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Outcome of Bilateral Thoracoscopic Sympathectomy for Patients with Primary Focal Hyperhidrosis, Sohag University Hospital Experience

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Abstract

Background: Primary focal hyperhidrosis (PFH) causes excessive sweating and significant quality-of-life impairment, with symptoms aggravated by emotional stress and anxiety. Conservative treatments often provide only temporary relief, making endoscopic thoracic sympathectomy (ETS) the definitive option, though traditional T2 interruption carries a high risk of compensatory sweating. Lower T3–T4 interruption may reduce this complication, but regional data are lacking. This study assesses the efficacy and safety of T3–T4 bilateral thoracoscopic sympathectomy in Egyptian patients.

Methods: This prospective study included 20 patients (≥16 years) with severe PFH (HDSS ≥3) unresponsive to conservative therapy, excluding those with severe cardiopulmonary disease or bleeding disorders. Diagnosis was confirmed clinically and with Minor starch–iodine testing. All patients underwent bilateral thoracoscopic T3–T4 sympathicotomy. Outcomes included symptom resolution, compensatory sweating, QoL (DLQI), complications, and recurrence, with follow-up up to 6 months.

Results: Twenty patients (mean age 20.9 years; 65% male) with severe PFH underwent bilateral thoracoscopic T3–T4 sympathectomy. All procedures were completed safely with minimal blood loss and rapid recovery. HDSS scores dropped from a median of 4 to 0 ($p < 0.001$), with high patient satisfaction (median 10/10). Compensatory sweating occurred in 15% (mild/moderate), and one patient (5%) had recurrence. Functional and occupational outcomes improved in nearly all patients, sustained at a mean follow-up of 8.6 months.

Conclusion: T3–T4 bilateral thoracoscopic sympathectomy is a safe, effective surgical option for severe PFH. It produces excellent symptom control, minimal morbidity, high patient satisfaction, and acceptable levels of compensatory sweating. With continued refinement of technique and patient selection, T3–T4 BTS can be considered a reproducible standard of care in resource-constrained settings.

KEYWORDS

Primary focal hyperhidrosis; Bilateral thoracoscopic sympathectomy; Compensatory sweating; Hyperhidrosis Disease

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Introduction

Primary focal hyperhidrosis (PFH) affects 2–4% of the population and causes excessive sweating with major psychosocial and occupational impacts [1, 2]. Symptoms are aggravated by emotional stress and anxiety. Conservative treatments—which offer only temporary relief—often remain unsatisfactory [3, 4]. Endoscopic thoracic sympathectomy (ETS) is the definitive treatment for refractory PFH, but traditional T2 interruption carries high rates of compensatory sweating (25–40%) [5, 6]. Lower-level T3–T4 interruption may reduce this risk while maintaining efficacy, though evidence from North Africa is lacking [7, 8]. This study evaluates the outcomes of T3–T4 bilateral thoracoscopic sympathectomy in Egyptian patients.

Patients and Methods

This prospective, single-center study was carried out at Sohag University Hospital from January 2024 to June 2025. it included 20 patients aged 16 years and older, both sexes, with Severe PFH [Hyperhidrosis Disease Severity Scale (HDSS) ≥3], failed non-surgical therapy [antiperspirants, iontophoresis, or botulinum toxin], and no thoracic surgery history. The study was approved by the Institutional Review Board of Sohag Faculty of Medicine (FM-SU-24-003). Written informed consent was obtained from all participants, including permission for the publication of their data.

Exclusion criteria included patients with severe cardiopulmonary disease, and individuals with known bleeding disorders.

Diagnostic Confirmation

PFH diagnosis was confirmed by clinical assessment and HDSS scoring, Minor starch–iodine (starch–iodine) testing for objective localization, and exclusion of secondary causes by targeted clinical and laboratory evaluation [1, 2].

