ORIGINAL ARTICLE

Evaluation of Needlescopic Sympathectomy for Management of Primary Palmar Hyperhidrosis in Children and Adolescents

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Abstract

Background: ***Primary palmar hyperhidrosis (PPH) is a distressing disorder defined by profuse sweating due to sympathetic nervous system overactivity of unidentified etiology. Needlescopic sympathectomy offers a minimally invasive technique for treating PPH in children and adolescents.***

Objective: ***This study assesses the safety, efficacy, and cosmetic outcomes of Needlescopic sympathectomy in pediatric and adolescent patients with PPH.***

Methods: ***A prospective study was conducted on 30 patients diagnosed with PPH at Al-Azhar University Hospitals between August 2023 and August 2024. All patients underwent bilateral Needlescopic sympathectomy at the R3-R4 level. Preoperative and postoperative assessments included intraoperative complications, compensatory sweating, and quality of life (QOL) scores.***

Results: ***The mean patient age was 11.88 ± 1.9 years, with an average symptom onset at 6.33 ± 1.12 years; all of them had impairment of daily activities. The mean operative time was 41.7 ± 5.35 minutes, and hospital stay averaged 1.3 ± 0.4 days. Intraoperative complications included minimal bleeding in five patients (16.6%), surgical emphysema in two patients (6.6%), and Pneumothorax requiring chest tube insertion in four patients (13.3%). Compensatory sweating postoperatively at one month was mild in three patients (10%) and moderate in one patient (3%), and at six months, four patients had mild CS (13%) with no recurrence observed. QOL scores improved significantly, from 73.2 ± 4.8 preoperatively to 24.7 ± 5.4 postoperatively.***

Conclusion: ***Needlescopic sympathectomy is a safe, efficient, and cosmetically favorable procedure for managing PPH in pediatric and adolescent patients, offering significant improvement in quality of life.***

Keywords: Palmar hyperhidrosis; thoracoscopic sympathectomy; Video-assisted thoracic surgery; Compensatory hyperhidrosis; Needlescopic sympathectomy

1. Introduction

Primary hyperhidrosis is a well-recognized condition marked by excessive sweating that is restricted to specific body regions, including the palms, axillae, soles, and face. Severe cases of primary palmar hyperhidrosis (PPH) can greatly diminish quality of life and hinder social interactions, often leading affected individuals to seek medical intervention.[1]

Various treatment modalities, including topical antiperspirants, iontophoresis, botulinum toxin injections, Radiofrequency ablation, and systemic anticholinergic medications, provide temporary relief. However, thoracoscopic sympathectomy remains the ideal therapeutic intervention for severe cases unresponsive to non-surgical management. Needlescopic sympathectomy, a minimally invasive alternative to traditional thoracoscopic approaches, has gained attention for its safety, efficacy, and improved cosmetic outcomes.[2]

Our purpose in this study is to assess the clinical results of needlescopic sympathectomy in children and adolescents with PPH.

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2. Patients and methods

This prospective study was carried out at pediatric surgery department, Al-Azhar University Hospitals in Cairo, Egypt, during the period from August 2023 to August 2024.

Thirty patients with primary palmar hyperhidrosis were enrolled in this study with essential diagnostic specifications of noticeable heavy perspiration that lasts for a minimum of six months, with no apparent cause, excluding secondary hyperhidrosis causes and having at least two of these criteria: Sweating bilaterally and symmetrically, at least once per week, impairment in everyday activities, Less than 16 years of age at onset, a positive family history, and the absence of sweating while sleeping.

Patients eligible for this study who had the following criteria: Primary palmar hyperhidrosis, both male and female genders, age between 6 and 18 years old, Frequency of at least once per week, and Impairment in everyday activities.

Patients excluded from this study who had Secondary hyperhidrosis (e.g. DM, Hyperthyroidism, TB), age less than 6 or more than 18 years old, Recurrent hyperhidrosis, Patients who suffer from unilateral primary palmer hyperhidrosis.

After a detailed history was obtained, all patients of this study were examined generally and locally, a chest X-ray, however a CT chest scan if any abnormalities were found. All patients underwent standard preoperative laboratory testing.

The patients' quality of life (QOL) prior to surgery was measured using The Campos Questionnaire (Campos), which was created especially to estimate the outcomes of sympathectomy using a thoracoscope as a treatment for primary palmar hyperhidrosis.3

Needlescopic sympathectomy technique:

Single lumen endotracheal intubation (two lungs ventilation) was used under general anesthesia, with carful control of patient's enhanced oxygenated ventilation in a decreased-volume/ low pressure/ increased-frequency manner, along with safe transient apnea episodes if required.

