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Pediatric Surgery

Thoracoscopic Sympathectomy versus Thoracoscopic Sympathotomy for The Treatment of Primary Palmar Hyperhidrosis in Children and Adolescents

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ABSTRACT

Background: Although thoracoscopy sympathectomy is a successful therapy for primary hyperhidrosis of the hands, the specific form of operation that produces the greatest outcomes is still being debated.
Aim of The Work: To compare the outcomes of thoracoscopic sympathectomy versus sympathotomy for the therapy of primary palmar hyperhidrosis in children and adolescents.
Patients and Methods: A randomized comparative prospective study involved forty patients diagnosed with primary palmer hyperhidrosis. All patients have been randomly allocated into 2 groups using the closed envelops method; group A, comprised of 20 patients, was managed by thoracoscopic sympathectomy and group B, comprised of 20 patients, was treated by thoracoscopic sympathotomy. All participants were subjected to full history taking, clinical assessment, routine preoperative laboratory investigations.
Results: In our study, group A had 10% postoperative complications and group B had 25%, with no statistically significant difference between the two groups at one week (P = 0.429). These complications were in the form of partial failure, pleuritic chest pain and wound infection. Also, there was no significant difference regarding recurrence as it happened in 2 cases (10%) in group B only (P = 0.487).
Conclusion: : In terms of long- and short-term postoperative complications, sympathectomy and sympathotomy techniques were comparable. However, sympathectomy showed a significant higher satisfaction rate at 1, 3 and 6 months postoperative than sympathotomy.

Keywords: *Primary Palmar Hyperhidrosis; Thoracoscopic Sympathectomy; Thoracoscopic Sympathotomy.*

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INTRODUCTION

Hyperhidrosis is a pathologic disease defined by excess sweating that exceeds the body's physiological requirements to sustain an appropriate temperature range .[1]

Sweating complaints in primary hyperhidrosis patients typically begin in their first decade of life (especially in the hands), resulting in a detrimental influence on their quality of life (QOL). The symptoms are exacerbated by physical, psychological, as well as emotional stress . [2]

However, thoracoscopy sympathectomy is a successful therapy for primary hyperhidrosis of the hands; the effects are irreversible and permanent. Nevertheless, there is still an active dispute concerning the specific form of operation that produces better outcomes, as well as not just the level or levels from which to break the sympathetic chain, but also "sympathotomy" vs. “sympathectomy”.[3]

When compared to open sympathectomy, the amazing view of the ganglion combined with appropriate magnification enables accurate ganglion division, resulting in reduced occurrences of Horner's syndrome (0.4% to 2.4%) .[4]

A variable level of compensatory sweating, primarily affecting the back, abdomen, and lower extremities, is the most common and worst secondary effect of sympathectomy .[5]

Our rationale was to assess the outcome of both thoracoscopic sympathectomy and sympathotomy for treating primary palmar hyperhidrosis in children and adolescents.

PATIENTS AND METHODS

A randomized comparative prospective study was performed by the Pediatric Surgery Department, Faculty of Medicine, Al-Azhar University during the period from May 2019 to October 2021. The current study involved forty patients diagnosed with primary palmer hyperhidrosis with main diagnostic criteria of visible exaggerated sweat, lasting for at least six months, with an unknown cause after excluding causes of secondary hyperhidrosis (e.g. hyperthyroidism, DM, TB) in addition to at least 2 of the following:

Sweating that is both bilateral and symmetrical.
The weekly occurrence of at least one episode.
Difficulties with day-to-day activities.
The onset age is less than 16 years old.
Presence of family history.

Sleeping without sweating.

All patients were allocated randomly into 2 groups using closed envelops method:

group A (20 patients): has been managed by Thoracoscopic sympathectomy.

group B (20 patients): has been managed by Thoracoscopic sympathotomy.

Ethical approval:

Al-Azhar University's Ethics Board gave their approval for the study. Each individual in the research provided informed written permission.

Inclusion criteria:

Sex: both male and female.
Age: 6 – 18 years.
Patients suffering from bilateral primary palmer hyperhidrosis.

Exclusion criteria:

Patients suffering from secondary hyperhidrosis.
Patients suffering from unilateral primary palmer hyperhidrosis .
Recurrent primary palmer hyperhidrosis.

Methods:

Patients included in the study were subjected to full history taking, clinical assessment, routine preoperative laboratory investigations.

