Video-assisted Thoracic Sympathicotomy for the Treatment of Palmar and Axillary Hyperhidrosis: A 17-Year Experience

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Purpose: Advances in video-assisted thoracoscopic surgery have allowed endoscopic surgical sympathectomy to become a viable safe therapy for upper limb hyperhidrosis. We evaluated if and how this procedure improves the quality of life in patients after a mean follow-up of 9.5 years.

Methods: Between 1995 and 2013, the senior author performed 1440 upper dorsal sympathicotomies in 720 patients. Questionnaires were submitted to randomized patients, both to evaluate the durability of the results and to assess their quality of life after surgery.

Results: In 46 patients, anatomical distinctive features obscured the sympathetic chain, precluding partial or total completion of the procedure. The other 674 patients reported complete relief of symptoms. A mean follow-up of 9.5 years (range, 2 to 17 years) was carried out on 450 patients: 6 recurrences have been observed, severe compensatory sweating was reported in 3 patients, and 441 patients were satisfied with nothing to complain. Furthermore, when comparing presurgery and postsurgery results, a statistically significant difference between most of patients answers came out (P = 0.001).

Conclusion: According to the data obtained, the procedure we described significantly improves the quality of life of treated patients, also proving the durability of this procedure.

Discussion: Minimally invasive endoscopic transthoracic sympathectomy has proven to be an effective and durable surgical treatment for severe primary hyperhidrosis.

Key Words: video-assisted thoracic sympathectomy, palmar hyperhidrosis, axillary hyperhidrosis

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Hyperhidrosis of the upper limbs is a relatively common condition with a report incidence between 1% and 3% of the general population. It has a significant negative impact on quality of life and poses both psychological and social problems. The prevalence and embarrassing nature of hyperhidrosis made it a topic of interest to many1–10; luckily, advances in video-assisted thoracoscopic surgery have allowed surgical sympathectomy to become a viable first-line safe and popular therapy for hyperhidrosis.

The principle of the procedure is to interrupt the cholinergic sympathetic innervation to the eccrine glands. Over the years, different thoracoscopic techniques have been proposed, relying on (at least) double trocar insertion (per side), carbon dioxide insufflation, or both. In 1998, the senior author, Raposo et al5 published an article in which they presented a minimally invasive transthoracic upper dorsal endoscopic technique to treat palmar and axillary hyperhidrosis surgically, by means of a single-entry specifically modified thoracoscope and without the need for carbon dioxide insufflation. This procedure was designed to minimize any damage to the intercostal neurovascular bundle, while avoiding the complications related to carbon dioxide insufflation. The immediate results after surgery were successful in 139 of the 142 operated patients, gaining complete relief of their symptoms. From data in literature,6,7 there has been observed a significant variability of complications by different authors. Compensatory sweating (CS) has been observed being the most recurring (3% to 98%), whereas complications such as permanent bradycardia, Claude-Bernard-Horner syndrome (0.7% to 3%), pneumothorax (1%), pleural effusion (1%), acute bleeding or delayed hemothorax (1%), and chylothorax and intercostal neuralgia (<1%) has been identified less frequently.8 With additional experience in this surgical technique in the recent years, we decided to evaluate the outcome in patients who underwent minimally invasive upper dorsal thoracoscopic surgical treatment of upper extremities hyperhidrosis after a mean follow-up of 9.5 years (range, 2 to 17 years). Furthermore, we assessed if and how this procedure improves the quality of life of patients, through a self-evaluation of several aspects of social life, and taking into consideration characters such as anxiety, depression, high emotionality, and irritability.

METHODS

Between 1995 and 2013, the senior author performed 1440 upper dorsal sympathicotomies in 720 patients (480 bilateral palmar and axillary hyperhidrosis, 153 bilateral palmar hyperhidrosis, 57 bilateral axillary hyperhidrosis) at the Departments of Surgical Sciences, Plastic Surgery Division, Universities of Genova and Parma, Italy. Indications for this procedure were palmar and axillary hyperhidrosis, upper extremities ischemia (caused by, eg, Raynaud disease), and upper extremities causalgia. Contraindications to perform an endoscopic transthoracic sympathectomy include relevant respiratory impairment and the presence of massive pleural adhesions. Patients underwent detailed evaluation to confirm the site(s) of focal hyperhidrosis; diagnosis was based on clinical features. Written, informed consent was obtained from all patients.

After general anesthesia with a double-lumen endotracheal tube, with the patient placed in a half-sitting position with both arms abducted to 90 degrees, a 1-cm stab incision was performed, along the mid-clavicular line (male patients) or the anterior axillary line (female patients), in the fourth intercostal space (Fig. 1). After selective deflation of the ipsilateral lung, trocar insertion, and creation of an artificial apical

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pneumothorax, a specifically designed thoracoscope was inserted. Our modified thoracoscope (Karl Storz, Tuttlingen, Germany) consists of a 9-mm trocar with air/insufflator/suction triple valve, a straight Hopkins telescope with fiber-light transmission, a Wittmöser operating sheath with a connection for high-frequency diathermy, and a specifically designed elliptical-tipped wire loop electrode for the electrocautery (Fig. 2). The dorsal sympathetic chain was visualized through the parietal pleura as it passes over the neck of the ribs close to the costovertebral junction. The second, the third, and/or the fourth thoracic sympathetic ganglia (Fig. 3) were then severed, under direct vision, by means of the electrocautery. Special care was taken not to injure the crossing vessels in the intercostal spaces. The surgical procedure was completed by reinflation of the collapsed lung, insertion of a chest drain by the same operative incision, and closure of the wound with cutaneous sutures. The entire procedure was then repeated on the opposite side in the same operative session. A postoperative pulmonary radiograph was routinely performed within 24 hours after the completion of the procedure to check for the presence of pneumothorax, hemothorax, or both; the chest drains were thereafter removed.

