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**Original Article**

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# Impact of Endoscopic Thoracic Sympathectomy among Hyperhidrosis Patients at A Tertiary Care Center

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## ABSTRACT

Hyperhidrosis is characteristically termed as excessive sweating excessively even during normal situations. **Objectives:** To assess the dynamics of sweating in patients with hyperhidrosis before and after treatment with Endoscopic Sympathectomy (ETS). **Methods:** This pre-post intervention research was carried out at the Thoracic Surgery Unit of Lady Reading Hospital, Peshawar, from January 2023 to December 2024. Patients presenting with sweating of either gender, between 18 to 60 years of age, diagnosed with primary hyperhidrosis, were included in the study. Patients having secondary hyperhidrosis, female with symptoms of menopause, patients having generalized sweating, with severe or multiple co-morbidities such as pulmonary or cardiac issues, chronic illness (uncontrolled) or with any neurological condition were excluded from the study. SPSS version 23.0 was used for data analysis. Paired Student t-test was applied for sweating parameters before and after ETS, keeping $p<0.05$ statistically significant. **Results:** The study included 53 patients with a mean age of (34.55 ± 8.72) years, nearly equally distributed by gender. Axillary hyperhidrosis was the most common type (43.4%), and most patients had HDSS grades 3or 4. Post-ETS, all sweat parameters showed significant improvement. Notably, BSR reduced to 0.09 ± 0.07 mg/min/cm$^2$, PSR to 0.2 ± 0.17 mg/min/cm$^2$, SV to 0.07 ± 0.05 mg/cm$^2$, and ST to (12.28 ± 10.8) seconds. These findings demonstrate that ETS effectively reduces the severity and extent of sweating in patients with hyperhidrosis. **Conclusions:** A significant reduction in sweating parameters of patients with hyperhidrosis undergoing Endoscopic Thoracic Sympathectomy.

## INTRODUCTION

Hyperhidrosis is characteristically termed as sweating excessively even during normal situations [1]. This results in perspiration more noticeably in extremities like armpits, hands, soles of feet and sometimes even face. This can occur intermittently or continuously, severely affecting routine daily activities [2]. The global prevalence of hyperhidrosis shows much variability, with recorded rates varying from as low as 1 % to as high as 16.7 % [3]. The frequency depends upon research from different populations as well as regions. The variations are postulated to have influences of climatic conditions, genetic factors and lifestyle differences [4]. For the treatment of hyperhidrosis, currently, medicinal treatment shows resistance; only surgical treatment is recommended [5]. Surgical treatment includes a procedure known as Endoscopic Sympathectomy (ETS), which is carried out by making small incisions in the chest of the patient via thoracoscopy [6]. Based on the surgeon's experience and type of hyperhidrosis, the sympathetic nerve trunk is severed using electric cautery that is linked to hyperhidrosis. This tends to reduce or halt abnormal stimulation of the gland effectively [7]. This makes ETS the preferred mode of treatment, having evident outcomes [8]. Nevertheless, compensatory hyperhidrosis (CH) is one of the few but frustrating adverse effects reported post-operatively [9]. In CH, various anatomic regions start



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sweating [10]. The most frequent adverse effect occurs on the chest, abdomen, groin and back. CH prevalence ranges very widely from 3 % to 98 % [11]. In addition to causing physical discomfort, CH leads to change in clothes more frequently, and causes the avoidance of certain activities. Coupled with all factors, it leads to substantial and unnecessary psychological distress, social withdrawal and anxiety [12]. In severe CH (SCH), patients might experience excessive as well as persistent sweating, interfering with activities of daily life and work, causing a substantial reduction in overall health and regret over choosing surgical treatment [13]. ETS is carried out by using a perspiration meter for measuring sweat volume (SV) before and after surgery. This is done for assessing indications and the effect of treatment. The etiology of hyperhidrosis is unknown [14]. Primary hyperhidrosis is a condition by itself, resulting from sympathetic hyper stimulation. Secondary hyperhidrosis is caused by various medical conditions such as neurological issues, endocrine disease, hematological malignancy, chronic infection, drugs and neuroendocrine tumor [15]. For many patients, the condition has a devastating social impact and emotional distress, leading to embarrassment and a reduction in quality of life. Nonetheless, patients prefer medicinal treatment to surgical treatment, which leads to either a delay in attaining proper treatment and therefore the severity of the condition increases [16]. Other causes of delay in being diagnosed and treated are misunderstanding of the patient on behalf of the disease, fearing a lack of medicinal treatment or fear of surgery, while it is the only option [17].

This study aimed to assess the dynamics of sweating in patients with hyperhidrosis before and after treatment with Endoscopic Sympathectomy (ETS).

