



## ORIGINAL ARTICLE

# LIMITED T-4 SYMPATHICOTOMY FOR PRIMARY PALMAR HYPERHIDROSIS (MANSOURA UNIVERSITY HOSPITAL EXPERIENCE)

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### Abstract

**Aim:** Hyperhidrosis is excessive sweating beyond physiologic needs resulting in profuse sweating of the palms, axillae, feet, and face. Endoscopic transthoracic sympathectomy is a popular surgical technique to treat primary hyperhidrosis; the aim of this study is to assess the effectiveness of limited T4 sympathectomy for alleviating palmar hyperhidrosis and preventing compensatory hyperhidrosis.

**Methods:** This study was conducted in General and Vascular Surgery Unit at Mansoura University Hospital in the period from February 2008 to January 2011 on 78 patients. All patients complained of palmar hyperhidrosis, 15 of them complained also from axillary hyperhidrosis, T4 sympathectomy by diathermy was done to all patients (T5 sympathectomy was also done with T4 in patients suffering from axillary hyperhidrosis).

**Results:** One hundred and fifty six sympathectomies were consecutively done in 78 patients. The mean age was (22.6±5.2 years) and there were 48 females and 30 males. 24 patients (30.8%) had family history of hyperhidrosis. Mean operative time was (35±7 minutes). No recurrence, no compensatory hyperhidrosis were observed in all patients. Minor complications were occurred in three patients (Pneumothorax in one patient and segmental atelectasis in two patients). All patients are satisfied with the operation. In addition, an improvement in the quality of life was seen starting from the first postoperative evaluation and maintained until the end of the follow up.

**Conclusion:** Limited T4 blockade is an easy, safe and effective treatment for patients with primary palmar hyperhidrosis without postoperative reflex sweating.

**Keywords:** Hyperhidrosis, sympathectomy, Reflex sweating, Sympathetic block.

### INTRODUCTION

Primary Hyperhidrosis (try HH) is defined as excessive sweating beyond physiologic needs, which results in profuse sweating of the palms, axillae, feet, and face.<sup>(1)</sup> It is caused by hyperfunctioning of the sympathetic nervous system and is frequently related to a triggering emotional situation.<sup>(2)</sup> This hyperfunction goes beyond

what is needed for thermoregulation and it is associated with severe emotional, occupational, and social distress that may develop conditions of social phobia.<sup>(3)</sup>

Sweat glands are of two main types, eccrine and apocrine. Apocrine glands play no role in thermoregulation and distributed in the axilla, perineum, and mammary areola and secrete a milky

odourless fluid, are probably under the control of circulating adrenaline, and do not appear to be supplied by secretory nerves. On the other hand, eccrine glands are found throughout most of the skin which are very dense on the palms and soles but less so in the head, neck, trunk, upper arms and legs. They are important in thermoregulation, supplied by cholinergic fibers present in sympathetic nerves, and are inhibited by atropine.<sup>(4)</sup>

1ry HH affects approximately 1% of the population, and mostly is prevalent in adolescents or young adults. Approximately 12.5% to 56.5% of the patients are associated with a family history.<sup>(1)</sup>

Endoscopic transthoracic sympathicotomy (ETS) is established minimally invasive procedure for thoracic sympathetic blockade in patients with hyperhidrosis, causalgia, facial flushing, Reynaard's disease and intractable angina.<sup>(5)</sup>

Anatomically, the upper four thoracic, stellate, and cervical sympathetic ganglia receive the preganglionic fibers from the upper four thoracic segments of the spinal cord and direct the postganglionic fibers to the targets, including the heart, the upper extremities and the cranial vessels. ETS blocks efferent sympathetic nerves to the heart as well as the upper extremities.<sup>(6)</sup>

Endoscopic transthoracic sympathicotomy is a popular surgical technique to treat severe refractory essential hyperhidrosis because it is a safe, effective, and minimally invasive method.<sup>(7)</sup>

Reflex sweating, also known as compensatory hyperhidrosis, is one of the most serious complications and the main reason for patients dissatisfaction postoperatively despite successful surgery.<sup>(8,9)</sup>

Many different methods have been suggested to lower the incidence of reflex sweating. Rennie<sup>(10)</sup> and Bonjer.<sup>(11)</sup> stressed the importance of minimizing the extent of sympathetic nerve injury. Gossot et al.<sup>(12)</sup> reported that selective resection of rami communicantes significantly decreased the rate of severe compensatory sweating. Lin et al.<sup>(13)</sup> state that the preservation of the sympathetic tone to the head is the main influential factor in avoiding reflex sweating in ETS.

