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Effect of Treatment of Primary Hyperhidrosis by Thoracoscopic Sympathectomy on Hands and Feet

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Abstract

Hyperhidrosis is characterized by excessive sweating unrelated to heat or exercise. Primary hyperhidrosis is diagnosed based on patient history and physical examination. Treatments include topical, oral, surgical, and non-surgical options, with thoracoscopic sympathectomy favored for its low morbidity, mortality, and minimally invasive approach. This study aims to assess if thoracoscopic sympathectomy is a reliable and effective treatment for palmar and plantar primary hyperhidrosis accompanied with less complication and more success by improving the quality of life. This prospective study included 50 patients with severe primary palmar and plantar hyperhidrosis who underwent thoracoscopic sympathectomy at the General Surgery departments of Al-Zahraa Hospital, Al Azhar University and Kobri-Elkobba Military Hospital. All patients underwent a thorough history, physical examination, routine preoperative tests, ECG, and chest and cervical X-rays to exclude cervical ribs and lung anomalies. The duration of hyperhidrosis ranged from 2 to 6 years, with a median of 3 years. The palmar region affected by (56%), preceded by the plantar (90%) finally the axillary regions (34%). No intraoperative complications were reported. Postoperatively, 62% of patients reported a very good quality of life, 36% excellent, and 2% good, a significant improvement compared to preoperative assessments. Satisfaction rates were high, with 86% completely satisfied, 12% partially satisfied, and 2% unsatisfied. For palmar hyperhidrosis, 78.6% had completely dry hands one week after surgery, decreasing to 50% in six months. For plantar hyperhidrosis, 62.2% had completely dry feet at one week, decreasing to 40% at six months Thoracoscopic sympathectomy is currently considered the optimal technique for managing primary hyperhidrosis.

Keywords: hyperhidrosis, Thoracoscopy, Quality of life.

1. Introduction

Primary hyperhidrosis, a condition marked by excessive sweating that occurs independently of environmental temperature or physical exertion, affects approximately 5% of the global population and is associated with significant social and psychological burdens [1]. This condition predominantly affects the palms, soles, axillae, and face, often leading to considerable impairment in daily activities and emotional well-being [2]. While several treatment modalities are available, including topical and oral medications, botulinum toxin injections, and non-surgical devices, surgical interventions such as thoracoscopic sympathectomy have shown high efficacy for severe cases [3].

Thoracoscopic sympathectomy, a minimally invasive surgical procedure that interrupts the sympathetic nerve pathways responsible for sweat gland stimulation, has gained popularity due to its relatively low morbidity and high success rates in alleviating symptoms of palmar and plantar hyperhidrosis [4]. Recent studies have demonstrated that this procedure not only significantly reduces sweating but also markedly improves the quality of life in affected patients [5]. However, potential complications, including compensatory hyperhidrosis and recurrence, necessitate further evaluation to optimize patient outcomes [6]. This study aims to investigate the impact of thoracoscopic sympathectomy on the treatment of primary hyperhidrosis of the hands and feet, focusing on post-operative quality of life and patient satisfaction over a six-month follow-up period. By examining clinical outcomes in a cohort of patients undergoing this procedure, we aim to enhance the understanding of its efficacy and long-term benefits.

2. Patients and Methods

This prospective study involved 50 patients undergoing thoracoscopic sympathectomy for the treatment of severe primary hyperhidrosis of the hands (palmar) and feet (plantar). The study was conducted in the General Surgery Departments of Kobri-El-Kobba Military Hospital and Al-Zahraa Hospital, Al-Azhar University, beginning in January 2022, with a follow-up period of six months.

2.1 Inclusion Criteria:

Participants included male and female patients aged (15-35) years old with severe, debilitating primary palmar and plantar hyperhidrosis.

2.2 Exclusion Criteria:

Exclusion criteria include patients with mild hyperhidrosis responsive to medical treatment, those with severe pulmonary disease or hemodynamic instability, individuals at high risk for general anesthesia (such as those with cardiac conditions or chronic obstructive pulmonary disease), patients with a history of open chest or heart surgery, patients or guardians who refused the thoracoscopic approach, those who had failed previous thoracoscopy due to significant complications related to the procedure, and patients with major chest deformities identified on chest X-ray.

2.3 Preoperative Assessment:

All patients were subjected to detailed history (family history, past history, history of present illness) evaluation, physical examination which included a general assessment and a localized examination of the hands, and feet to clinical assess the severity of hyperhidrosis for comparison with postoperative assessments.

