



## Assessment of Efficacy of Video Assisted Thoracoscopic Sympathectomy In Management of Primary Palmar Hyperhidrosis

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### ABSTRACT

**Background:** Primary hyperhidrosis is still frequently treated surgically today, particularly when medical therapies have failed. **Objectives:** To investigate the efficacy of video-assisted thoracoscopic sympathectomy as an approach for management of palmar hyper-hydrosis in improving symptoms and quality of life. **Study Question:** Is the endoscopic sympathectomy effective in management of palmar hyperhydrosis? Hypothesis: Surgery will improve symptoms and quality of life. There is a difference between R3 and R4 sympathectomy as regard to improvement and complications. **Methods:** thirty two patients suffering palmer hyper-hydrosis were operated upon in Department of Cardio-thoracic Surgery, Suez Canal University between 1st March, 2020 and 1st October, 2021. Bilateral sympathectomy at one session was done for each patient. Destruction of 2nd and 3rd thoracic ganglia and nerve connections of both ganglia was done for 16 patients (Group R3), Adding destruction of the 4th thoracic sympathetic ganglia was done for additional 16 patients (group R4). **Results:** Severe hyperhidrosis was 80% in group R3 and 74% in group R4, intolerable in 20% of R3 and 26% of group R4. Group R3: at one month 47% and at 6 months added 40% of cases, Group R4: at one month 40% and at 6th month added 33% of mild and moderate compensatory hyperhidrosis. There is no difference in post-operative pain degree between the 2 groups. The incidence of compensatory hyperhidrosis was less in the R4 group at 1 month and 6 months follow up and there were no severe cases. Three cases (20%) from R3 group complained of facial sweating when eating hot or spicy foods while only 1 (6.67%) patient had the same complaint among the R4 group. Rate of compensatory hyperhidrosis was much lower among group R4. There is significant difference between the two groups according patient satisfaction after the operation with more satisfaction between R4 group patients. There was great improvement post-operative in the 2 groups with more improvement in R4 group (93.33%) than R3 group (86.67%). **Conclusion:** Extending sympathectomy to down to the 4th dorsal ganglion and its nerve connections lowers rate of compensatory hyperhidrosis.

**Keywords:** Endoscopic Sympathectomy, Thoracoscopic Dorsal Sympathectomy, Compensatory Hyperhidrosis.

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### INTRODUCTION

In western countries, the prevalence of primary hyperhidrosis is around 1.1%, whereas it can reach 3% in eastern ones. It is described as an increase in sweating [1,2]. It can have an impact on the cheeks, soles, axillary areas, and palms. When under stress and anxiety, it got worse. [3] Although it is not regarded as a major medical issue, it is crucial because it has negative effects on patients' quality of life, especially in young people. These effects include embarrassment, lowered

self-esteem, and decreased personal function, which can lead to social and mental issues [4]. There are numerous therapy options, including medical and surgical procedures, iontophoresis, antiperspirants with aluminium chloride, systemic or topical anticholinergic drugs, and topical anaesthetics [5].

Due to its effectiveness, high success rates, long-term results, greater patient satisfaction with fewer side effects, and lack of frequent repetition, surgical management is better to



medical treatments. It is not dependent on patient adherence [5,6].

Surgery is used to stop sympathetic nerve signals from reaching the sweat glands. Resection, ablation, cutting, or splitting the sympathetic chain can accomplish this disorder [1-4]. Open techniques (via axillary, supraclavicular, or posterior incisions) or thoracoscopic procedures can be used [6].

Due to lower morbidity and mortality, VATS is now the preferred procedure on a global scale and can be performed through 4, 3, 2, or even just one port [6,7].