## METHODS

This pre-post intervention study was carried out at the Thoracic Surgery Unit of Lady Reading Hospital, Peshawar (Reference No: 377/LRH/MTI) from January 2023 to December 2024. Patients presenting with sweating of either gender, between 18 to 60 years of age, diagnosed with primary hyperhidrosis, were included in the study. Patients having secondary hyperhidrosis, females with symptoms of menopause, patients having generalized sweating, with severe or multiple co-morbidities such as pulmonary or cardiac issues, chronic illness (uncontrolled) or with any neurological condition were excluded from the study. Informed consent was obtained from each patient before their inclusion in the research. The sample size was calculated using the Open Epi online software, keeping the hypothesized frequency of hyperhidrosis at 8.85 % as reported in a study; the sample size came out to be 53 at a 80% confidence level [18]. Due to constraints in resources and limited availability of patient sample size, the confidence level was kept at 80%. Because at a 95% confidence level, the sample size had come out to be 124; however, this sample was not feasible for us. This is why it was kept at 80%. Population size was kept as 1,000,000 as fpc (finite population correction factor), as it is used generally when calculating sample sizes. Primary hyperhidrosis was confirmed by the clinician after excluding all possible causes of hyperhidrosis (secondary). The term secondary hyperhidrosis was used when excessive sweating takes place, which was not idiopathic but was due to an underlying condition or medication side effect. Diseases of the spinal cord (including CNS), thyroid disease, chronic infections like tuberculosis or HIV-associated disorders, auto-immune diseases, neuroendocrine tumors or hematological malignancies. The HDSS was used for objectively measuring primary hyperhidrosis severity. It helps in assessing hyperhidrosis severity on the basis of the extent of excessive sweating associated with impairment of routine activities. Severity of hyperhidrosis was rated by the patients as follows [6]: 1- Underarm sweating was never noticeable and never interferes with daily activities, 2- Underarm sweating is tolerable but sometime interferes with daily activities, 3- Underarm sweating was barely tolerable and frequently interferes with daily activities, 4- Underarm sweating is intolerable and always interferes with daily activities. After ethical approval and taking informed consent from the patients, data were collected, which included baseline demographics, clinical signs and symptoms and any treatment received before being advised for ETS. Any treatment before surgical advice, including topical antiperspirant, anti-cholinergic or iontophoresis, etc., was also recorded. The symptom severity was recorded before and after ETS. ETS was performed under general anesthesia for each patient. Intubation was of the double-lumen variety. A single-staged bilateral ETS using two-port VATS (video-assisted thoracoscopic surgery) was carried out using single lung ventilation with the patient kept in the lateral decubitus position. Incision of the thoracoscopic port was in the mid-axillary line, incised at the 6th intercostal space. The instrument port was incised at 3rd intercostal space in the anterior axillary line. The sympathetic chains were transacted at the 3rd and 4th level of ribs using electro-cautery, and extending to the 5th rib if there was the presence of axillary hyperhidrosis. At the lower rib border, special care was considered for avoiding any injury to the intercostal bundles (neurovascular). The trunk's exact spot was identified via surrounding landmarks like the arch of aorta arch and the azygous arch. The 1st rib was another vital landmark, where the pulse of the subclavian artery could be felt in a closed C-shape ring. To prevent bleeding or hyperemia, unnecessary palpation of the sympathetic chain was avoided as much as possible. SPSS version 23.0 was used for analyzing the


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data. Data included were age, gender, Hyperhidrosis severity scale (HDSS), basal sweat rate (BSR), start sweat rate (SR), peak sweat rate (PSR) and sweat time (ST). Comparison of demographics and various variables pre- and post-ETS was carried out using a paired student t-test, keeping p-value of ($p<0.05$) as statistically significant after testing the normality of data using the Shapiro-Wilk test (for limited sample size). The result of normality testing came back insignificant($p>0.05$), suggesting that the data were normally distributed, and so a paired t-test was then applied.

## RESULTS

The study included 53 patients undergoing Endoscopic Thoracic Sympathectomy (ETS) for hyperhidrosis. The mean age of participants was (34.55 ± 8.72) years. Gender distribution was almost equal, with 26 (49.06%) male and 27 (50.94%) female. Regarding the site of hyperhidrosis, 23 patients (43.4%) had axillary hyperhidrosis, 11 (20.75%) had palmar hyperhidrosis, 9 (16.98%) had plantar hyperhidrosis, and 10 (18.87%) had genital hyperhidrosis. The Hyperhidrosis Disease Severity Scale (HDSS) showed that 5 patients (9.43%) were at level 2, 25 (47.2%) at level 3, and 23 (43.4%) at level 4, with no patients categorized at level 1 (Table 1).

