

## Comparing Electro-Coagulation and Clipping for Palmar Hyperhidrosis in the Same Patient

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## 1. Abstract

**1.1. Background:** Thoracoscopic sympathectomy is an effective treatment for primary hyperhidrosis of the hands, however, there is still active debate about the exact type of surgery that provides the best results. The aim of the work is to compare the rate of success, compensatory sweating, recurrence, and degree of satisfaction in patients undergoing electro-coagulation thoracoscopic sympathectomy on the right side and clipping sympathetic block on the left side in the treatment of palmar hyperhidrosis in the same patient.

**1.2. Methods:** A prospective study involved 64 patients who underwent 128 sympathetic interruption procedures, from March 2020 to March 2023. The procedures were categorized into two groups: right-sided transection sympathectomy of the T3 ganglions and left sided clipping of the T3 ganglions. Patients were evaluated for successful results, degree of satisfaction, compensatory sweating, and recurrence.

**1.3. Results:** There is no statistical difference between the two groups according to their rate of success. Compensatory sweating was observed on 28 sides (21.8%) overall, with 4 cases of severe, unsatisfied compensatory sweating. Recurrence was reported in one case with transection and in two cases with clipping. 63 cases were satisfied by the transection procedure, and 61 cases were satisfied by the clipping procedure.

**1.4. Conclusion:** Both thoracoscopic sympathetic transection or clipping of T3 ganglion are safe and effective procedures in palmar hyperhidrosis treatment. with no differences regarding recurrence rate, patients' satisfaction and incidence of the compensatory

sweating.

## 2. Introduction

Palmar hyperhidrosis is characterised by excessive sweating that goes beyond what the body physiologically requires, to keep its temperature within a reasonable range [1].

Primary hyperhidrosis appears to be more than just "excessive quantity of sweat"; it appears to be related to a dysfunction on the sympathetic part of the autonomic nervous system's ability to regulate body temperature. This leads to a significant imbalance between the stress trigger and/or environmental temperature, which causes the body to produce sweat and makes social interaction more challenging [1].

Treatment for palmar and axillary hyperhidrosis consists of sympathetic denervation of the affected area, which is usually the region innervated by sympathetic ganglia T3, and T4 [2].

This can be achieved by excision of the relevant segment of the sympathetic chain, sectioning of the chain, which is known as either sympathotomy or sympathicotomy using scissors, an electric scalpel or ultrasonic scalpel, and blocking the chain using clips [3-5].

The clipping technique is advantageous in many ways since it can be applied efficiently and securely. Although clipping is as effective as any other sympathectomy method, it is potentially reversible if the patient develops severe compensatory sweating, clips removal is an option [3].

Our aim was to assess the outcome of Thoracoscopic management of Palmar Hyperhidrosis using Electro-Coagulation at one

side Versus Clipping at another side in the same patient, to provide a methodology focused on the fixation of all clinical and demographic data of the examined sample and to neutrally evaluate the two procedures in pediatric cases.

### 3. Patients and Methods

From March 2020 and March 2023, both sexes under the age of 18 were included in the research at Al-Azhar University Hospitals' Department of Pediatric Surgery. All research participants had thorough history collection, clinical evaluations, and customary preoperative laboratory tests. The key diagnostic requirements were obvious, extreme, symmetrical sweating on both sides for at least six months with impairment in everyday activities with no known cause (such as hyperthyroidism, diabetes, or tuberculosis). We excluded patients with unilateral palmar hyperhidrosis, secondary hyperhidrosis, and recurrence instances.

According to the surgical techniques, the procedures were divided into two groups: left-sided clipping and right-sided transection sympathectomy of the T3 ganglions. Each individual parent's, involved in the research provided informed written consent for participation and publication. The study was approved by the Institutional Reviewer Board of Al-Azhar University, Faculty of Medicine. IRB (1-3-2020-000049).

#### 3.1. Surgical Procedures

A qualified anesthesiologist provided general anesthesia and

managed the patient's O<sub>2</sub>-enriched ventilation using an endotracheal tube and one lung ventilation anesthesia. The patient was placed in the semi-fowler position, which is dorsal decubitus with the arms locked at 90 degrees and abducted. The lungs could be pushed below by elevation the trunk's 30–40 degree. It was essential to position the patients carefully and prevent them from falling while being operated on by slightly elevating the bed at the knee level.