Thoracoscopic sympathectomy technique:

Three ports were used; the first port was a 5 mL port, which was put in the 5th intercostal gap in the mid axillary line. This port has been used to pass a telescope through. At the level of the 3rd and 4th intercostal gaps in the anterior axillary line, two more 3 mL apertures for instrumentation have been placed. After identifying the sympathetic chain, the sympathetic chain resection was extended from the head of the 3rd rib to the head of the 4th rib, extending the resection 2 cm laterally to resect possible chain bypassing branches (e.g., the nerve of Kuntz).

Thoracoscopic sympathotomy technique:

Two ports were used. The first port, containing 5 mL, was introduced in the mid-axillary line's 5th intercostal space; the endoscope was inserted through this port. The other port, a 3ml port, was placed at the anterior axillary line in the 3rd intercostal space under vision. After identifying the sympathetic chain, transection of the sympathetic trunk was done using electrocautery at the level of the 3rd rib and the level of the 4th rib's head, prolonging the cauterization laterally for a length of 2 cm to cauterize possible chain bypassing branches (e.g. the nerve of Kuntz). The other steps were like the technique of thoracoscopic sympathectomy.

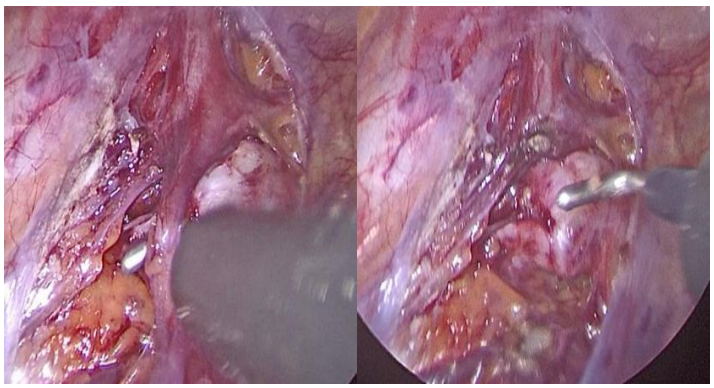

Fig. 1: The sympathetic chain dissected, isolated and cauterized.

Statistical Analysis:
The data has been gathered, revised, coded, and entered into the IBM SPSS version 20 statistical package for social science. When the distribution has been found to be parametric, qualitative data has been provided as numbers and percentages, whereas quantitative data has been represented as mean, standard deviations, and ranges. Both groups were compared using an independent t-test and a Chi-square test. If the p-value was < 0.05, it was considered significant.

RESULTS

In this study, a total of forty patients were enrolled, with the average age in group A ranging from 12.05 ± 3.50 years, while in group B it was 12.45 ± 2.98 years. Regarding the diagnostic criteria among all patients, all patients presented by bilateral symmetrical sweat with more than one episode per day and caused them impairment in their daily activity. The age of onset in group A varied from 1 - 10 years with a mean age of 4.6 ± 2.76 years, while in group B, the age of onset ranged from 1 - 9 years with a mean age of 4.65 ± 2.66 years. Ten patients (25%) had a positive family history, 3 from group A and 7 from group B. Concerning age, gender, diagnostic criteria, family history, and age of onset, there has been no significant difference between the two groups (Table 1).

		Sympathectomy (group A)	Sympathotomy (group B)	Test value	P-value	Sig.
		No. = 20	No. = 20			
Bilateral and symmetrical sweat		20 (100%)	20 (100%)	NA	NA	NA
Frequency of episode per week > 7		20 (100%)	20 (100%)	NA	NA	NA
Impairment in daily activities		20 (100%)	20 (100%)	NA	NA	NA
Age of onset	Mean±SD	4.60 ± 2.76	4.65 ± 2.66	-0.058**	0.954	NS
	Range (yrs)	1 – 10	1 – 9			
Family History		3 (15.0%)	7 (35.0%)	2.133*	0.144	NS
Sweat during Sleep		6 (30.0%)	3 (15.0%)	1.290*	0.256	NS

*: Chi-square test;**: Independent t-test

Table 1: Comparison between sympathectomy (group A) and sympathotomy (group B) techniques concerning diagnostic criteria.

The operative time in group A varied from 30 - 78 minutes, with a mean time of 55.65 ± 12.54 minutes, while in group B, the operative time ranged from 30 - 81 minutes with mean time of 45.90 ± 13.71 minutes and that difference was statistically significant (P = 0.024). Regarding intraoperative complications, pneumothorax was developed in one case (10%) in each group (P = 1.00), while minimal bleeding reported in two cases (10%) of group A and one case (5%) of group B (P = 1.0). No cases in our study required conversion to open thoracotomy, showed cardiac complication or Horner`s syndrome (Table 2).