2.4 Preoperative Investigations:

Routine preoperative laboratory workup included a complete blood count (CBC), coagulation profile (prothrombin time [PT], partial thromboplastin time [PTT], and international normalized ratio [INR]), liver function tests, kidney function tests, and electrocardiogram (ECG) to all patients. Plain chest and cervical X-rays (posteroanterior [PA] and lateral views)

were performed to rule out cervical ribs and lung anomalies.

2.5 Patient Preparation:

On the morning of the surgery, the axillary area was scrubbed with disinfectant soap and hair was clipped. Preoperative antibiotics, such as a third-generation cephalosporin (e.g., cefotaxime), were administered one hour prior to the procedure to provide prophylaxis against Staphylococcus species.

2.6 Surgical Procedure:

Patients were positioned supine with arms abducted for lung deflation on the side of the operation. Two incisions (5–10 mm) were made: one for the thoracoscope above the areola and another for instruments in the third intercostal space along the anterior axillary line. Ports were inserted, and CO_2 was insufflated at 10 mmHg to partially collapse the lung. The sympathetic chain was identified and cauterized at the second, third, and fourth ribs, with care taken to address any bypass branches. The lung was reinflated under visual guidance, and the procedure was repeated on the opposite side.

Figure (1): Ports position in thoracic sympathectomy.

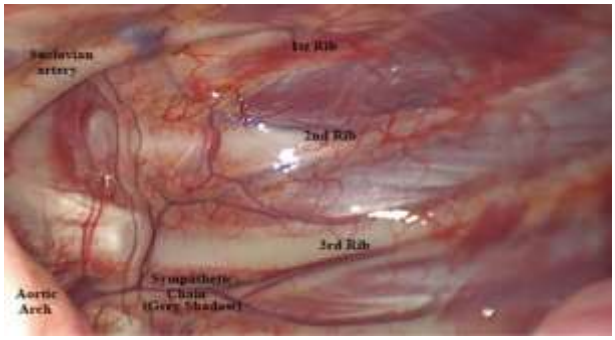

Figure (2): Sympathetic chain.

Figure (3): Sympathetic chain transaction.

2.7 Postoperative Follow-up:

A chest X-ray was performed six hours post-surgery to confirm lung re-expansion, followed by spirometer use. Patients were monitored weekly for the first month, bi-weekly in the second month, and at three and six months postoperatively. Follow-up assessments included pain management, hospital stay duration, return to normal activities, and patient satisfaction, and using clinic visits and telephone calls to monitor for complications.

2.8 Statistical analysis

Data analysis was performed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were reported as mean ± SD or median (IQR), and categorical variables as frequencies and percentages. Preoperative and postoperative comparisons used paired Student's t-tests or Wilcoxon signed-rank tests, while categorical data were analyzed with chi-square or Fisher's exact tests. Changes in outcomes over time were assessed with repeated-measures ANOVA and post hoc Bonferroni corrections. Statistical significance was set at $p < 0.05$, with normality and variance assessed using the Shapiro-Wilk and Levene's tests, respectively.

3. Result

As shown in Table .1 this prospective study included 50 patients who underwent thoracoscopic sympathectomy for the treatment of primary hyperhidrosis affecting the hands (palmar) and feet (plantar). The patients' ages ranged from 17 to 28 years, with a median of 23 years (SD ± 3.01). The majority of participants were male (74%), while 26% were female; 80% were non-smokers, and 20% were smokers. As shown in Table .2 the laboratory data for the studied patients showed median values within normal ranges: total leukocyte count (6.7 x 10^3/mm^3), hemoglobin (12.9 g/dL), and platelet count (252 x 10^3/mm^3). Protein and liver function tests had median values of 6.7 g/dL for total protein, 1.09 mg/dL for total bilirubin, 0.23 mg/dL for direct bilirubin, 3.55 g/dL for albumin, 31.5 U/L for AST, and 25 U/L for ALT. Renal function markers included median creatinine of 0.95 mg/dL and BUN of 22.9 mmol/L. Coagulation profiles showed a median PTT of 35 seconds, PT of 12.8 seconds, and an INR of 1.34.

As shown in table 3 the duration of hyperhidrosis among the patients ranged from 2 to 6 years, with a median duration of 3 years. The most frequently affected area was the plantar region, reported in 90% of patients, followed by the palmar region (56%), and the axillary region (34%) being the least affected. Only 8% (4 patients) had a family history of hyperhidrosis, while 92% had no such history. As shown in table 4 The duration of the surgical procedure ranged from 20 to 50 minutes, with a mean of 33.3 minutes (SD ± 8.65). No intraoperative complications were observed. As shown in Table .5 postoperative complications occurred in 12% of the patients, including dyspnea in 4% (2 patients), compensatory hyperhidrosis in 4% (2 patients), Horner's syndrome in 2% (1 patient), and thoracic pain in 2% (1 patient).