To reduce sweating substantially in the target area while simultaneously minimizing compensatory hyperhidrosis in the other "innocent areas," we classified different sympathetic disorders into different groups from concepts of segmental distributions of sympathetic innervations in the human body.<sup>(14)</sup>

Lin- Telaranta classification was first introduced in 2001 for disease specific level of sympathetic blockade.<sup>(15)</sup>

New lin-Telaranta classification was done by addition of group 4 (axillary sweating) for better application in sympathetic surgery.<sup>(16)</sup> Table 1.

**Table 1. New Lin-Telaranta Classification (2004).**

	Sympathetic disorders	Procedure
<b>Group 1</b>	Facial blushing	ESB <sub>2</sub>
<b>Group 2</b>	Facial sweating, Facial sweating with blushing	ESB <sub>3</sub>
<b>Group 3</b>	Palmar Hyperhidrosis	ESB <sub>4</sub>
<b>Group 4</b>	Axillary sweating	ESB <sub>5</sub>

(ESB: Endoscopic Sympathetic Blockade).

The aim of this study is to assess the effectiveness of limited T4 sympathetic ganglion blockade for alleviating primary palmar hyperhidrosis and preventing postoperative reflex sweating

## PATIENTS AND METHODS

This study was conducted in General and Vascular Surgery Unit (VSU) at Mansoura University Hospital (MUH) in the period from February 2008 to January 2011 on 78 patients. Informed consent and IRB approval (Informed consent was obtained from all patients to be included in the study, after explanation of the nature of the disease and possible treatment. The study was approved by the local ethics committee.

All our patients complained of palmar hyperhidrosis, 15 patients of them complained of axillary hyperhidrosis, No patients complained from facial blushing or sweating

Inclusion criteria was primary hyperhidrosis (palm alone or palmer and axillary HH)with history taking stressing on: Dating of hyperhidrosis, Areas of hyperhidrosis (craniofacial, palmer, axillary or combination) and its Social effect on patient's relations, Previous treatment modalities :( medical, conservatives or operative) In addition, Family history of HH. Exclusion criteria were secondary HH, recurrent HH after surgery.

**Surgical technique:** Patients were positioned in thoracotomy position (Lateral decubitus) with arm abducted, or in supine position with semisitting with arms abducted. General anesthesia was induced with single lumen endotracheal tube. Pneumothorax was achieved with a Verres needle using CO2 insufflation with about two liters at a pressure of eight mmHg. then introduced two ports (sixth intercostals space mid axillary line & fourth intercostals space anterior axillary line). Unless there is an extensive adhesion & there is a need for third port for adhesiolysis. The first port for the endoscope and the second for dissection & diathermy.<sup>(17)</sup>

After collapse of the lung identification of first rib by finding the first intercostal muscle in the lateral chest

wall, the rib below it is the second rib then palpate the pad of fat above the second rib by endoscopic instrument to ensure that it contain the first rib. the sympathetic trunk and ganglion overlap the rib head area which identified by touch or compress the parietal pleura in the rib head area by endoscopic instrument to evaluate the sympathetic trunk or ganglion).<sup>(18)</sup> then T4 sympathicotomy by diathermy was done (in 15 patients suffering from axillary hyperhidrosis T5 sympathicotomy was also done with T4).

Then the anesthetist re-inflated the lung until it reaches the intercostals muscles with positive pressure until closure of the wound was done. All patients postoperatively did follow up x-ray & discharged 24 hours after unless complications happened.

**Follow up:** Patients without co morbid conditions discharged 24 hours postoperative and return for follow-up in outpatient clinic after 10 days for removal of stitches. All patients were not restricted in their activity but were encouraged to return to their previous lifestyle without limitation as soon as pain or discomfort permits. Later on, the patients examined every 6-month and answer a written questionnaire.