Vasospasms and hyperhidrosis were recognised criteria for upper thoracic sympathectomy during this time. For thirty years, an anterior upper-supraclavicular approach was the norm. In 1929, Adson and Brown used a posterior technique and saw promising results. In 1942, Hughes used a thoracoscopic technique to amputate the sympathetic ganglion for the first time. In 1944, Goetz and Marr of Cape Town were the first to use an anterior thoracic wall transthoracic technique. The inventor of thoracoscopic surgery was Kuks from Innsbruck, who in 1954 had published more than 1400 procedures on sympathetic and splanchnic nerves [7].

To distinguish between the two terminology, sympathectomy was used to describe the removal of one or more ganglions, while sympathictomy described the division of the sympathetic chain without the removal of ganglia [6-8].

Compensatory hyperhidrosis, which is defined as increased sweating in the trunk, groyne, and thigh areas, is the main side effect of sympathictomy other than the usual surgical complications. Although there are numerous reports linking this condition to the degree of sympathictomy, its exact cause is still unknown [8, 9]. There is still much disagreement over the level of sympathictomy that has the best effectiveness and the fewest problems [7,9].

The aim of the present study is to investigate the efficacy of video-assisted thoracoscopic sympathectomy as an approach for management of palmar hyper-hydrosis in improving symptoms and quality of life.

## PATIENTS AND METHODS

A prospective randomized controlled clinical trial at Suez Canal University Hospital and Nasser institute hospital in the scheduled operating theatres. 30 patients with 1ry palmar hyperhidrosis.

### Inclusion criteria

Patients with severe 1ry palmar hyperhidrosis not controlled by medical treatment. The disease is affecting patient's life quality.

### Exclusion criteria

Patients with various varieties of hyperhidrosis (craniofacial, axillary or planter hyperhidrosis). Patients under the control of medical care. The patient's quality of life is unaffected by the condition. cardiac patients, particularly those with arrhythmias. Other factors that contribute to palmar hyperhidrosis include hyperthyroidism, hypermetabolism, menopause, diabetes, and other drugs.

#### I. Pre-operative Investigations:

Full history taking including hyperhidrosis, aggravating and relieving factors, its intensity, and its affection on patient's life quality. Clinical full examination. Full labs including CBC, liver function profile and renal function profile. ECG. Plain chest x-ray. CT chest Transthoracic Echocardiography.

#### II. post-operative Assessment:

Full labs including CBC , liver function profile and renal function profile, ECG and plain chest x-ray. Follow up of patient satisfaction and life quality improvement.

Thirty patients with 1ry palmar hyperhidrosis will be recruited and was have VATS sympathictomy done for them.



### Ethical Approval:

The study was conducted in accordance with the Declaration of Helsinki, and with approval from the Research Ethics Committee of the Faculty of Medicine, Suez Canal University. All patients were fully informed about the trial and provided signed consent preoperatively, explaining the purpose, effects, technique and complications.

Items to be assessed pre-operatively as age, sex, weight, intensity of hyperhidrosis and its effect on patient's life quality. Operatively as operation time and sympathectomy level. Post-operatively as hospital stay, mortality, post-operative morbidities and complications especially compensatory hyperhidrosis. Also, improvement of life quality and patient satisfaction.

### Operative techniques:

A single-lumen or double-lumen tube is used during thoracoscopic sympathectomy under general anaesthesia. Patients are positioned with their arms 90 degrees abducted and supine. Both axillae and the chest have been prepared for the operating room. Next, the fourth rib is given a 5-mm

incision. With ventilation stopped laterally, the pleural area at the top of the fourth rib is dissected into using a mosquito clamp (**Figure 1**). Ventilation is then restarted after a 30 degree, 3 mm thoracoscope has been inserted into the pleural space. Next, the sympathetic chain is found. At this time, lowering the tidal volume being used to ventilate the patient also helps to add visualisation. The sympathetic nerve is divided over the required rib using a 2 mm electrocautery that is inserted through the incision next to the scope once the desired level of sympathectomy and all accessory nerves have been detected (**Figures 2**). The nerve ends that have been transected are then separated by 1 to 1.5 cm to stop further development. Then, the accessory nerves that lie above the target ribs are split uniformly. The remainder of the air and fluids are evacuated by replacing the electro-cautery with a 2 or 3 mm suction. The chest tube needs to be put in. One absorbable stitch can be used to close the incision, and the opposite side is treated in the same way. The patient is subsequently transported to the recovery unit after being extubated.