Surgical Technique

Procedures were performed under general anesthesia with selective single-lung ventilation using double lumen intubation without CO2 insufflation. Patients were placed in the semi-Fowler position. Two 5-mm ports were inserted at the second and fourth intercostal spaces along the anterior axillary line, with the upper port used as the camera port and the lower port as the working port.

The sympathetic chain was identified and transected at the T3 and T4 levels. The Kuntz nerve was divided when present. Electrocautery was used for dissection and hemostasis, and the pleural cavity was inspected bilaterally.

Standard 20 Fr chest tubes were placed bilaterally, with routine removal within 24 hours following radiographic confirmation of lung expansion

Outcome Measures

Primary Outcome: Symptom resolution was defined as postoperative HDSS ≤1, Compensatory sweating (CS) graded as: [mild (occasional, not bothersome), moderate (which requires clothing changes, socially noticeable), and severe (activity-limiting, disabling)], and QoL impact was assessed by the Dermatology Life Quality Index (DLQI).

Secondary Outcome: Operative time and intraoperative/early postoperative complications, Patient satisfaction assessed on a 0–10 visual analogue scale (VAS), and Recurrence, defined as return of bothersome sweating at the original site, assessed at 6-month follow-up.

Follow up:

Patients were evaluated postoperatively at 1 week, 1 month, 3 months, and 6 months. At each visit, HDSS and DLQI were recorded, and complications including CS were documented.

Ethical Compliance:

The study was approved by the Institutional Review Board of Sohag Faculty of Medicine (FM-SU-24-003). Written informed consent was obtained from all participants, including consent for data publication.

Statistical analysis

Data were analyzed using SPSS v28.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD) or median (interquartile range, IQR) according to

distribution, which was assessed with the Shapiro–Wilk test. Paired t-test or Wilcoxon signed-rank test was applied for pre- and postoperative HDSS comparisons. Categorical variables were analyzed with Fisher's exact test. Statistical significance was set at $p < 0.05$.

A priori sample size calculation was not feasible due to limited regional prevalence data; the study was designed as an exploratory cohort study.

Table 1: Demographic and Clinical Characteristics of the Study Population (n = 20)

Variable	Value
Age (years), mean ± SD (range)	20.9 ± 3.2 (16–27)
Sex (male:female), n (%)	13 (65%): 7 (35%)
BMI (kg/m²), mean ± SD	25.3 ± 2.4
Symptom duration (years), mean ± SD (range)	9.6 ± 2.6 (6–15)

Table 2: Clinical Characteristics of Primary Focal Hyperhidrosis (n = 20)

Parameter	N (%)
Type of PFH	
Palmar	12 (60%)
Palmar & plantar	5 (25%)
Palmar & axillary	3 (15%)
Severity of PFH (HDSS)	
Moderate (HDSS = 3)	6 (30%)
Severe (HDSS = 4)	14 (70%)

Results

A total of 20 patients with primary focal hyperhidrosis (PFH) underwent bilateral thoracoscopic sympathectomy (BTS) at the T3–T4 levels. The cohort was predominantly young, with a mean age of 20.9 ± 3.2 years (range: 16–27), and a male predominance (65%). The mean body mass index (BMI) was 25.3 ± 2.4 kg/m². The average duration of symptoms prior to surgery was 9.6 ± 2.6 years (range: 6–15). None of the patients had comorbidities that increased surgical risk. Table 1

Palmar hyperhidrosis was the most common pattern (60%), while 40% of patients exhibited combined involvement (palmar–plantar in 25%, palmar–axillary in 15%). Disease severity was high: all patients had baseline Hyperhidrosis Disease Severity Scale (HDSS) scores ≥3, with a median of 4 (IQR: 3.75–4). Seventy percent had severe disease (HDSS = 4). Table 2

All procedures were completed thoracoscopically without conversion to open surgery, confirming the feasibility and safety of T3–T4 BTS. Mean operative time was 65.9 ± 14.9 minutes, and mean blood loss was minimal at 36 ± 13.5 mL. Chest tubes were removed within 24 hours in all patients. Table 3