Quality of life was examined using the version 2.0 of the short-form 36 healthy survey (SF-36v2). as SF-36 is suitable for this procedure because it is a multi-purpose, short- form health survey with only 36 questions and easily applicable, valid, reliable and sensitive . it have been translated in more than 50 countries as a part of the International Quality of Life Assessment (IQOLA) project.

**Statistical analysis:** The statistical analysis of data done by using excel program and SPSS program statistical package for social science version 16.

The description of the data done in form of mean (+/-) SD for quantitative data .And Frequency & proportion for Qualitative data.

The analysis of the data was done to test statistical significant difference between groups.

For quantitative data, independent sample t-test was used to compare between two groups.

Chi square test was used for qualitative data.

N.B: P is significant if < or = 0.05 at confidence interval 95%.

## RESULTS

One hundred and fifty six sympathectomies were consecutively done in 78 patients. The mean age was 22.6±5.2 years and there were 48 females and 30 males. All patients were suffering from bilateral hyperhidrosis. Fifty-three patients were suffering from palmar hyperhidrosis while fifteen patients suffering from

palmar and axillary hyperhidrosis. 24 patients (30.8%) had family history of hyperhidrosis Table 2.

**Table 2. Patient's characters.**

Age	Mean age 22.6±5.2 years
Sex	48 female and 30 males
Family history	24 patients (30.8%)
Palmar hyperhidrosis	63 patients (80.8%)
Palmer + axillary hyperhidrosis	15 patients (19.2%)

45 patients (57.7%) had hyperhidrosis since childhood 20 patients (25.6%) since puberty and 13 patients (16.7%) for less than 10 years. Table 3.

**Table 3. Dating of hyperhidrosis.**

Childhood	45 patients (57.7%)
Puberty	20 patients (25.6%)
Less than 10 years	13 patients (16.7%)

Mean operative time was (35±7 minutes) range from 25-46 minutes. All patients except one were discharged the day after operation there were no compensatory hyperhidrosis in all patients.

Complications were occurred in three patients Pneumothorax in one patient which was unilateral and discovered 6 hours postoperative by plain X ray and necessitated insertion of intercostals tube and removed after 48 hours. Two patients developed segmental atelectasis that improved in follow up by physiotherapy in the form of respiratory exercise using diaphragmatic breathing and Intensive Spirometer) Table 4.

**Table 4. Hospital stay, Follow up & complications.**

Mean hospital stay	1±0.2 Days
Mean follow up period	23±5.4 months
Number of post-operative complications	3
Number of recurrence	0
Number of post-operative reflex sweating	0

All patients are satisfied with the operation. And an improvement in the quality of life was seen starting from the first post-operative evaluation and this improvement was maintained until the end of the follow up. Table 5.

**Table 5. Outcome of quality of life assessed by SF – 36-health survey.**

	Preoperative	Six months Post-operative
1-Physical functioning	67	74
2-Role physical	54	71
3-Bodily pain	71	68
4-General health	75	77
5-Vitality	69	74
6-Social functioning	50	83
7-Role emotional	76	79
8-Mental health	72	70

## DISCUSSION

Anatomically, the sympathetic nerves originate in the intermediolateral horns of the spinal cord, between segments T1 and L2. Each sympathetic pathway is composed of preganglionic and postganglionic neurons.

The nerve fibers to the sweat gland are postganglionic fibers arising from the ganglion on the sympathetic trunks. These fibers reenter the corresponding spinal nerves along its grey ramus communicans. In addition, they may go upward and downward in the sympathetic trunks before leaving and distributing to the sweat gland. Therefore, the distributions overlap, and are not necessarily to the same part of the body from the same spinal segments.<sup>(16)</sup> (we have zero % recurrence in our series inspite of this overlapping of nerve fibers because our patients complaining from hyperhidrosis which is a pathological condition in which there is excessive sweating beyond physiologic needs and this improved by our operation, but after operation the patients had normal palmar sweating which occurring due to overlapping of nerve fibers ,and if this overlapping is not present the patients will complaining from over dryness of the hand which distress the patients).