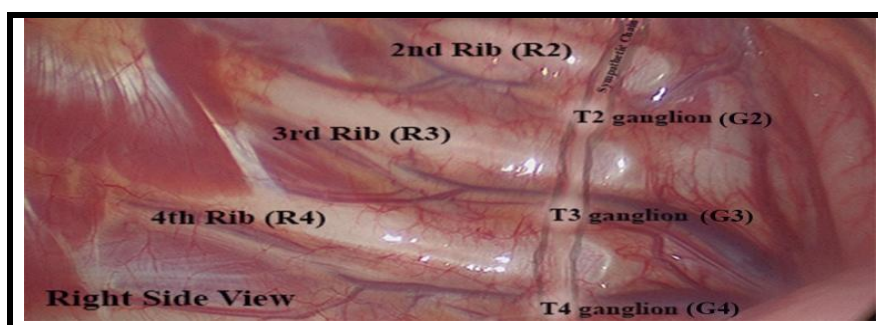
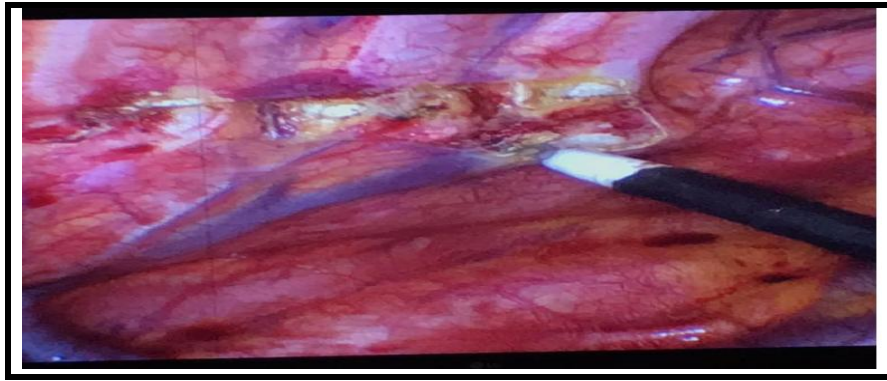


Figure (1): Normal anatomical location of sympathetic chain





**Figure (2): Thoracoscopic sympathectomy Technique showing dissection for ablation of the 2nd, 3rd and 4th ganglia thoracoscopically**

### Statistical Analysis:

The statistical analysis was performed using IBM SPSS Statistics®22 for Windows 8 operating system. Descriptive data expressed as median and interquartile range (-) for continuous nonparametric variables, as mean and SD for continuous parametric variables, and count/total and percentages (%) for categorical and dichotomous variables. Student T-test used to analyze the continuous variables between the two studied groups and Chi-test for categorical and dichotomous variables. One-way analysis of variance (ANOVA) with Repeated Measures will be used to analyze the continuous variables among the follow-up points within the same group. Statistically significant differences among the different readings will be further assessed using Fisher's least significant difference (LSD) post hoc analysis. The level of statistical significance will be considered to be  $p < 0.05$ .

### Results:

Severity of hyperhidrosis: Severe in 80% in group R3 and 74% in group R4, intolerable in 20% of R3 and 26% of group R4. There were not any significant differences between both groups except in rate of compensatory hyperhidrosis (**Tables 1,2**).

Group R3: at one month 47% and at 6 months added 40% of cases, Group R4: at one month 40% and at 6<sup>th</sup> month added 33% of mild and moderate compensatory hyperhidrosis. There were no cases of severe compensatory hyperhidrosis. Rate of compensatory hyperhidrosis was much lower among group R4. No significant as regard time of operation and hospital stay between 2 groups (**Tables 3,4**).