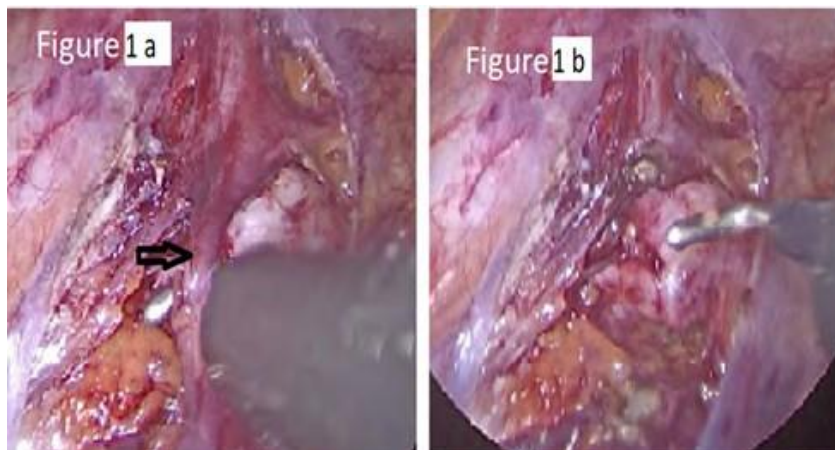
We used the two-ports video thoracoscopy technique, using two 5 mm ports. The camera port was placed laterally at the fourth or fifth intercostal space (depending on the age of the patient), at the mid-axillary line. the second port was medially inserted in the third intercostal space, just posterior to the anterior axillary fold created by the pectoralis major muscle.

#### 3.2. A-Thoracoscopic sympathotomy technique (TS)

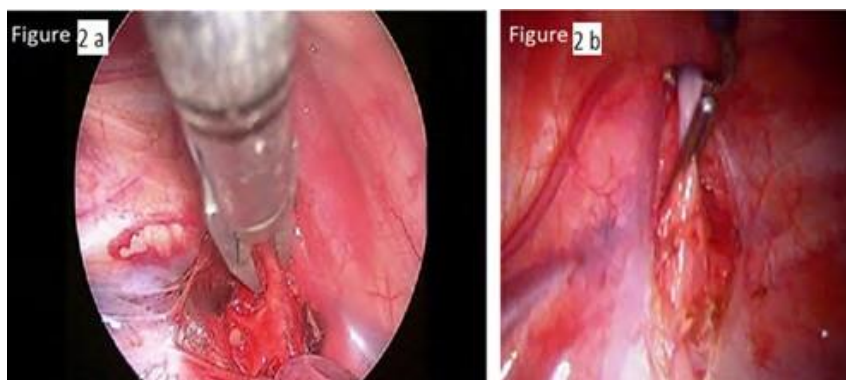
After identification of the sympathetic chain, mobilization and dissection at the level of the superior border of the third ribs was done. Then transection of the sympathetic chain was done using an electrocautery hook (Figure 1 a, b).

#### 3.3. B-Thoracoscopic Clipping Technique

Mobilization and isolation of sympathetic chain at level of T3 ganglion was done. Then Interruption without transection was done, using metallic clips (Titanium) applied across the trunk of sympathetic chain (Figure 2 a, b).



**Figure 1 (a, b):** The sympathetic chain dissected, isolated and cauterized (black arrow).



**Figure 2 (a, b):** The sympathetic chain dissected, isolated and clipped.

### 3.4. In Both Procedures

hemostasis was done if needed, testing the lungs for air leaks, insufflated CO<sub>2</sub> was evacuated under direct vision without a chest tube, then the ports were closed. Postoperative analgesics were given (NSID), and postoperative routine chest X-rays were obtained in all patients after the surgery to rule out significant pneumothorax.

After discharge, all patients were evaluated for the degree of success, compensatory sweating, and patient satisfaction with either transection or clipping, during follow-up visits at 1.6.12 and 24 months

### 3.5. Statistical Analysis

Data were collected, revised, coded, and entered to the Statistical Package for Social Science (IBM SPSS) version 23. The qualitative data were presented as numbers and percentages, while the quantitative data were presented as means, standard deviations, and ranges when their distribution was found to be parametric. Independent t-test and Chi-square tests were used to compare both groups. The p-value was considered significant if < 0.05.