After sterilization and draping, patients were positioned in semi-Fowler posture, placing the patient in dorsal decubitus posture with abduction and securing of arms at 90 90-degree angle. Elevation of the trunk at 30 to 40 degree. The elevation aided in the lung's downward displacement. For the patients' safety and to guard against slipping, a small bed elevation at the knee level was done.

Initially the patient's dominant side was approached, two ports were used, first one a 5 mm trocar inserted in the mid-axillary line at the 5th intercostal space for the 30° telescope (visualizing port), second port for a special homemade invented needle 2 mm thickness with electric isolation coat, inserted directly through the anterior axillary line at 3rd intercostal space (Figure 1:A, B).

The regular use of low-pressure (6–8 mmHg) CO2 insufflation during the surgery, which maintained the lung compressed, allowed for adequate visualization.

The thoracic cavity was explored, placement in a reverse Trendelenburg position was done, which allowed the lung to drop away from the upper mediastinum, then rotation of operating bed was done to aid manual retraction of the lung.

After identification of the sympathetic chain, mobilization and dissection to the extent of the superior border of the third and fourth ribs were performed (Figure 2). Then, coagulation and division (sympathectomy) were done at the levels of R3 and R4, with cauterization laterally for two centimetres in order to cauterise possible bypassing chain branches (such as the Kuntz nerve). Using coagulation diathermy, which was connected to the needle (Figure 3:A).

Introduction of an adjusted needle-scopic suture grasper (Mediflex) connected to a coagulation diathermy with an electric isolation coat (Figure 3:B) for the extraction of the coagulated, divided segment through the same port of the initial working needle (Figure 4).

Local haemostasis was completed and after exclusion of air leakage, evacuation of surgically induced Pneumothorax under direct inspection by asking the anaesthetist to do positive ventilation till complete lung expansion then wound closure was done (Figure 5).

Postoperative care included analgesic regimen (NSAID), a routine postoperative chest X-ray after six hours was done to exclude considerable Pneumothorax in all patients after the surgery. If the patient developed signs of respiratory distress or oxygen desaturation, urgent Chest X-ray was done.

Postoperative follow up was evaluated at four intervals, at first week, first month, third month and sixth month after the surgery and included; Efficacy of the operation (Cured, Partial failure, Complete failure), complications, compensatory hyperhidrosis, and measuring patients' quality of life (QOL) using The Campos Questionnaire (Campos), which was created especially to assess the outcomes of sympathectomy using thoracoscope as a treatment for primary palmar hyperhidrosis. The effect of treatment on Quality of life: (the closest value to) Before surgery (17 Excellent – 85 worse) - After surgery (17 Much better – 85 much worse).4

Statistical analysis:

The recorded data were analyzed using the Statistical Package for the Social Sciences (SPSS)

software, version 23.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data with a normal distribution were presented as mean ± standard deviation and range, whereas non-normally distributed data were expressed as the median with an interquartile range (IQR). Categorical variables were reported as frequencies and percentages. The normality of the data distribution was assessed using the Shapiro-Wilk and Kolmogorov-Smirnov tests.

3. Results

Thirty patients were enrolled in this study, mean of patients' age was 11.88±1.9 years, mean of patients' age of symptoms onset was 6.33±1.12 years, Fifteen patients were males with percentage %50, Fifteen patients were females with percentage %50, Nine patients had positive family history with percentage %30, and Thirty patients had impairment of daily activities with percentage of %100.

Table 1. Distribution of Demographic and characteristic data in the studied group.

		RANGE	MEDIAN	MEAN ±SD
AGE (IN YEARS)		7 - 14	11.8	12±1.9
AGE OF ONSET (IN YEARS)		4 - 9	6	6.33±1.12
			N	(%)
SEX	Male	-	15	%50
	Female	-	15	%50
FAMILY HISTORY		-	9	%30
IMPAIRMENT OF DAILY ACTIVITIES		-	30	%100

Mean of operative time was 41.7±5.35 minutes , regarding intraoperative complications, five patients (16.6%) had minimal bleeding which was managed by electrocautrization, two patients (6.6%) had surgical emphysema which resolved spontaneously and four patients (13.3%) had Pneumothorax with chest tube insertion which was removed after 24 hrs, while mean of Hospital Stay (Days) was 1.3±0.4 (Table 2).

Table 2. Distribution of Intra Operative data and Hospital Stay (Days) in the studied group.