To evaluate the durability of the results, we have submitted, by phone, a 3-item questionnaire to 450 of the 720 patients operated by endoscopic transthoracic dorsal sympathectomy, asking the patients if they still suffered from hyperhidrosis, if some new symptom had occurred (e.g., CS), and if they considered their selves satisfied. Furthermore, with the purpose of assessing the satisfaction about surgical operation’s results and possible changes in self-perception, quality of life, and social relationships, we submitted, by phone, a closed-answer questionnaire (composed of 29 items) to 77 randomized of the 500 patients operated between 1997 and 2006 by endoscopic transthoracic dorsal sympathectomy. We examined the presence of anxiety, intended as being “in a oppression state,” alert, warning, irritability, considered as “unsuitableness, self-devaluation, and social phobia,” depression, evaluated as “isolation, lack of confidence or interest for social life,” and emotional lability, defined as “simple and sudden excitableness” as well as “difficulty in dominating emotions.” We pondered both clinical data, like the presence of palmar hyperhidrosis or CS, and objective and subjective data, such as age of onset of symptoms, knowledge of therapeutic chances, motivation for surgery, and changing in the sense of self after surgical procedure. Eventually, with an open question, we accepted eventual advices about (both physical and psychological) preparation to the surgery.

Statistical Analysis
A numeric score has been assigned to each answer; consequently, Wilcoxon statistic test have been used to analyze the results. By means of The Mann-Whitney U test, we compared the items groups connected to psychological variables described above. Finally, we tried to identify the differences in sex distribution between these psychological parameters, considering the median of basal variables. Statistical analysis has been performed through SPSS 12.0 software.

RESULTS
We have performed 1440 upper dorsal sympathectomies in 720 patients (480 bilateral palmar + axillary hyperhidrosis, 183 bilateral palmar hyperhidrosis, 57 bilateral axillary hyperhidrosis). The age of the patients ranged from 18 to 52 years (mean, 31 y). In 46 patients, massive pleural adhesions, overlying vascular bundles, or a thick overlying subpleural fat obscured the sympathetic chain, precluding access to the ganglia and partial or total completion of the procedure. All the other 674 patients reported extreme satisfaction with the results of their operation, gaining immediate complete relief of their

FIGURE 1. One-centimeter stab incision along the anterior axillary line (female patient) in the fourth intercostal space.

FIGURE 2. The specifically modified thoracoscope used to perform the minimally invasive sympathectomy.

FIGURE 3. The third thoracic sympathetic ganglion severed, under direct vision, by means of a electrocautery.
Symptoms. For all the patients, the hospital stay was 2 days, whereas the time to resume work was 4 days. No relevant complication (pneumothorax, hemothorax, ulcer neuralgia, Horner syndrome, wound infection) has been observed. No patient complained of discomfort sufficient to delay discharge. A mean follow-up of 9.5 years (range, 2 to 17 y) was carried out on 450 (66.7%) patients by means of 3-item telephonic questionnaires: 6 (1.4%) recurrences have been observed, severe CS was reported in 3 patients (0.6%), and 441 (98%) patients were satisfied both with early postoperative outcome and after several years of follow-up. In the matter of evaluating psychological aspects between 77 randomized of the 500 patients taken into consideration in this analysis, the expected interval between the awareness of therapeutic chances and surgery was 0 to 2 years for 70.3% cases, 3 to 4 years for 16.2% cases, and ≥3 years for 13.7% cases (considering the time of waiting list). When comparing presurgery and postsurgery results, Wilcoxon test pointed out statistically significant differences: the answers on anxiety about future, discomfort between people, irritability due to hyperhidrosis, unsuitableness due to the same cause, difficulty in being relaxed, emotional outburst, embarrassment in hugging people, anxiety during a date, discomfort when shaking hands, embarrassment among many people, stress for being invited to a party, panic when meeting someone, palmar hyperhidrosis, and other parts of body with excessive perspiration showed a P value highly significant (<0.001), whereas interest in social life and comfortableness in meeting strangers resulted statistically significant with P values of <0.01 and <0.05, respectively.

The Mann-Whitney U test showed a highly statistically significant difference between presurgical and postsurgical data (Fig. 4): anxiety and neurosis had higher median variation than emotional lability and depression that, however, had significant changes. Analyzing the frequency distribution between sex, the median values were, generally, higher in women than in men (Fig. 4).

Twenty-four percent of patients had CS in the abdomen and lower limbs; however, this complication has been interpreted as an improvement compared with their initial condition. Seventy-four percent of patients considered this treatment not painful, although drainages were considered uncomfortable.

**DISCUSSION**

Between findings reported in literature, there is no consensus regarding the most advisable technique when performing sympathicotomies. Indeed, although some authors agree that CS is more significant when resecting T2-T4 than T2-only or T3-only resection, other authors substantiate that there are no significant differences between extent of sympathicotomies and the occurrence of CS. In our experiences, both severe CS and recurrence of hyperhidrosis occurred in a slight percentage of patients; nevertheless, all the 3 patients in which the CS occurred declare themselves partially satisfied, because they considered it a more endurable condition compared with that of their primary hyperhidrosis.

Minimally invasive endoscopic transthoracic sympathicotomies has proven to be an effective and durable surgical treatment for severe primary hyperhidrosis. The operation was successful in 674 (93.6%) patients, and of the 450 patients interviewed during the follow-up, 441 (98%) patients were satisfied both with the early postoperative outcome and after several years of follow-up. In our opinion, according to the data obtained, minimally invasive upper dorsal thoracoscopic surgical treatment of upper extremities hyperhidrosis significantly improves the quality of life of treated patients, proving the durability of this procedure.

**REFERENCES**