## 4. Results

Sixty-Four patients 24 males and 40 females, underwent 128 sympathetic interruption procedures, electro-coagulation sympathetomy on the right side and clipping on the left side. With a mean age of 17±0.9 years, with a mean follow up period of 20±0.7 months, patient’s clinical data are described in (Table 1). Pnumothorax occurred on two sides of the transection procedure compared to one side of clipping procedures and resolved spontaneously. No overdryness was reported in both procedures; 63/64 hands on the transection side were dry, while 62/64 hands on the clipping side were dry. Recurrence was reported in one side with transection and two sides with clipping procedures; there was no statistical difference between the two procedures according to rate of success (Table 2). Compensatory sweating was observed in 28 cases in their abdomens and backs; 12 sides in the transection procedure suffered from compensatory sweating, (4 mild, 5 moderate, and 3 severe degrees), while 16 sides with clipping procedure suffered from compensatory sweating (12 mild, 3 moderate, and 1 severe degree), There was no significant difference between both procedures regarding the presence and degree of compensatory sweating (Table 3). Regarding the rate of satisfaction, patients were satisfied by 63/64 of the transection procedure, 41 very satisfied, 22 quiet satisfied and one patient was dissatisfied due to a recurrence of the condition, while by the clipping procedure, the patients were satisfied by 61/64 procedures, 38 very satisfied, 23 quiet satisfied and 3 patients were dissatisfied, two cases due to recurrence of the condition and one case due to severe compensatory sweating, with no significant difference between the two groups regarding patients’ satisfaction (Table 4).

**Table 1:** Patients demographic data

Demographic	Total	%
Female	40	62.50%
Male	24	37.50%
Age	17 ± 9 years	
Follow up	20 ± 7 months	

**Table 2:** Difference between the two groups according rate of success.

Result	TS (64)		Clipping(64)		Test value*	P-value
	No	%	No	%		
Treatment success	63	98.40%	62	96.90%	0.341	0.559
Wet	1	1.60%	2	3.10%	0.341	0.559
Over dry	-	-	-	-	-	-
Recurrence	1	1.60%	2	3.10%	0.341	0.559

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

\*: Chi-square test.

**Table 3:** Difference between the two groups according compensatory sweating.

Compensatory	TS		Clipping		Test value*	P-value
	No	%	No	%		
None	52	81.30%	48	75.00%	0.731	0.393
Mild	4	6.30%	12	18.80%	4.571	0.033
Moderate	5	7.80%	3	4.70%	0.533	0.465
Sever	3	4.70%	1	1.60%	1.032	0.31

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

\*: Chi-square test

**Table 4:** Difference between the two groups according satisfaction.

Satisfaction	TS (64)		Clipping (64)		Test value*	P-value
	No	%	No	%		
Very satisfied	41	64.10%	38	59.40%	0.298	0.585
Quiet	22	34.40%	23	35.90%	0.034	0.854
Dissatisfied	1	1.60%	3	4.70%	1.032	0.31
Overall satisfaction	63	98.40%	61	95.30%	1.032	0.31

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS)

\*:Chi-square test

## 5. Discussion

Hyperhidrosis is a sympathetic nervous system malfunction in which there is excessive sweating beyond physiological needs. It affects mainly the hands and axillae, making social interaction difficult. Thoracic sympathectomy and symatotomy (TS) are utilized in circumstances where medical therapy is ineffective or refused. Since thoracoscopic surgery was initially used in 1920, ongoing developments have resulted in a steady decrease in morbidity, and death [6].

The majority of studies reported no intraoperative complications. However, some authors stated that possible intraoperative complications as lung injury, pneumothorax, major bleedings, chylothorax, and phrenic nerve injury, all these complications are rare and can be prevented by a meticulous and careful surgical technique [1]. Although, the commonest and worst adverse effect of sympathectomy is a variable degree of compensatory sweating, mainly involving the back, abdomen, and lower limbs [1,7].

The thoracoscopic clipping procedure has a number of benefits since it may be carried out effectively and securely with a similar success rate to thymatectomy. Despite the fact that it might be curable if the patient experiences excessive compensatory sweating [3,8]. In light of this, Whitson et al. [8] advise sympathetic chain clipping since, in cases of extreme compensatory sweating, removal of the clip(s) will promote nerve regeneration, which will improve the compensatory sweating.