		Sympathectomy (group A)	Sympathotomy (group B)	Test value	P-value	Sig.
		No. = 20	No. = 20			
Operative time	Mean±SD	55.65 ± 12.54	45.90 ± 13.71	2.347**	0.024	S
	Range	30 – 78	30 – 81			
Intraoperative complication No (%)						
Pneumothorax		1 (5.0%)	1 (5.0%)	0.00*	1.00	NS
Minimal bleeding		2 (10.0%)	1 (5.0%)	0.00*	1.00	NS
Cardiac Complication		0 (0.0%)	0 (0.0%)	NA	NA	NA
Conversion to Open		0 (0.0%)	0 (0.0%)	NA	NA	NA
Total		3 (15.0%)	2 (10.0%)	0.625*	0.429	NS

Table 2: Comparison between sympathectomy (group A) and sympathotomy (group B) techniques concerning operative data.

*: Chi-square test; **: Independent t-test

In our study, group A had 10% postoperative complications and group B had 25%, with no statistically significant difference between the two groups at one week (P = 0.429). At one month, group A was 10% and group B was 20%, and the difference between both the two groups was statistically insignificant (P = 0.661); at three months, group A was 5% and group B was 15%, and the difference between both the two groups was statistically insignificant (P = 0.605); and at six months, group A was 0% and group B was 10%, with the difference between both the two groups being statistically insignificant (P = 0.526). These complications were in the form of partial failure, pleuritic chest pain and wound infection. There has also been no statistically significant difference regarding recurrence, as it happened in 2 cases (10%) in group B only (P = 0.487). (Table 3).

	Sympathectomy (group A)	Sympathotomy (group B)	Test value	P-value	Sig.
	No. = 20	No. = 20			
Recurrence	0 (0.0%)	2 (10.0%)	0.526*	0.487	NS
Postoperative complications					
One week	2 (10.0%)	5 (25.0%)	0.625*	0.429	NS
One month	2 (10.0%)	4 (20.0%)	0.196*	0.661	NS
Three months	1 (5.0%)	3 (15.0%)	0.278*	0.605	NS
Six months	0 (0.0%)	2 (10.0%)	0.526*	0.487	NS

*: Chi-square test.

Table 3: Comparison between sympathectomy (group A) and sympathotomy (group B) techniques regarding recurrence and postoperative complications.

There was no significant difference regarding degree of compensatory sweating post-operative between the two groups. Sweating as a form of compensation was considered a side effect of the procedure rather than a complication, in our study 70% of each group developed compensatory sweating at all follow up periods and it was ranging from mild to severe degree (Table 4).

Degree of compensatory sweating		Sympathectomy (group A)	Sympathotomy (group B)	Test value	P-value	Sig.
		No. = 20	No. = 20			
1 week	**Negative**	6 (30.0%)	6 (30.0%)	2.48*	0.480	NS
	Mild	3 (15.0%)	6 (30.0%)			
	Moderate	8 (40.0%)	4 (20.0%)			
	Severe	3 (15.0%)	4 (20.0%)			
1 month	**Negative**	6 (30.0%)	6 (30.0%)	2.93*	0.402	NS
	Mild	4 (20.0%)	8 (40.0%)			
	Moderate	7 (35.0%)	3 (15.0%)			
	Severe	3 (15.0%)	3 (15.0%)			
3 months	**Negative**	6 (30.0%)	6 (30.0%)	1.89*	0.596	NS
	Mild	6 (30.0%)	9 (45.0%)			
	Moderate	5 (25.0%)	2 (10.0%)			
	Severe	3 (15.0%)	3 (15.0%)			

6 months	**Negative**	6 (30.0%)	6 (30.0%)	0.0*	1.00	NS
	Mild	3 (15.0%)	9 (45.0%)			
	Moderate	9 (45.0%)	3 (15.0%)			
	Severe	2 (10.0%)	2 (10.0%)			

*: Chi-square test.

Table 4: Comparison between sympathectomy (group A) and sympathotomy (group B) techniques regarding degree of compensatory sweating post operative.

There was no significant difference regarding postoperative Campos questionnaire between the two groups after one week. While group A showed significant decrease (improvement) regarding postoperative Campos questionnaire than group B after one month, 3 months and 6 months (p=0.033, 0.001 & <0.001, respectively) (Table 5).