Table 3: Intraoperative Outcomes (n = 20)

Metric	Value
Operative time (minutes), mean ± SD	65.9 ± 14.9
Blood loss (mL), mean ± SD	36 ± 13.5
Conversion to thoracotomy, n (%)	0 (0%)

Postoperative recovery was uniformly favorable, with no major complications or readmissions. Mild incisional pain occurred in 80% and resolved within a median of 1.5 days (IQR: 1–2) with non-opioid analgesics. Minor complications occurred in 3 patients (15%), subcutaneous emphysema (n = 2) and transient pneumothorax (n = 1)—all resolving spontaneously without intervention. No major complications, readmissions or mortality were observed. All patients were discharged within 48 hours. Table 4

Table 4: Postoperative Recovery Metrics (n = 20)

Outcome	Value
Pain incidence, n (%)	16 (80%)
Median pain duration (days, IQR)	1.5 (1–2)
Minor complications, n (%)	3 (15%)
Subcutaneous emphysema	2 (10%)
Transient pneumothorax	1 (5%)
Major complications	0 (0%)
Length of hospital stay	≤48 h in all patients

Symptom Resolution:

Symptom relief was profound and consistent across the cohort. HDSS scores decreased from a preoperative median of 4 (IQR: 3.75–4) to 0 (IQR: 0–0.25) at follow-up ($p < 0.001$), representing near-complete resolution with a very large effect size (Cohen's d = 4.2; 95% CI: 3.1–5.3). Subjective improvement, assessed on a 10-point scale, averaged 8.7 ± 1.6 (range: 5–10). This represents not only statistical but also clinically meaningful

improvement, translating to complete functional resolution in nearly all patients. Figure 1

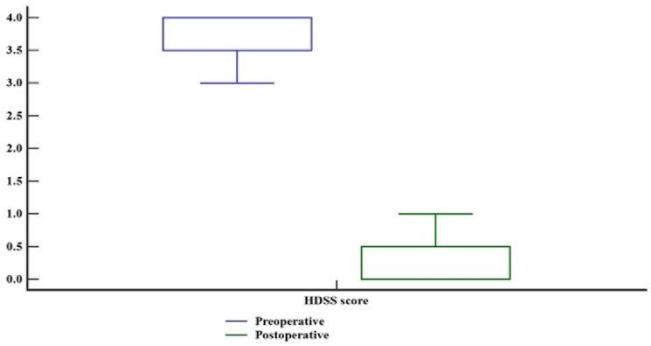

Figure 1: HDSS score of the studied patients

Compensatory Sweating (CS):

Compensatory sweating (CS) developed in 3 patients (15%), all confined to the trunk. One case (33.3%) was mild, and two cases (66.7%) were moderate; none were severe or disabling. This incidence is substantially lower than historical reports of 30–80% following T2 ablation. One patient (5%) with palmar–axillary disease developed recurrence at 6 months follow up. Table 5

Table 5: Primary Outcomes (n = 20)

Outcome	Value
HDSS reduction (median, IQR)	4 (3.75–4) → 0 (0–0.25), $p < 0.001$
Subjective improvement (VAS, mean ± SD)	8.7 ± 1.6
Compensatory sweating, n (%)	3 (15%)
Mild	1 (5%)
Moderate	2 (10%)
Severe	0 (0%)
Recurrence, n (%)	1 (5%)

Quality of Life Impact

Patient-reported satisfaction was high, with a median score of 10/10 (IQR: 8.75–10). Functional recovery was excellent: all patients resumed normal social activities, and 95% reported improved occupational performance. At a mean follow-up of 8.6 ± 2.4 months (range: 6–12), therapeutic benefits were sustained in all but one patient (the recurrence case). Table 6

Predictive Analysis

Correlation analysis demonstrated that patient satisfaction strongly correlated with HDSS reduction ($r = 0.82$, $p < 0.001$) and absence of compensatory sweating ($r = 0.76$, $p < 0.001$). No demographic or baseline clinical factors significantly predicted the risk of CS ($p > 0.05$).