Concerning early complications, Pneumothorax was showed in 2 cases in R3 group. while only 1 (6.67%) patient had the same complaint among the R4 group (**Table 5**).

**Table (1): Demographic data of the studied patients.**



		R3 group	R4 group	Significance
<b>Age in years</b>		<b>19 – 27</b>	<b>18 – 30</b>	<b>NS</b>
<b>Mean age</b>		<b>23 ± 2.8</b>	<b>24 ± 1.41</b>	
<b>Weight</b>		<b>58 – 92</b>	<b>54 – 91</b>	<b>NS</b>
<b>Mean weight</b>		<b>74.6 ± 10.31</b>	<b>75.5 ± 10.06</b>	
<b>Gender</b>	<b>Males</b>	<b>6 (40%)</b>	<b>7 (46.7%)</b>	<b>NS</b>
	<b>Females</b>	<b>9 (60%)</b>	<b>8 (53.5%)</b>	<b>NS</b>
<b>Severity</b>	<b>Mild</b>	<b>0.00%</b>	<b>0.00%</b>	<b>NS</b>
	<b>Moderate</b>	<b>0.00%</b>	<b>0.00%</b>	<b>NS</b>
	<b>Severe</b>	<b>80%</b>	<b>73.3%</b>	<b>NS</b>
	<b>intolerable</b>	<b>20%</b>	<b>26.7 %</b>	<b>NS</b>

**Table (2): Severity was determined according to hyperhidrosis severity scale.**

Degree	Manifestations
<b>Mild</b>	Sweating is unnoticeable and doesn't interfere with daily activities
<b>Moderate</b>	Sweating is tolerable but sometimes interferes with daily activities
<b>Severe</b>	Sweating is barely tolerable and frequently interferes with daily activities
<b>Intolerable</b>	Sweating is intolerable and always interferes with daily activities

**Table (3): Time of operation among the studied patients.**

Time of operation (min)	R3 group	R4 group	Significance
<b>Range</b>	<b>45 -68</b>	<b>46 – 70</b>	<b>NS</b>
<b>Mean ± SD</b>	<b>54.87 ± 7.98</b>	<b>56.8 ± 7.01</b>	

**Table (4): Hospital stay among the studied patients.**

	Hospital stay (hr.)		Significance
	Range	Mean ± SD	
<b>R3 group</b>	<b>24 -72 hr.</b>	<b>30.4 ± 16.9</b>	<b>NS</b>
<b>R4 group</b>	<b>24 – 72 hr.</b>	<b>30.4 ± 16.9</b>	

There is no difference in post-operative pain degree between the 2 groups which was mild in all patients and managed with NSAIDs (**Table 6**).

The incidence of compensatory hyperhidrosis was less in the R4 group at 1 month and 6 months follow up and there were no severe cases (**Table 7**).





Regarding gustatory sweating; 3 (20%) patients from R3 group complained of facial sweating when eating hot or spicy foods while only 1 (6.67%) patient had the same complaint among the R4 group (**Table 8**).

There is significant difference between the two groups according patient satisfaction after the operation with more satisfaction between R4 group patients (**Table 9**).

Comparing to the preoperative quality of life, there was great improvement post-operative in the 2 groups with more improvement in R4 group (93.33%) than R3 group (86.67). Only 1 (6.67%) patient in R3 group whose response were worse. The need for thoracotomy. No patient needed thoracotomy among both groups. No mortality, three patients needed chest tube for pneumothorax and 1 patient had simple wound infection (**Table 10**).