Postoperative Campos questionnaire		**Sympathectomy (group A)**	**Sympathotomy (group B)**	**Test value**	**P-value**	**Sig.**
		No. = 20	**No. = 20**			
1week	Mean ±SD	35.40 ± 9.62	37.80 ± 10.76	-0.744*	0.462	NS
	Range	24 – 68	25 – 64			
1 month	Mean ±SD	32.42 ± 8.54	39.90 ± 12.5	-2.83*	**0.033**	S
	Range	24 – 68	25 – 64			
3 months	Mean ±SD	28.40 ± 9.32	40.25 ± 10.76	-9.87*	**0.001**	HS
	Range	24 – 68	25 – 64			
6 months	Mean ±SD	25.42 ± 8.87	48.99 ± 3.56	-11.4	**<0.001**	HS
	Range	24 – 68	25 – 64			

*: Independent t-test.

Table 5: Comparison between sympathectomy (group A) and sympathotomy (group B) techniques regarding postoperative Campos questionnaire.

The efficiency was 100% in group A and 95% in group B following one week, while the efficiency decreased to 90% after 1, 3 and 6 months in group B only, without significance between both groups (Figure 3).

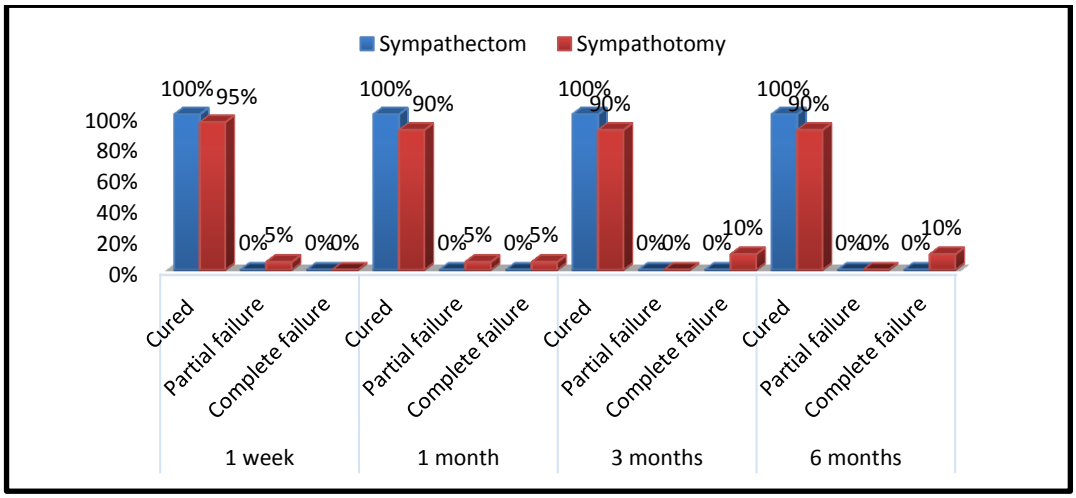

Fig. 3: Comparison of postoperative efficiency between the two groups.

DISCUSSION

Hyperhidrosis involves a sympathetic nervous system malfunction characterized by excessive sweating in excess of physiological requirements. It mostly affects the hands and axillae, which makes social interactions challenging. Medical therapies are effective, but in refractory cases, thoracic sympathectomy (TS) is employed. Despite the fact that it has been practised since 1920, ongoing advancements throughout the years have resulted in a progressive decrease in the aggression, morbidity, and death [6].

In the current study, the operative time in group A varied from 30–78 minutes with an average time of 55.65 ± 12.54 minutes, while in group B, the operative time ranged from 30–81 minutes with a mean time of 45.90 ± 13.71 minutes, and that difference was statistically significant (P = 0.024). Despite that the difference between the operative time of the two groups was statistically significant, yet it was only about 10 minutes.

In agreement with our study, Aydemir *et al.* (2015) [7] reported that average surgical time for a sympathicotomy is frequently much less than the average sympathectomy. They discovered comparable findings in terms of surgery time, with Group A averaging 50 mins and Group B averaging 36 mins. The key explanation could be the amount of

time required for resection. According to Turner et al. (2010),[8] ablation takes nearly twice as long in most situations. In this instance, a standard two-port sympathectomy with sympathetic chain excision was performed. Moreover, sympathicotomy is both technically and procedurally simpler than sympathectomy.