As Shown in Table .6 following surgery, there was a notable improvement in quality of life: 62% of patients reported a very good quality of life, 36% reported an excellent quality of life, and 2% reported a good quality of life. A significant difference was found in the quality of life before and after sympathectomy ($P < 0.001$); postoperatively, 62% of patients reported a very good quality of life compared to 58% who had reported a poor quality of life preoperatively. As shown in table 7 in terms of patient satisfaction, 86% of patients were completely satisfied with the outcome, 12% were partially satisfied, and 2% were unsatisfied. For palmar hyperhidrosis, the percentage of patients with completely dry hands decreased from 78.6% one-week post-sympathectomy to 50% at six months, with some showing improvement (21.4% to 28.6%) or no change/worsening symptoms (3.6% to 21.4%). For plantar hyperhidrosis, 62.2% of patients had completely dry feet one week after the procedure, decreasing to 40% at six months, with similar trends in improvement (20% to 31.1%) and no change/worsening symptoms (17.8% to 28.9%). No significant differences were observed in either palmar or plantar manifestations over the follow-up period ($P > 0.05$).

Table (1): Demographic data of the group studied:

Variables	All patients (n=50)
Age *(years)* *Mean ± SD* *Range*	 23.17±3.01 (17 – 28)
Sex *(N.%)* – Male – Female	 37 (74%) 13 (26%)
Height *(cm)* *Mean ± SD* *Range*	 169.9 ± 7.39 (152 – 188)
Weight*(kg)* *Mean ± SD* *Range*	 71.48 ± 10.14 (48 – 96)
BMI *(kg/m^2)* *Mean ± SD* *Range*	 24.68 ± 2.54 (18.5 – 30.5)
Occupation *(N.%)* – Employed – Unemployed – Student	 33 (66%) 8 (16%) 9 (18%)
Smoking status *(N.%)* – Non-smoker – Smoker	 40 (80%) 10 (20%)

Table (2): The baseline laboratory data among studied patients.

	All patients (n=18)			
	Median	IQR	Minimum	Maximum
TLC (103/mm3)	6.7	4.9	4.2	11.5
Hb (g/dL)	12.9	0.6	11.8	13.8
PLT (103/mm3)	252	43	153	290
Total protein (g/dL)	6.7	0.88	6	7.7
Bilirubin total (mg/dL)	1.09	0.55	0.3	1.33
Bilirubin direct(mg/dL)	0.23	0.11	0.03	0.43
Albumin (g/dL)	3.55	0.6	3	3.9
AST (U/L)	31.5	5	16	36
ALT (U/L)	25	11	18	36
Creatinine (mg/dL)	0.95	0.5	0.7	1.7
BUN (mmol/L)	22.9	7	7.7	34
PTT (s)	35	5.4	27	37
PT(s)	12.8	1.3	11	13.9
INR	1.34	0.2	1.11	1.8

Table (3): Condition characteristics among studied patients

Variables	All patients (n=50)
Duration of condition(years) Median (IQR) Range	3 (3) (2 – 6)
Body parts affected (N. %) Palmer Planter Axillary	28 (56%) 45 (90%) 17 (34%)
Family history of hyperhidrosis (N. %) Absent Present	46 (92%) 4 (8%)

Table (4): Operation characteristics among studied patients

Variables	All patients (n=50)
Duration of operation (minutes) Mean ± SD Range	33.3 ± 8.65 (20 – 50)
Operative complications (N. %) Absent Present	50 (100%) 0 (0%)

Table (5): Post-operative complications among studied patients

Variables (N. %)	All patients (n=50)
Postoperative complications Absent Present	44 (88%) 6 (12%)
Complications type Dyspnea Compensatory hyperhidrosis Horner's syndrome Thoracic pain Hemothorax Pneumothorax Surgical site infection Paresthesia	2 (4%) 2 (4%) 1 (2%) 1 (2%) 0 (0%) 0 (0%) 0 (0%) 0 (0%)

Table (6): Quality of life before and after surgery among studied patients

Variables (N. %)	Before surgery (n=50)	After surgery (n=50)	P value
Very poor	20 (40%)	0 (0%)	<0.001
Poor	29 (58%)	0 (0%)	
Good	1 (2%)	1 (2%)	
Very good	0 (0%)	31 (62%)	
Excellent	0 (0%)	18 (36%)	