Elshahawy et al.'s [9] study compared the effectiveness of thoracoscopic sympathectomy using electrocautery versus thoracoscopic sympathetic chain interruption using metal clips as a treatment for primary hyperhidrosis in children. The study enrolled 40 patients. In the clipping group mean age was  $(12.05 \pm 3.50)$  years, and in Cautery group the mean age was  $(12.45 \pm 2.98)$  years. Also, in the study done by Osman et al [10] submitted on 20 patients, the mean age was  $(21 \pm 2.2)$  years in the clipping group and  $(21.6 \pm 3.02)$  in the cautery group, and the successful rate between the transection and clipping groups in both studies was statistically insignificant. Although, number of patients in our study was 64, our sample size was larger than Elshahawy et al [9] and Osman et al [10] studies. and the mean age in our study was  $17 \pm 0.9$  years, higher than Elshahawy et al [9] and lower than Osman et al [10] study. We agreed with Elshahawy et al [9] and Osman et al [10] that there was no significant difference in the successful rate between the two procedures in our study.

In our study, the success rates of the cautery procedure and clipping procedure were 98.4% and 96.8%, respectively. The study done by Kocher GJ et al [11], which supports our findings, revealed that the cautery group's success rate was higher (100%) than that of the clipping group, which was approximately (96%), there was no statistically significant difference between the two groups.

The complications rate in our study was 4.6% in both procedures, only 3 cases had pneumothorax, the same as the complication rate observed in the study of Findikcioglu et al [12], which showed 3 cases of pneumothorax in both clipping and cautery groups. On the contrary, the study of Kocher GJ et al. [11] showed only one case of pneumothorax due to air leakage, which resolved spontaneously after chest tube insertion.

In our study, 81 % of cases on the cauterization side and 75% on the clipping side did not develop compensatory sweating, and compensatory sweating ranged from mild to severe in 12/64

(18.7%) of cases on the cauterization side and 16/64 (25%) of cases on the clipping side. Similar results were found in the study of Findikcioglu et al [12] as (17.9) in the cautery group and (18.8) in the clipping group have compensatory sweating, and the difference between both groups was statistically insignificant. Although in our study, the mild form of compensatory sweating in both techniques had statistically significant differences.

In another recent study conducted by Huang et al., [13] compensatory sweating was developed in 45.5% of the total patients included in the study, and about 12.5% of cases have a severe degree of compensatory sweating. While our study reported that 21.8% of total cases developed compensatory sweating, and 3.1% had a severe degree, there was no significant difference between the two techniques regarding the severity of compensatory sweating. In a meta-analysis by Du X et al., [14] the difference in severe compensatory hyperhidrosis between sympathectomy using cautery and clipping was not significant.

Osman et al (2022) [10] in their study, 10% of patients were unsatisfied with the procedure, as they developed severe compensatory hyperhidrosis. The other (80%) of patients were satisfied with the procedure. In our study, only 4 patients (6.2%) were unsatisfied with the procedures, as they developed severe compensatory hyperhidrosis or a recurrence of the condition. The other 60 (93.8%) patients were satisfied with the procedures, as there was a noticeable enhancement in their quality of life, without a significant difference between both groups regarding their satisfaction.

The strength of this study is that it is the first to compare transection sympathectomy with clipping in the same patients, and all operations were done by one surgical team with the same surgical principle.

The limitations of the present study, that it was a single-centre experience, the mean follow-up time was rather short, and we also need a large number of patients to assess and support the value of this technique and compare it with other approaches.

## 6. Conclusion

Both thoracoscopic sympathetic transection or clipping of T3 ganglion are safe and effective procedures in palmar hyperhidrosis treatment. with no differences regarding recurrence rate, patients' satisfaction and incidence of the compensatory sweating.

## 7. Declarations

**7.1. Ethical approval:** The study was approved by the Institutional Reviewer Board of Al-Azhar University, Faculty of Medicine. IRB (1-3-2020-000049).

**7.2. Consent for participation and publication:** Written informed consent was obtained from parents for participation and publication. The consents were approved by our University Hospital's Ethics Committee. (Al-Azhar University, Faculty of Medicine)

**7.3. Availability of data and material:** The datasets used and/or analyzed during the current study are available from the corresponding author but couldn't be sent due to the medico-legal aspect of the hospital policy.

**7.4. Conflicts of interest:** All authors declare that there are no conflicts of interest and no financial disclosures.

**7.5. Acknowledgements:** Great Acknowledgement for all participant's families, for their great effort with the patients included in the study.

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