We also found that there had been no statistically significant difference regarding intraoperative complications among the two groups. The complications rate of our study was 15% in group A and 10% in group B and the difference between the 2 groups was statistically insignificant (P = 0.429), Pneumothorax was developed in one case (10%) in group A, and in group B there was one case cases (P = 1.00), While in group B there was one case (5%) of bleeding and only two cases (10%) in group A (P = 1.0). No cases in our study required conversion to open thoracotomy, showed cardiac complication or Horner`s syndrome.

The majority of studies reported that there were no any intraoperative complications. However, Vannucci & Araújo (2017) [13] stated that the most noticeable intraoperative consequences are injury to the lung, pneumothorax, severe bleeding, chylothorax, and phrenic nerve damage. All of these are uncommon and may be avoided with a precise and thorough surgical procedure.

Our study revealed that there have been no statistically significant differences concerning postoperative complications after one week, one month, 3 months, and 6 months among the two groups. Our study had a 15% complication rate in group A and a 25% complication rate in group B, with the difference between the two groups being statistically insignificant (P = 0.429),

Our results were supported by Aydemir *et al.* (2015),[7] who reported that both approaches offer the same operational success rate. There have been no serious complications reported. When comparing sympathectomy versus sympathicotomy, we found that sympathicotomy caused less internal tissue trauma while yielding similar clinical outcomes. Both techniques come with the usual risks, surgical complications, and postsurgical adverse impacts. Muscle soreness, eczema, and limb numbness are among the negative impacts reported by patients. Some such complaints are regarded as minor because patients do not consider them bothersome or burdensome. The majority of patients in our research complained of significant postsurgical pain, primarily in the anterior chest as well as upper back pain.

Furthermore, Mohebbi *et al.* (2012) [9] reported that in early assessments, the average postsurgical pain scores in the groups of sympathectomy and sympathicotomy became 6.25 ± 2.31 and 5.33 ± 1.84 (V.A.P.S.) respectively (P = 0.101). In late assessments, the average pain scores were 2.3 ± 1.03 and 1.93±0.98 (P = 0.702). Early and late negative impacts of compensatory sweating (C.S) on life in groups did not differ significantly. Figures 1 and 2 depict this data. During the follow-up period, our patients experienced no additional postsurgical complications like hemothorax, pneumothorax, Horner's syndrome, or recurrence.

A literature review by Manoochehry et al. (2016) [10] revealed that the most prevalent adverse impacts of sympathectomy and sympathicotomy operative procedures are CS, followed by gustatory sweating. Horner's syndrome (myosis, ptosis, and anhidrosis), as well as pompholyx or dyshidrotic eczema, are other potential consequences (a type of palmar eczema marked by maculopapular and vesicular rashes produced by severe palmar anhidrosis and dry skin).

We also found that there had been no statistically significant difference concerning recurrence as it happened in 2 cases (10%) in group B only (P = 0.487). The one from the sympathotomy group showed recurrence of the symptoms which was managed by sympathotomy with complete resolution of the symptoms postoperative, the other patient showed recurrence of the symptoms at the palmer region on the right side which was managed by Redo sympathectomy R3 with complete resolution of the symptoms postoperative.

Several publications claim that no recurrences occurred during a period of follow-up *(Fiorelli et al., 2012; Mohebbi et al., 2012)*, [9] while others found rates of recurrence ranging from 3% to 8.2% (Scognamillo et al., 2011).[11]

However, Vanaclocha *et al.* (2021) [12] reported that the recurrence rate was more prominent in the first than in the second group (5% ramicotomy vs. 0% sympathicotomy). This increase in the recurrence rate was a deterrent for spreading this surgical technique of grey and white rami communicantes lesion.

The current research revealed that there was no statistically significant difference regarding the postsurgical Campos questionnaire between the two groups after one week. While there was significant decrease (improvement) regarding Postoperative Campos questionnaire in group A compared group B after one month, 3 months and 6 months (p=0.033, 0.001 & <0.001 respectively).

In agreement with us, Mohebbi *et al.* (2012) [9] found no significant differences in total early and late satisfaction rates among the two groups. The satisfaction rate declined over time in all three sites (hands, axillae, and feet). Furthermore, the satisfaction rate fell in a decreasing trend with hyperhidrosis sites (palmar, axillary, and plantar, respectively), and these findings are consistent with prior studies.

CONCLUSION

In terms of long- and short-term postoperative complications, hospital stay, recurrence, degree of compensatory sweating, and efficiency, we can conclude that sympathectomy and sympathotomy techniques were comparable .

However, sympathectomy showed a significant higher satisfaction rate at 1, 3 and 6 months postoperative than sympathotomy.

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