	RANGE	MEDIAN	MEAN ±SD
OPERATIVE TIME (IN MINUTES)	32 - 52	41.5	41.7±5.35
INTRA OPERATIVE COMPLICATIONS		N	%
MINIMAL BLEEDING	-	5	16.6%
SURGICAL EMPHYSEMA	-	2	6.6%
CONVERSION TO OPEN	-	0	0%
PNEUMOTHORAX WITH CHEST TUBE INSERTION	-	4	13.3%
	Range	Median	Mean ±SD
HOSPITAL STAY (DAYS)	1 - 2	1	1.3±0.4

Regarding Distribution of postoperative complications, after 1 week three patients (10%) had post-operative pain while there were no other complications, after 1 month Two patients (6%) had post-operative pain while there were no other complications, after 3 months one patient (3%) had post-operative pain while there were no other complications, and after 6 months there was no complication between study group (Table 3).

Table 3. Distribution of postoperative complications.

	1 WEEK		1 MONTH		3 MONTHS		6 MONTHS	
	N	(%)	N	(%)	N	(%)	N	(%)
PARTIAL FAILURE	0	0%	0	0%	0	0%	0	0%
COMPLETE FAILURE	0	0%	0	0%	0	0%	0	0%
POST-OPERATIVE PAIN	3	10%	2	6%	1	3%	0	0%
WOUND INFECTION	0	0%	0	0%	0	0%	0	0%
HORNER SYNDROME	0	0%	0	0%	0	0%	0	0%

Regarding distribution of recurrence and compensatory sweating, Four patients (13%) had compensatory sweating and no recurrence was detected (Table 4).

Table 4. Distribution of recurrence and compensatory sweating.

	STUDIED GROUP N=30	
	N	(%)
RECURRENCE	0	(0%)
COMPENSATORY SWEATING	4	(13%)

Regarding areas affected by compensatory sweating, one patient (3.33%) affected by Compensatory sweating in thighs, one patient (3.33%) affected by Compensatory sweating in abdomen, two patients (6.66%) affected by Compensatory sweating in back (Table 5).

Table 5. Areas affected by compensatory sweating.

	STUDIED GROUP N=30	
	N	(%)
THIGHS	1	(3.33%)
ABDOMEN	1	(3.33%)
BACK	2	(6.66%)

Regarding of Degree of compensatory sweating, after 1 month and 3 months three patients (10%) had mild CS while one patient (3.33%) had moderate CS, after 6 months four patients (13.33%) had mild CS (Table 6).

Table 6. Distribution of Degree of compensatory sweating

	1 MONTH		3 MONTHS		6 MONTHS	
DEGREE OF COMPENSATORY SWEATING	N	(%)	N	(%)	N	(%)
MILD	3	10%	3	10%	4	13.33%
MODERATE	1	3%	1	3.33%	0	0%
SEVERE	0	0%	0	0%	0	0%

According to this table the mean of (QOL) pre-operative values was 73.2±4.8 and mean of (QOL) post-operative values was 24.7±5.4, (the closest value to 17 Excellent – 85 very bad). There was a statistically significant improvement between the pre-operative and the post-operative quality of life

(QOL) values (Table 7).

Table 7. Distribution of quality of life in the studied group.

QUALITY OF LIFE	RANGE	MEDIAN	MEAN ±SD
PRE-OPERATIVE	61 - 80	74	73.2±4.8
POST-OPERATIVE	19 - 40	23	24.5±5.4
P-VALUE	-	-	0.001*

±SD: Standard Deviation, P-value < 0.05.

4. Discussion

Primary palmar hyperhidrosis (PPH) is a frequent problematic disorder defined by undue secretion of the eccrine sweat glands over the body's physiological demands. The palms are commonly involved, but the sole and axilla may also be affected, resulting in debilitating social, psychological, and vocational dysfunction. PPH is so common that efforts should be made to improve its identification, diagnosis, and treatment.[5]

conservative treatments, including systemic anticholinergics, iontophoresis, local antiperspirants, and botulinum toxin injection, improve symptoms temporarily, but the recurrence rate is common. Surgical modalities include local sweat gland removal, open thoracic approach, sympathectomy (video-assisted thoracic surgery (VATS), and robotic thoracic surgery.[6]

Currently, sympathectomy using thoracoscopy is considered the most efficient approach and resilient treatment for patients who have PPH, and results are less invasive and offer good cosmesis.[7]

This study aimed to asses safety, efficacy, and cosmetic results of needlescopic sympathectomy for management of primary palmar hyperhidrosis in children and adolescents. This prospective study included 30 patients diagnosed with PPH. This study was carried out at the pediatric surgery department in Al-Azhar university hospitals in Cairo, Egypt.

The current study reported that the mean age of patients was 11.88±1.9 years, mean of patients' age of onset was 6.33±1.12 years, 50% of patients were males, 50% of patients were females, 30% of patients had positive family history, and 100% of patients had impairment of daily activities.