Table (7): Palmar and planter sweating during follow up period among studied patients

		Cases				P value
		Completely dry	Improved	Unchanged	Worse	
		No (%)	No (%)	No (%)	No (%)	
Palmer manifestations (n=28)	1 week	22 (78.6%)	6 (21.4%)	0 (0%)	0 (0%)	0.28
	1 month	20 (71.4%)	7 (25%)	1 (3.6%)	0 (0%)	
	3 months	18 (64.3%)	6 (21.4%)	3 (10.7%)	1 (3.6%)	
	6 months	14 (50%)	8 (28.6%)	4 (14.3%)	2 (7.1%)	
Planter manifestations (n=45)	1 week	28 (62.2%)	9 (20%)	7 (15.6%)	1 (2.2%)	0.39
	1 month	24 (53.3%)	11 (24.4%)	8 (17.8%)	2 (4.4%)	
	3 months	21 (46.7%)	15 (33.3%)	5 (11.1%)	4 (8.9%)	
	6 months	18 (40%)	14 (31.1%)	7 (15.6%)	6 (13.3 %)	

4. Discussion

Bilateral thoracic sympathectomy (TS) has been established as an effective, permanent, and safe treatment for primary hyperhidrosis (PH), typically performed under general anesthesia during a single intervention. Proper patient selection remains critical to minimizing the risks associated with this procedure. Video-assisted thoracoscopic sympathectomy (VATS) has demonstrated a significant impact on improving patients' daily lives, with most patients expressing high levels of satisfaction and good tolerance to postoperative complications.

Gan [7] reported a significantly higher tolerance for thoracic sympathectomy (TS) in children compared to adults, with 90% of children under 14 showing minimal compensatory sweating (CS) ($P < 0.01$) and high postoperative satisfaction rates (92%), suggesting early intervention as primary hyperhidrosis is not self-limiting. Our study's findings support these observations, showing similarly high levels of satisfaction and reduced CS among younger patients.

Our approach using general anesthesia with a double-lumen endotracheal tube is consistent with other studies, such as Moustafa et al. [8], who reported using the same technique in 100% of their cases. The use of CO_2 insufflation at low pressure provided enhanced visualization of the sympathetic chain, reducing the risk of pneumothorax without significant complications, as supported by Hurley and Keszler [9], who found that avoiding high-pressure CO_2 minimizes risks like cerebral edema.

The mean operative time in our study was 33.3 ± 8.65 minutes, aligning with Rashad et al. [10], who reported a mean of 27.5 minutes (range: 10–45 minutes), but shorter than the 76.2 minutes (range: 55–125 minutes) reported by Bakoush et al. [11]. Postoperative complications in our study were minimal, with 12% experiencing issues such as dyspnea (4%), compensatory hyperhidrosis (4%), Horner's syndrome (2%), and thoracic pain (2%). This is compatable to Moustafa et al. [8], who reported compensatory hyperhidrosis in feet in 10% of cases and thoracic pain in 13% of cases.

In terms of quality of life, 62% of our patients reported a very good outcome post-surgery, while 36% rated it as excellent, and 2% as good. This represents a significant improvement over preoperative level (58% poor quality, 40% very poor quality) ($P < 0.001$). These results align with Elmallah et al. [12], who reported a 100% improvement in quality-of-life scores, and Moya et al. [13], where 82% of patients reported improved quality of life post-surgery. In contrast, Mohebbi et al. [14] found a decline in satisfaction rates over time across different hyperhidrosis sites ($P < 0.05$).

Regarding palmar hyperhidrosis, 50% of our patients had completely dry hands at six months post-surgery, a decline from 78.6% at one week. This trend is consistent with findings from Moustafa et al. [8], who noted that 100% of their patients were dry immediately after surgery, but symptoms recurred in 11% during the follow-up period. For plantar hyperhidrosis, our dryness rates decreased from 62.2% to 40% over six months, echoing Wolosker et al. [15], who found an initial improvement that diminished over a year.

5. Conclusion

Thoracoscopic sympathectomy is a highly effective and safe treatment for primary hyperhidrosis, significantly improving patients' quality of life with a high satisfaction rate. While the procedure is associated with minimal complications, careful patient selection and surgical technique optimization are essential to minimize risks, particularly compensatory hyperhidrosis. Further research is needed to explore long-term outcomes and refine patient management strategies to enhance treatment efficacy and patient satisfaction.

6. Conflicts of interest:

No competing interests.

7. References

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