Table 6: Quality of Life Outcomes (n = 20)

Metric	Value
Satisfaction score (median, IQR)	10 (8.75–10)
Resumption of social activities	20 (100%)
Improved occupational performance	19 (95%)

Discussion

Our findings clearly demonstrate that T3–T4 Sympathectomy is highly effective in controlling excessive sweating. Patients experienced marked improvement, and the reduction in HDSS scores was both dramatic and statistically significant. These outcomes are in strong agreement with the results of Doolabh et al. [9], who reported excellent symptom control and patient satisfaction with T3–T4 ablation.

Similarly, Ong et al., [10] and Mahmoud et al., [11] found that targeting the sympathetic chain at T3–T4 provided an optimal balance between efficacy and the incidence of compensatory hyperhidrosis.

The low recurrence rate observed in our study (5%) is likely related to our routine identification and ablation of the nerve of Kuntz, in addition to meticulous dissection of the sympathetic chain. Our results align with those of Pei et al., [8], who reported that unrecognized nerve of Kuntz branches was a leading cause of postoperative recurrence.

The most significant finding in our study concerns compensatory hyperhidrosis (CH). We observed a 15% incidence, with no severe cases. This reduction supports the concept that sparing the T2 ganglion preserves partial truncal thermoregulatory control, thereby mitigating excessive compensatory sweating.

Our findings are consistent with those of Doolabh et al., [9], who reported a 17% incidence of CH following R3–R4 sympathectomy, Similarly, Ong et al., [10] observed mild CH in only 14% of cases at the R3–R4 level, with high patient satisfaction.

Schmidt et al., [12] and Licht et al., [13] also demonstrated that limiting dissection to R3–R4 achieves excellent control of palmar and axillary sweating while minimizing the risk of CH.

The procedure demonstrated an excellent safety profile, with no intraoperative complications. Postoperative discomfort was mild and transient, primarily localized to chest tube insertion sites, and resolved within a few days without intervention. This is consistent with previous studies reporting similar outcomes after VATS Sympathectomy [3, 10, 12].

Our two-port configuration proved to be efficient, ergonomic, and minimally invasive. Recent comparative studies have shown that two-port techniques offer equivalent or superior outcomes—shorter operative times, comparable recurrence rates, and lower postoperative pain—making them a current global preference for routine sympathectomy [8, 12].

The selection of the R3–R4 level remains the most crucial determinant of the balance between efficacy and postoperative side effects in thoracoscopic sympathectomy. Our outcomes strongly support this level as the current optimal target for the treatment of palmar and axillary hyperhidrosis, achieving both durable symptom control and a low incidence of compensatory hyperhidrosis (CH).

Limitations and future prospects

Limitations include small sample size (n = 20), single-center design, and relatively short follow-up (mean ≈8.6 months) which may underestimate late CH or recurrence. Nevertheless, these prospective data provide meaningful regional evidence for North Africa: T3–T4 BTS appears particularly suitable for climate-vulnerable populations where limiting CH is a priority. Future multicenter studies with longer follow-up are warranted.

We recommend multicenter Egyptian trials with extended follow-up (>24 months), standardized CH assessment using validated tools, and comparative cost-effectiveness analyses of BTS vs botulinum toxin/iontophoresis in public health contexts.

Conclusion

T3–T4 bilateral thoracoscopic sympathectomy is a safe, effective surgical option for severe PFH. It produces excellent symptom control, minimal morbidity, high patient satisfaction, and acceptable levels of compensatory sweating. With continued refinement of technique and patient selection, T3–T4 BTS can be considered a reproducible standard of care in resource-constrained settings.

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