**Table (5): Early post-operative complications**

Complication	R3 group	R4 group
Pneumothorax	2 (13.3%)	1 (6.67%)
Haemothorax	0	0
Horner's syndrome	0	0
Wound infection	0	1 (6.67%)

**Table (6): Post-operative pain degree between the 2 groups**

Pain degree	R3 group	R4 group
Range	2 – 4	2 – 4
Mean ± SD	2.47 ± 0.74	2.53 ± 0.74

**Table (7): Late post-operative complications between the 2 groups**

		R3 group	R4 group	Significance
Incidence	At 1 month	47%	40.0%	S
	At 6 months	40 %	33 %	S
Severity at 6 months	Mild	50.00%	80.00%	S
	Moderate	33.33%	20.00%	S
	Severe	0 %	0%	NS

**Table (8): Gustatory sweating between the 2 groups**



	R3 group	R4 group	Significance
<b>Gustatory sweating</b>	<b>3 (20%)</b>	<b>1 (6.67%)</b>	<b>S</b>

**Table (9): Patient satisfaction between the 2 groups**

	R3 group	R4 group	Significance
<b>Very satisfied</b>	<b>3 (20%)</b>	<b>9 (60%)</b>	<b>S</b>
<b>Satisfied</b>	<b>10 (53.33%)</b>	<b>4 (26.67%)</b>	<b>S</b>
<b>Not satisfied</b>	<b>2 (13.33%)</b>	<b>2 (13.33)</b>	<b>NS</b>

**Table (10): Quality of life improvement between the 2 groups**

	R3 group	R4 group	Significance
<b>Much better</b>	<b>46.67%</b>	<b>66.67%</b>	<b>S</b>
<b>Better</b>	<b>40.00%</b>	<b>26.67%</b>	<b>S</b>
<b>Much better + better</b>	<b>86.67%</b>	<b>93.33%</b>	<b>S</b>
<b>Same</b>	<b>6.67%</b>	<b>6.67%</b>	<b>NS</b>
<b>Worse</b>	<b>6.67%</b>	<b>0.00%</b>	<b>S</b>
<b>Much worse</b>	<b>0.00%</b>	<b>0.00%</b>	<b>NS</b>

**Discussion:**

Thoracoscopic sympathectomy is a minimally invasive procedure that permits precise visualisation of the sympathetic ganglia and little postoperative morbidity; however, outcome studies of this method have been scarce [4-7].

Treatment for pain issues and palmar hyperhidrosis may include a thoracic sympathectomy. The decision to consider surgical treatment was previously limited by the high level of invasiveness, known morbidity, acceptable outcome, and established recurrence rates of earlier surgical treatments [5].

In a study include thoracoscopic procedures were performed on 39 patients, and the results were comparable to those of previously accepted open surgical techniques

in this small series. However, the operative morbidity rates, hospital stays, and recovery times were significantly shortened. Similar to earlier accounts, complications and recurrence of symptoms also occurred. All patients varied from 66 to 96% in terms of overall patient satisfaction and desire to repeat the surgical operation. Due to its low morbidity and at least comparable success rates compared to other treatments, minimally invasive thoracoscopic sympathectomy operations are a viable choice for patients and doctors to treat sympathetically related illnesses. Key Words: sympathetic ganglia, endoscopy, and thoracoscopic sympathectomy In order to execute a thoracoscopic sympathectomy, minimally invasive endoscopic methods are used first [1].

The present study aimed to assess the



effect of VATS sympathectomy on R3 or R4 level in palmar hyperhidrosis management on the mortality, post-operative morbidities parameters and improvement of quality of life.

Thoracoscopic sympathectomy is performed using minimally invasive endoscopic techniques first described by **Kux [17]** in 1951 for the treatment of hyperhidrosis. There was little interest until the past decade **[4,9,12,15,22-26,28]** when minimally invasive procedures became theoretically possible thanks to video-assisted endoscopic imaging. The main focus is on treating sympathetically mediated illnesses that affect the upper extremities, such as Raynaud's syndrome, reflex sympathetic dystrophy, and pain syndromes like causalgia or reflex sympathetic dystrophy **[11]**.