The present study demonstrated that the mean operative time was 41.7±5.35 minutes. This was similar to Kuijpers M, et al., who reported that the mean operative time was 47 minutes for bilateral sympathectomy.[8]

As regards intraoperative complications, our results showed that five patients (16.6%) had minimal bleeding controlled by electrocauterization, two patients (6.6%) had surgical emphysema resolved after 24 hrs., and four patients (13.3%) had Pneumothorax managed by chest tube insertion and removed after one day, while the mean of hospital stay was 1.3±0.4 days. As regards post-operative complications, 10%, 6%, and 3% of patients had post-operative chest pain after one week, one month, and 3 months, respectively. After 6 months, there were no complications among the studied patients.

Similarly, a retrospective study conducted by Abdel-Aziz et al. discussed the long-term outcomes of sympathetic chain interruption methods. They reported that twenty-one patients had intraoperative bleeding that was managed by suction and electrocauterization. Also, 21 cases reported Pneumothorax that spontaneously resolved within 8–18 hours (10 (5.2%) patients had Pneumothorax, and 5.2% had bleeding in sympathectomy).[9]

This study findings reported that 4 patients (13%) had compensatory sweating, as regards the degree of compensatory sweating, the current study reported that one patient (3%) had a mild degree after one week. Also, 3 patients (10%) had mild degree, and one patient (3%) had moderate degree of compensatory sweating after one month and after 3 months as well. Then after 6 months we had 4 patients (13%) of mild degree only.

This study results were comparable with a study done by Elshahawy, M. et al. who compared Clipping and Electrocautery Techniques for Thoracoscopic Sympathectomy, and reported that compensatory hyperhidrosis was identified as a popular undesirable effect of sympathectomy instead of being a complication, 70% of group A and 75% of group B experienced compensatory hyperhidrosis which ranged from mild to severe, however only 15% from group A and 20% from group B experienced severe degree, yet the distinction among the two studied groups showed no statistical significance. (P = 0.367).[10]

Bell D et al. reported that the possibility and intensity of compensatory hyperhidrosis were observed to alter according to age, and the alteration was significant (P = 0.0006). The possibility of not developing compensatory hyperhidrosis was greater at a young age, and this declined with older ages. The possibility of severe compensatory sweating decreased with younger ages; therefore, it is evident that a younger age may be a predictor of favorable results following sympathectomy in terms of the risk of compensatory sweating, symptom relief, and individual satisfaction.[11]

In the current study, no recurrence was detected during the follow-up period of 6 months. The results of this study were consistent with Mo'men M. et al., who compared Thoracoscopic Sympathectomy Versus Thoracoscopic

Sympathotomy and found no recurrence in the sympathectomy group and two recurrent cases in the sympathotomy group.[12]

In the current study, we performed minimally invasive sympathectomy, as it was done through only two ports with very tiny post-operative scars. This results in excellent cosmetic appearance and high patient satisfaction. This is consistent with Feng X et al., who reported that Needlescopic T4 Sympathectomy for PPH was a convenient, safe, and minimally invasive approach suitable for broad clinical use.[13]

This is different from the conventional 3-port sympathectomy done by Mahmoud, Mohamed Mostafa et al. They used three 5-mm ports in the sympathectomy group for their prospective study, as they compared T3-T5 Thoracoscopic sympathectomy versus sympathectomy in the treatment of palmar–axillary–plantar hyperhidrosis with no obvious major complications but with an extra wound scar.[14]

Regarding quality of life, this study measured patients' quality of life using the Campos Questionnaire, which revealed that the mean of preoperative values was 73.2±4.8 and the mean of post-operative values was 24.7±5.4. (The closest value is 17 Excellent – 85 very bad). There was a statistically significant improvement between the preoperative and the postoperative quality of life (QOL) values.

Also, the present study results were consistent with Alkosha et al., who reported that the preoperative Hyperhidrosis Quality of Life Questionnaire (HQLQ) score ranged from 65 to 96, and the mean postoperative HQLQ score was 42 ± 13.6 (range, 25–87).[15]

A study done by Rahman, A. et al., who compared Intradermal Botulinum Neurotoxin Injection Versus Thoracoscopic Sympathectomy for PPH, reported superiority of video-assisted thoracoscopic sympathectomy with a higher satisfaction rate.[16]

4. Conclusion

The outcomes of this study demonstrated that Needlescopic sympathectomy is a safe, reliable, and effective technique for the management of primary palmar hyperhidrosis in pediatrics and adolescents. The advantages include good cosmetic outcome, achievement of permanent dryness of palms, no recurrence, a short hospital stay, and low risk of complications, especially compensatory sweating with notable improvement of patients' quality of life and high patient satisfaction.

Disclosure

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Authorship

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Conflicts of interest

There are no conflicts of interest.

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