We use the term "reflex sweating" instead of "compensatory hyperhidrosis" because the latter has been misused as a medical term and several observations

have been noted in actual practice. First, there is no increased sweating over the face and upper body after lumbar sympathectomy for plantar sweating. Second, different degrees of post-operative sweating were found after different levels of sympathetic block. Lastly, there has been abnormal sweating induced after sympathetic procedures for a non-sweating sympathetic disorder (e.g., facial blushing). Hence, post-operative sweating is not a sort of compensation but due to the feedback mechanism of the autonomic nervous system.<sup>(19)</sup>

Reflex sweating is classified into four grades Grade 1 no reflex sweating, Grade 2 mild sweating, Grade 3 embarrassing sweating, Grade 4 disabling sweating.<sup>(20,21)</sup>

The majority of surgeons remove the second, third, fourth, and sometimes the lower part of the stellate ganglion. However, it is questionable whether such an extensive resection is necessary. Limiting the extent of sympathectomy is supposed to reduce operative time, intraoperative bleeding, the incidence of Horner's syndrome and compensatory hyperhidrosis<sup>(22)</sup> (because limited T4 is the minimum procedure, preserving –ve feedback mechanism and away from satellite ganglion).

Transection of the sympathetic chain varies in extension and level. An overview of published series of thoracoscopic sympathectomy for palmar hyperhidrosis is given in Table 6.

**Table 6. Summary of series on the treatment for palmar hyperhidrosis.**

Author, Year& Reference	No. of patients	Level of surgery	Success Rate (%)	Reflex sweating (%)
Yilmaz 1996 (23)	28	T2-5	100	67
Drott&Class1996(24)	1163	T2-3	98	55
Andrews 1997(25)	42	T2-3	97.6	86
Gossot 1997(26)	54	T2-4	98.2	72
Rex,etal.,1998(27)	785	T2-3	99.4	59.8
Zacherl 1999(28)	369	T1-4	98.7	68
Reisfeld 2000(29)	650	T2	85.2	83
Nicholas,etal2000(30)	125	T2-4	98.5	91
Riet,etal.,2001(31)	28	T3	100	0
Han,etal.,2002(30)	179	T2-3	99.4	67.3
Yoon,etal.,2003(31)	27	T3	100	3.7
Choi,etal.,2003(9)	52	Upper part of 4	90.8	87.5
Yano,etal.,2005(34)	67	T2	81	90
Chou,etal.,2006(16)	324	T4	100	0
Present study	78	T4	100	0

(T1-4, resection of lower part of stellate ganglion to fourth ganglion; T2-4, resection of second to fourth ganglion; T2, limited resection at level of second ganglion; T3, limited resection at level of third ganglion; T4 limited resection at level of fourth ganglion).

The rationale of blockade T4 instead of T2 and/or T3 for the treatment of PH is based on (i) the neuroanatomical concept of sympathetic nervous system and (ii) the positive and negative feedback mechanism of the autonomic nervous system<sup>(35)</sup>

Mean hospital stay in our study was one day while in Wait et al 2010<sup>(34)</sup> study the averaged hospital stay was 0.5 day.

In our study the recurrence of hyperhidrosis was 0% which is comparable to that reported in the literature 2% reported by Rathinam et al 2008 study,<sup>(4)</sup> 6.5% by Lai et al 1997 study<sup>(37)</sup> and 0% by Chou,etal.,2006.<sup>(16)</sup> this difference in the recurrence may be due to accurate localization of T4 and relatively small number of the patients in our study in comparison to other studies.

In our study, we did T4 blockade for palmar hyperhidrosis, T4&T5 for palmar and axillary hyperhidrosis and there is no reported compensatory

hyperhidrosis during the period of follow up but Wait et al 2010 found that ablation of T5 increase the incidence of reflex sweating (In our study there were small numbers of patients did T5 with T4 blockade {15 patients} but Wait et al did T5 blockade to 642 patients so the complications appear more in studies with large number of patients).

In this study we represent our experience in Mansoura University Hospital about this technique and this our results during the period of follow up[ 23 ±5.4 months] which was similar to other studies as Chou, etal., 2006)as they advocate, T4 blockade for palmar hyperhidrosis due to its high success rate and effective reduction of compensatory hyperhidrosis.

In conclusion limited T4 blockade is an easy, safe and effective treatment for patients with primary palmar hyperhidrosis without postoperative reflex sweating.

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