The STS consensus has suggested the following standardised procedures, despite the fact that there is still some debate and divergent views regarding the appropriate level of interruption of the sympathetic trunk **[12]**:

The best curative scenario for palmar hyperhidrosis, characterised by entirely dry hands but with a higher risk of CH, will be provided by interruption at the R3 and R4 levels. The interruption can only be performed at R4 level for patients who want a lower risk of CH at the tradeoff of less dry hands. Patients need to be informed that their hands would likely become drier than they were previously, but they may also stay moist. Patients with modest symptoms or complaints from palmar hyperhidrosis may benefit from this strategy. Patients with significant complaints of isolated palmar hyperhidrosis can also be successfully treated by an R3 level interruption alone given the increased risk of CH when dealing with multiple levels of the trunk **[12]**.

Since sympathectomy is associated with inferior success and higher regretting rates in patients with isolated axillary hyperhidrosis, the STS consensus advises against considering

surgery as a first line of treatment. The recommended strategy and frequently our personal preference in the event that less intrusive treatments are unsuccessful and an ETS is necessary is an R4-R5 disruption. Patients who complain of isolated palmar hyperhidrosis can also be successfully treated by an R3 level disruption alone. This approach can be used to treat patients with palmar-axillary and palmar-axillary-plantar hyperhidrosis **[13]**.

We firmly believe that R3 interruption should be added to the originally planned approach for patients with axillar and/or plantar hyperhidrosis associated with palmar symptoms whenever the hand sweating component presents as a major complaint and completely dry hands are considered imperative for these patients, despite the fact that the risk of CH is higher in these cases. The level that guarantees the dry hands is R3. Patients must, of course, consent to it after being properly apprised of the risk/benefit ratio associated with this approach **[14]**.

Thoracoscopic sympathectomy indications offers a magnified view of the sympathetic chain and surrounding anatomy for precision surgical removal of the sympathetic ganglia, potentially lowering the morbidity of open thoracotomies and/or supraclavicular or posterior paraspinal surgeries. Shorter hospital stays and lower rates of morbidity now result in greater patient demand for this operation and higher levels of patient satisfaction, which lower costs. The primary treatment for these conditions is thoracoscopic sympathectomy, but there are few long-term outcome studies available **[6]**.

In our opinion, compensatory hyperhidrosis (CH) is more a possible undesirable effect of the sympathectomy than a surgical complication itself. Following surgery, CH is the development of a new pattern of excessive sweating that becomes noticeable and bothersome to the patient. Its actual incidence is extremely difficult to





pinpoint and ranges from 3% to 98% in the literature [13]. A number of individual and regional characteristics, surgical technique, and the lack of a standardised nomenclature for the classification of CH and its severity grades all contribute to this broad heterogeneity. In the end, the diagnosis is most heavily influenced by the patient's perception. The abdomen, thorax, back, thighs, and/or groin areas are more prone to be impacted, while it can happen anywhere on the body [14].

Although late recurrence is rare, it is possible. It is more likely to occur in children who may continue to grow after surgery or when the transected trunk ends are still close to one another. Reoperation may also be necessary in both circumstances. Studies have found that as many as 92% of patients experience excessive compensatory sweating. In one study, around 25% of patients who experienced this adverse effect reported it to be a significant, incapacitating issue [15].

The psycho-galvanic reflex is eliminated by sympathectomy. Small cerebrocortical veins' heterogeneous oxygen saturation is decreased by cervical sympathectomy [18–20]. Mönckeberg's MS has several causes, one of which is sympathetic denervation. The baroreflex regulation of heart rate was decreased in patients with palmar hyperhidrosis after T2-3 sympathectomy. In individuals who received the ETS, the baroreflex response necessary to maintain cardiovascular stability is decreased [14–17]. Stroke from excessive heat [18]. Following sympathectomy, the myocardium underwent morphofunctional alterations [19–20].

### Conclusion:

Extending sympathectomy to down to the 4th dorsal ganglion and its nerve connections lowers rate of compensatory hyperhidrosis. Bilateral Thoracoscopic sympathectomy in one session is safe and reproducible.

**No conflict of interest.**

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