommend it as a treatment for palmar hyperhidrosis. Thoracic sympathectomy eliminates palmar hyperhidrosis with no recurrence (none in our series). Although the percentage of compensatory sweating is high (in some cases, it tends to decrease spontaneously), it produces a high rate of patient satisfaction (95.3% report improvement in their quality of life), with 97.2% reporting that they would have undergone the operation even if they had they known of the possible emergence of compensatory sweating.

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