**Table 1:** Baseline Demographics of Patients Undergoing ETS (n=53)

| Variables | | Frequency (%) / Mean ± SD |
|---|---|---|
| **Mean Age** | | 34.55 ± 8.72 |
| Gender | Male | 26 (49.06 %) |
| | Female | 27 (50.94 %) |
| Site of Hyperhidrosis | Axillary | 23 (43.4 %) |
| | Plantar | 9 (16.98 %) |
| | Palmar | 11 (20.75 %) |
| | Genital | 10 (18.87 %) |
| HDSS | 1 | 0 |
| | 2 | 5 (9.43 %) |
| | 3 | 25 (47.2 %) |
| | 4 | 23 (43.4 %) |

Following ETS, significant reductions were observed across all measured sweat parameters. The BSR (Baseline Sweat Rate) decreased from a mean of 1.1 ± 0.5 mg/min/cm$^2$ to 0.09 ± 0.07 mg/min/cm$^2$ ($p<0.001$). PSR (Peak Sweat Rate) was reduced from 2.62 ± 0.81 to 0.2 ± 0.17 mg/min/cm$^2$ ($p<0.001$). Sweat Volume (SV) decreased substantially from 5.2 ± 2.97 to 0.07 ± 0.05 mg/cm$^2$ ($p<0.001$). The Sweat Time (ST) also significantly decreased from 236.76 ± 94.2 seconds to 12.28 ± 10.8 seconds ($p<0.001$). Similarly, the SR start (Sweat Rate at initiation) dropped from 2.01 ± 0.78 to 0.1 ± 0.06 mg/min/cm$^2$ ($p<0.001$), indicating a marked treatment impact of ETS on sweat parameters (Table 2).

**Table 2:** Comparison of Sweat Parameters Before and After ETS (n=53)

| Sweat Parameters | Prior to ETS | After ETS | p-Value |
|---|---|---|---|
| BSR (mg/min/cm$^2$) | 1.1 ± 0.5 | 0.09 ± 0.07 | <0.001 |
| PSR (mg/min/cm$^2$) | 2.62 ± 0.81 | 0.2 ± 0.17 | <0.001 |
| SV (mg/cm$^2$) | 5.2 ± 2.97 | 0.07 ± 0.05 | <0.001 |
| ST (s) | 236.76 ± 94.2 | 12.28 ± 10.8 | <0.001 |
| SR start (mg/min/cm$^2$) | 2.01 ± 0.78 | 0.1 ± 0.06 | <0.001 |

## DISCUSSION

In this research, a comparison of sweat parameters was made before and after ETS in patients diagnosed with primary hyperhidrosis in which medical treatment had failed. A significant reduction in sweat parameters was observed in patients undergoing ETS. Since sweating differs in its terms, localization, factors, etc., diagnosing local hyperhidrosis necessitates objective evaluation and assessment of sweating quantitatively by using a highly reliable technique. Quantitative assessment of sweating parameters is vital in the evaluation of temporal aspects of sweating disorders [19]. A study recommended the use of the SKN-2000 device for measuring the flow volume-compensating ventilation capsule perspiration meter that works by entering air into the capsule and then measures the difference in humidity in-between prior to and after bringing air into the capsule [20]. The meter contains a servo system which controls airflow volume, which depends on the CV, allowing high responsiveness and objectively measuring hyperhidrosis [21]. A similar problem was used in our study as well for inducing emotional stress and sweating. Another study reported demonstrated all stimuli induced sweating amongst hyperhidrosis patients in comparison to patients without hyperhidrosis. Furthermore, the study reported that the difference due to mental arithmetic, such as emotional stimuli, was the highest [22]. In yet another study, it was reported that different types of emotional sweating take place even among non-hyperhidrosis individuals; however, the phenomenon is substantially larger among hyperhidrosis patients [23]. Similar to the findings of our research, sweating was measured prior to ETS and right after ETS and then over time. However, the study used VapoMeter for comparison of transepidermal water loss till 1-year post-resection in either T3 or T4 sympathetic ganglia and observed that sweating was substantially decreased among both groups of patients 1-year post-surgery. In general, it is regarded that characteristically prolonged ST is a more authentic measure of pre-operative hyperhidrosis patients than high PSR [24]. Similarly, in our study as well, we found elevated BSR, prolonged ST and an increase in PSR among hyperhidrosis patients pre-operatively. As predicted, post-operatively, all parameters


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of sweating reduced significantly to almost nil.

## CONCLUSIONS

The findings of this study showed a significant reduction in sweating parameters of patients with hyperhidrosis undergoing Endoscopic Thoracic Sympathectomy.

## Authors Contribution

Conceptualization: FK
Methodology: MAK, FK
Formal analysis: MAK
Writing review and editing: MAK, TA

All authors have read and agreed to the published version of the manuscript

## Conflicts of Interest

All the authors declare no conflict of interest.

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